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# Table of Contents

9

# Growth of Hydroxyapatite on Sericin Coated and Non-Sericin Coated Silk Fibers using Simulated Body Fluid

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*Abstract*- Hydroxyapatite (HAp) was grown on sericin coated silk fibers and non-sericin coated silk fibers using simulated body fluid (SBF) at 37 °C and two concentrations of 1.0×standard SBF and 1.5×standard SBF. The results showed that, for both concentrations of SBF, HAp grown on sericin coated silk fibers is more than that on non-sericin coated silk fibers. This indicates that sericin on the silk fiber plays an important role on the growth of HAp on the silk fibers. Moreover, the particle size of HAp grown in 1.5×SBF concentration is smaller than that in 1.0×SBF concentration.

*Index Terms*- Hydroxyapatite, Simulated body fluid, Sericin, Silk fiber, Concentration, Calcium phosphate

## I. INTRODUCTION

The composite material in human body such as bone consists of mineral phase about 70 wt.% and organic matrix about 30 wt.% [1-4]. Mineral phase in natural bone is hydroxyapatite (HAp, $Ca_{10}(PO_4)_6(OH)_2$) which is excellent application in biocompatibility, osteo-conductivity and bioactivity [5]. Nowadays, many applications on such special characteristics of hydroxyapatite have been extensively studied [6] and developed for bone replacement and remodelling processes of cells surrounding soft tissues at the bone-implant interface [7]. HAp may become an excellent host for living tissues since it allows body fluid or human blood to diffuse into its porous structure to supply nutrient and mineral ions for accelerateing the proliferation and differentiation of bone cells [8].

Natural silk fiber, obtained from cocoon (*Bombyx mori*), consists of protein-based fiber. It is naturally originated from silkworm. There are two types of protein in silk fiber, that is sericin and fibroin. Fibroin is the core filament and benefit for medical applications, substrate for cell culture, artificial skin and tendon [1]. Fibroin was approved for its biocompatibility which can be perfectly used in medical application as reported by Altman [9]. Sericin is naturally coated on the fibroin core. It is a water soluble protein and used in biological and medical applications due to its antibacterial, UV resistant property [10], lipid oxidation [11] and anti-tumour property in immunogenicity [12-13].

In this research, sericin coated silk fibers (SF) and non-sericin coated silk fibers (NSF) were used as seed fibers to induce HAp crystals by soaking in SBF of various concentrations. The silk fibers with induced HAp crystals on the surface were washed and dried for morphological investigation using thermal scanning electron microscopy (SEM) and field-emission electron microscopy (FE-SEM). Then, the deionised (DI) water was added into the silk fibers for sonicating in ultrasonic bath to remove HAp crystals from the silk fibers, and HAp crystals suspended in DI water were obtained. Finally, they were dropped and dried on silicon wafers for characterization. The structure of HAp crystals was characterized by X-ray diffraction (XRD). The element of HAp was characterized by energy dispersive X-ray spectroscopy (EDX). HAp functional group was characterized by Fourier transform infrared spectroscopy (FTIR)

## II. EXPERIMENTAL

### A. Silk fiber preparation

Two types of silk fibers were prepared: (i) SF and (ii) NSF. SF were prepared by rinsing the raw silk fibers with DI water for three times to remove the dust and impurity on the surface and dried in an oven at 37 °C for 1 day. NSF were prepared by boiling the raw silk fibers in DI water at 100 °C for 20 min and this process was repeated for 5 times to ensure that any residual sericin on the silk fibers was completely removed. Then, both SF and NSF were cut into 5 cm long for soaking in SBF solution.

### B. Simulated body fluid preparation

The simulated body fluid (SBF) is the liquid solution that contains the same ion concentrations as human blood plasma as reported by Kokubo [8,14-19]. The 1.5×SBF prepared in this work followed Kokubo's recipe as shown in Table 1. In this work, 1.5×SBF was prepared as a stock solution in which its ion concentration is 1.5 times of human blood. The 1.0×SBF means that the prepared solution has the same ion concentration as in human blood plasma. In this work, the 1.0×SBF was prepared by dilution of 1.5×SBF, following the equation:

$$C_1 V_1 = C_2 V_2 \qquad (1)$$

where $C_1$ is the concentration at 1.5×SBF, $V_1$ is the volume of 1.5×SBF, $C_2$ is the concentration at 1.0×SBF, $V_2$ is the volume of 1.0×SBF.

**Table 1** Reagent addition order in DI water for 1 litre of 1.5×SBF

| Order | Reagent | Source of reagent | Amount |
|-------|---------|-------------------|--------|
| 1 | NaCl | Ajax Finechem | 12.053 [g] |
| 2 | NaHCO$_3$ | Ajax Finechem | 0.533 [g] |

| 3 | KCl | Ajax Finechem | 0.338 | [g] |
| 4 | $K_2HPO_4 \cdot 3H_2O$ | Carlo Erba Reagent | 0.347 | [g] |
| 5 | $MgCl_2 \cdot 6H_2O$ | Ajax Finechem | 0.467 | [g] |
| 6 | 1M HCl | J.T. Baker | 50 | [ml] |
| 7 | $CaCl_2$ | Ajax Finechem | 0.438 | [g] |
| 8 | $Na_2SO_4$ | Ajax Finechem | 0.108 | [g] |
| 9 | $C_4H_{11}NO_3$ (Tris) | Ajax Finechem | 9.177 | [g] |
| 10 | 1M HCl | J.T. Baker | 8.5 | [ml] |

*C. Growth of Hap on silk fibers*

The prepared 1.0× SBF was filled in two plastic tubes and 1.5×SBF was also filled in another two plastic tubes, each tube with 30 ml. Two types of silk fibers, SF and NSF which already prepared and cut into 5 cm long were used for soaking in SBF solutions.

0.2 g of SF was soaked in 1.0×SBF and 1.5×SBF are SF 1.0 and SF 1.5, respectively. 0.2 g of NSF after soaked in 1.0×SBF and 1.5×SBF are NS F1.0 and NS F1.5, respectively.

The prepared four samples, i.e. SF 1.0, SF 1.5, NSF 1.0 and NSF 1.5 were kept in an incubator at 37°C for 7 days to observe the growth of HAp on the silk fibers. After 7 days, HAp crystals were grown on the surface of all four samples. They were then washed with DI water and dried in an air oven at 37°C for 1 day.

All four dried samples with HAp crystals on the surface were used for investigating the morphology by thermal SEM and FE-SEM. Subsequently, HAp crystals on the silk fibers were removed by sonicating method. About 0.2 g each of four dried silk fibers with HAp crystals on the surface obtained above, was put in 10 ml of DI water and sonicated in ultrasonic bath for 30 min. Then, the silk fibers were removed out of the DI water and small size of HAp crystals suspended in the DI water was obtained. Finally, they were centrifuged at 14,000 rpm for 1 hr and the supernatant was removed out of the tube. The wet HAp crystals were left at the bottom of the tube. About 50 μl of the wet HAp crystals was dropped on silicon wafers (100) and dried at 70 °C for 20 min. To increase the HAp film, the drop-dried method was repeated for 3 times. The dried HAp samples were used for XRD investigation.

To compare HAp crystals obtained from the growth on the silk fibers with those of pure HAp crystals, therefore pure HAp crystals were also prepared in this work. First, mixing 10.32 g $Ca(OH)_2$ with 120 g DI water. Then, 9.64 g 85 wt% $H_3PO_4$ solution was added by drop wise into $Ca(OH)_2$ solution. The pH of the mixture was adjusted to be 9.0 by adding ammonium hydroxide and stirred at 800 rpm for 3 hours, followed by three cycles of alternate centrifugation and water-washing to harvest the precipitates. The precipitates were dried in vacuum at 50 °C for 48 hours and ground into fine powder using an agate mortar [22].

*D. Characterization*

The structure of HAp crystals was characterized by XRD (Rigaku, RING 2000) with $CuK_\alpha$ in the 2θ range of 20°-55° with a scan step of 0.02°. The morphological structure of HAp crystals on the silk fibers was characterized with two methods. First method was thermal SEM (JSM-JEOL, 5800LV) at 10 kV and 10 nm gold coating. Second method was FE-SEM (JSM-JEOL, 6301F) at 5 kV and 30 nm gold coating. The chemical compositions of HAp crystals were analyzed by SEM-EDX (Oxford, ISIS 300) at 10 kV, 30° take off angle and 100 elapsed life times. The functional group of HAp crystals on the silk fibers was characterized using FTIR (Perkin Elmer, Spectrum One) by KBr pellet.

### III.   RESULTS AND DISCUSSION

Figure 1 shows the XRD patterns of hydroxyapatite $(Ca_{10}(PO_4)_6(OH)_2)$ and calcium phosphate $(Ca_3(P_5O_{14})_2)$ crystals on SF and NSF. The observed peaks in Figure 1 could be indexed based on HAp and calcium phosphate crystals in Joint Committee on Powder Diffraction Standard (JCPDS) card numbers 09-0432 and 52-1538, respectively.

For NSF, it is seen in Figure 1(a) and 1(b) that mixed crystals of monoclinic phase of calcium phosphate $(Ca_3(P_5O_{14})_2)$ and hexagonal phase of HAp $(Ca_{10}(PO_4)_7)$ were grown on NSF. However, the grown crystals are mainly calcium phosphates. When the SBF concentration was increased to 1.5×SBF, the XRD pattern shown in Figure 1(b) revealed that more HAp crystals were grown on the silk fibers. For SF, only pure HAp crystals were grown on the silk fibers for both SBF concentrations as shown in Figure 1(c) and 1(d). This grown HAp crystal has the same phase as in human bone. The above XRD results indicate that sericin is an important factor on the growth of HAp crystals on the silk fibers. Sericin composed mainly of serine and aspartic acid compared with glycine and alanine in fibroin. Furthermore, serine and aspartic acid have more COOH group than that of glycine and alanine. COOH group has high electrostatic and hydrophilic force from lone pair electron, therefore it prefers to coordinate with calcium ions $(Ca^{2+})$ in SBF. As a result, SF is better seed fiber to grow HAp than NSF.

Figure 2 shows the thermal SEM images of crystals on silk fibers. It can be seen in Figure 2(a)-2(d) that the crystals were grown on all silk fiber surfaces. The growth of crystals on silk fibers in Figure 2 because all the prepared SBF solutions used in this work reached a supersaturated concentration. The interfacial energy between a crystal nucleus and silk fiber surfaces in supersaturated concentration is lower than that of the crystals in contact with the SBF solution [21].
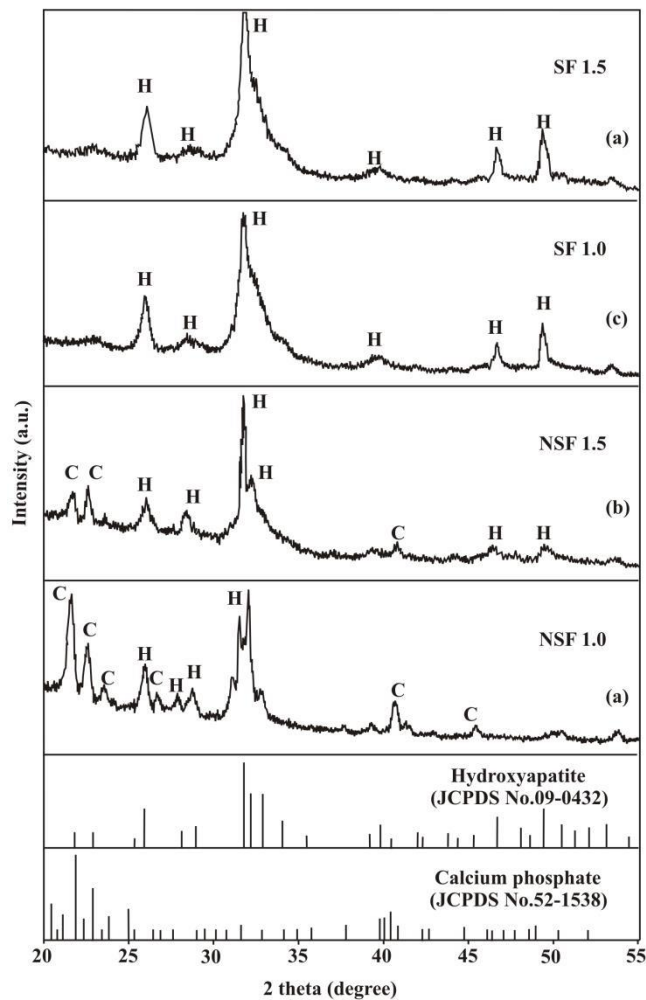
**Figure 1** XRD patterns of HAp and calcium phosphate crystals grown on (a) NSF 1.0, (b) NSF 1.5, (c) SF 1.0 and (d) SF 1.5.   C is calcium phosphate and H is HAp
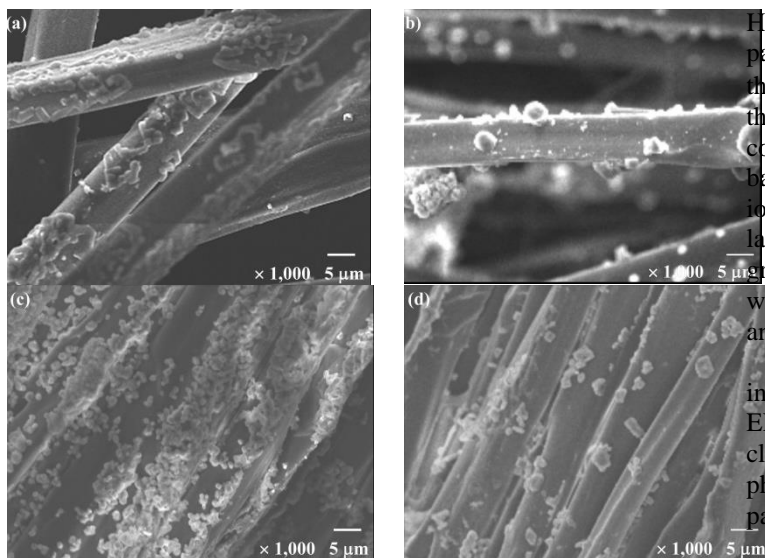


**Figure 2** SEM images of crystals on (a) NSF 1.0, (b) NSF 1.5, (c) SF 1.0 and (d) SF 1.5

The above results show that silk fibers are good seed for growing the crystals because there is hydrophilic functional group of protein on silk fibers acted like sponge to absorb SBF. However, we cannot identify the difference between morphology of crystals from thermal SEM images. Therefore, further investigation on crystals was carried out using FE-SEM.
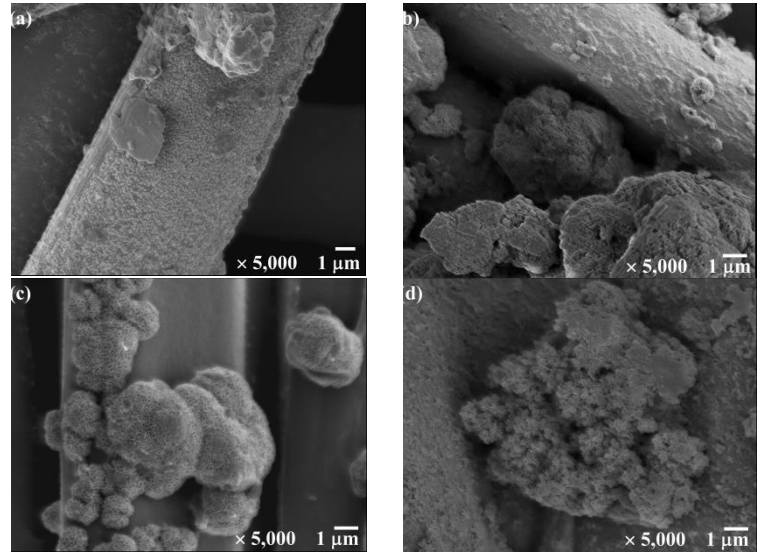


**Figure 3** FE-SEM images of calcium phosphate and HAp crystal on (a) NSF 1.0, (b) NSF 1.5, (c) SF 1.0 and (d) SF 1.5

Figure 3 shows the FE-SEM images of the crystals on silk fibers after soaking in SBF. Figure 3(a) and 3(b) show the flat shape and cauliflower shape crystals grown on NSF 1.0 and NSF 1.5, respectively. The flat shape and cauliflower shape crystals are attributed to calcium phosphate and HAp, respectively [23]. These results are in good agreement with those of XRD as shown in Figure 1(a) and 1(b). That is the mixed crystals of calcium phosphate and HAp were grown on both NSF 1.0 and NSF 1.5.

Figure 3(c) and 3(d) show cauliflower shape crystals, that is, HAp, grown on both SF 1.0 and SF 1.5, respectively. The particle size of HAp crystals grown on SF 1.5 and SF 1.5 are in the range of 1-4 μm and 0.1-0.2 μm, respectively. It is seen that the particle size of HAp crystals decreased with increasing SBF concentration. Because at high SBF concentration, that is, high barrier energy is difficult to dilute in solution and hence calcium ions prefer to grow into HAp with small crystals than those of large crystals [21]. The results show that pure HAp crystals were grown only on SF after soaking in both SBF concentrations which agrees well with those of XRD as shown in Figure 1(c) and 1(d).

The chemical composition of cauliflower shape crystals shown in Figure 3(c) was further analyzed by SEM-EDX. The SEM-EDX spectrum of HAp crystals is shown in     Figure 4. It is clearly observed that HAp crystals are composed mainly of phosphate and calcium. Oxygen element appeared in SEM-EDX pattern arises from carbonate group of HAp

The functional group of HAp crystals on SF 1.0 was carried out and compared with pure HAp crystals. The IR spectra obtained from HAp crystals growth on SF 1.0 and pure HAp crystals prepared in this work are shown in Figure 5. The

assignments of the vibrational modes associated with different functional groups reported in the literature for HAp crystals is presented in Table 2 [22,24].
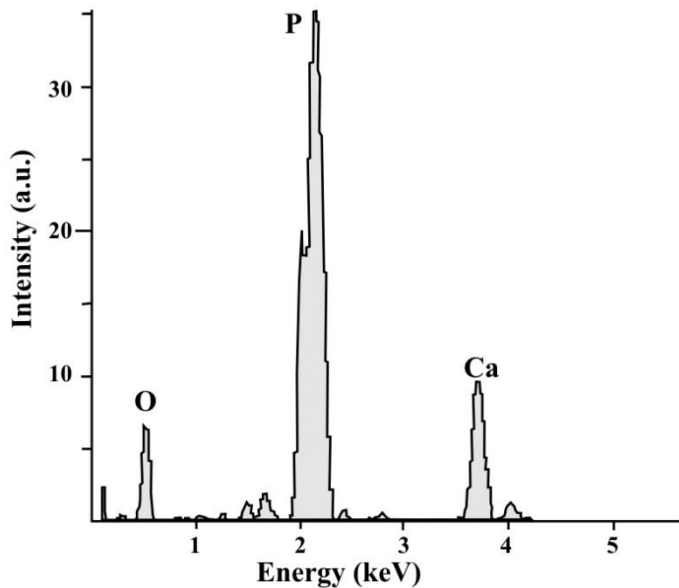


**Figure 4** SEM-EDX spectrum of HAp crystals from SF 1.0
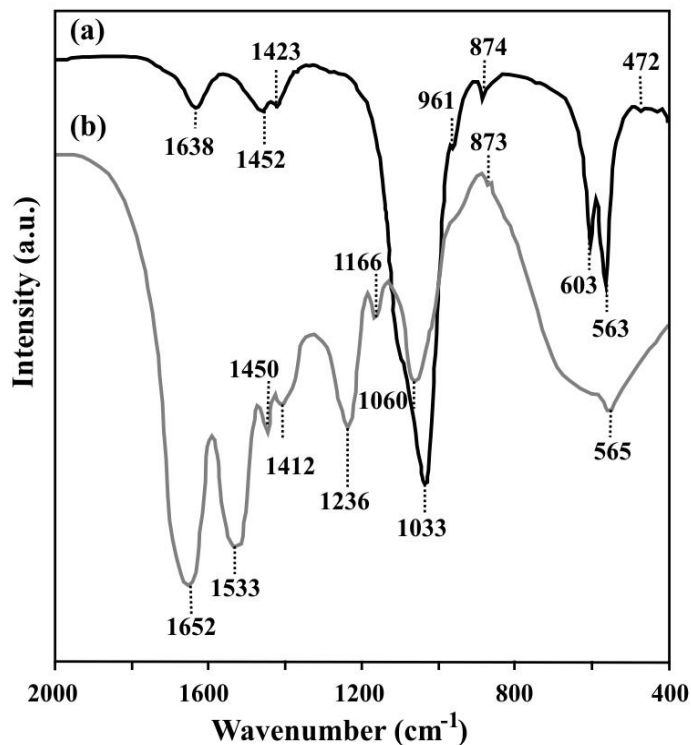


**Figure 5** FTIR spectra of (a) pure HAp crystals and (b) HAp

crystals on SF 1.0

**Table 2** Assignments of infrared vibrational modes of HAp crystals

| Frequency (cm$^{-1}$) | Vibrational mode assignments |
|---|---|
| 472-474 | $\nu_2$ bending O-P-O |
| 563-565, 602-605 | $\nu_4$ bending O-P-O |
| 800-970 | $\nu_2$ C-O B |
| 960-965 | $\nu_1$ symmetric stretching P-O |
| 1033, 1060 | PO$_4$ group |
| 1165-1167, 1410-1456 | Carbonate ion |
| 1230-1410 | Amide III |
| 1510-1535 | Amide II |
| 1600-1655 | Amide I |
| 1610-1640 | Bending O-H-O |

The peaks located between 472 and 605 cm$^{-1}$ is identified as the bending O-P-O vibration in which the phosphorous move approximately at right angle to the O-O lines and in the O-P-O planes. The peaks at 800-970 cm$^{-1}$ are C-O vibration. The strong peaks at 1033 and 1060 cm$^{-1}$ are PO$_4$ group [25]. The peaks located between 1165-1167 and 1410-1456 cm$^{-1}$ are carbonate ions [26]. The peaks shown between 1230-1410, 1510-1535 and 1600-1655 cm$^{-1}$ are amide III, amide II and amide I, respectively [27,28]. The peak at 1610-1640 cm$^{-1}$ is bending O-H-O vibration in which the hydrogen move at right angle to the O-O lines and in O-H-O planes. It is clearly observed that the IR spectra of HAp crystals on SF 1.0 showed strong peak of amide I, amide II, and amide III because they are main components in the silk fiber.

The peaks located at 1423 and 1452 cm$^{-1}$ for pure HAp, and 1166, 1412 and 1450 cm$^{-1}$ for HAp crystal on SF 1.0 are derived from carbonate ions, even though no carbonate source was introduced into the starting materials. Since, two samples were prepared in an atmospheric environment, it is reasonable to infer that the carbonate ions incorporated into HAp crystals from carbon dioxide gas in air. The band at 1638 cm$^{-1}$ representing O-H-O bending (OH group) of pure HAp and that of HAp crystals on SF 1.0.

## IV. CONCLUSION

This study demonstrates that HAp can be perfectly grown on SF 1.0 and SF 1.5. The structure of HAp as confirmed by XRD was hexagonal, which is the same phase as found in human bone. The morphology of HAp as observed by FE-SEM was confirmed by the cauliflower shape. At a low SBF concentration, NSF 1.0 was not a good seed to induce nucleation of HAp crystals. However, at higher concentration, NSF 1.5 can be used to grow both calcium phosphate and HAp crystals. On the other hand, for SF, they are suitable to be used to grow HAp crystals in both SBF concentrations. Thus, it may be concluded that sericin is a good seed protein for inducing nucleation of HAp crystal. Furthermore, HAp were rapidly grown on SF 1.5 with a small size crystal.

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# Assessment of Technological Options for Solid Waste Treatment in Kerala

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*Abstract-* The developing stage of any country is crucial for planning its resources. The sustainable development is the key factor governing the present scenario of social, economic, political, technological, and environmental challenges faced by the world. The Kerala state being enriched by natural resources and good environmental conditions is also going through the phase of urban development. The resulting trends are the increased consumerism which constituted the solid waste management problems along with severe energy crisis in recent times. The proper management of solid waste is the critical challenge faced by the state today. Both these challenges should be resolved in a win-win manner by adopting suitable technological solutions. The present study is an overview of the existing solid waste treatment systems in the state, the major challenges faced and the feasible opportunities for sustainable management of municipal solid waste.


*Index Terms*- Sustainable development, Biodrying, landfilling, Moisture content, refuse derived fuel

## I.    INTRODUCTION

The developing Kerala is becoming a heap of solid waste and the social issues related to improper management of solid waste is increasing at an alarming rate. This point out the immediate attention required for developing suitable solid waste management technologies for the state. The sustainability is the main criteria for waste management systems. The detailed studies on existing treatment facilities in Kerala revealed that the anaerobic digestion process is prone to failure after some period of operation in majority of the plants and also the composting process has not succeeded in finding the market for the end product. The incineration of the humid waste is also creating air pollutant leaching in spite of sophisticated control measures, in addition to high economics. The landfilling of waste is not at all the good choice for the monsoon dominating climatic conditions of the state. Also it is a fact that no engineered landfills exist in the state, instead only dumping yards exist which increases the adverse effects. All these indicate the fact that most of the existing technologies for municipal solid waste treatment in the state are unsuccessful. This situation makes it necessary that the development of a sustainable treatment technology is essential to reduce the impacts of municipal solid waste accumulation.


 The municipal solid waste of Kerala is found to be having high average moisture content of about 70 % and low average calorific value of 7300 kJ/Kg [1]. Both these factors making many of the treatment options failures and also it cause some economical issues due to high moisture content. Improvement is required in both these parameters which can show the way to a sustainable option. The technology options of different methods of municipal solid waste treatment, prevailing all over the world is studied in the literature review and an innovative biodrying process is proposed to fulfill the sustainability criteria.


## II.    IDENTIFY, RESEARCH AND COLLECT IDEA

## 2. MATERIALS AND METHODS

### 2.1 Municipal Solid Waste Scenario
### 2.1.1 Quantification Studies
The studies carried out by the National Environmental Engineering Research Institute (NEERI) in Indian cities have revealed that the quantum of Municipal Solid Waste (MSW) generation varies between 0.21-0.35 Kg/capita/day in large cities [2]. Based on this the waste generation in municipalities of Kerala can be taken as an average of 0.28 Kg/capita/day. The studies conducted by the Urban Development Section of World Bank, considering the relation between Gross National product (GNP) and per capita waste generation is estimated to grow at an exponential rate of 1.41% per annum. Therefore the present average generation of MSW can be considered as 0.343 Kg/capita/day, with total MSW generation of 7056 tonnes/day. The database for MSW generation based on direct sampling for the state obtained from literature review is summarised in Table.1.1[3].

**Table.1.1. Municipal Solid Waste Generation Estimated Based on Direct Sampling**

(Dr.R.Ajaykumar Varma, 2006)

| | MSW Generation sources | Quantum of MSW Generation(tones/day) | | | |
|---|---|---|---|---|---|
| | | Kollam | Kochi | Thrissur | Kozhikkode |
| 1 | Domestic sources | 95 | 134.7 | 75.75 | 100.12 |
| 2 | Commercial establishments | 17 | 32.99 | 13.02 | 28.16 |
| 3 | Marriage & community halls | 1 | 4.75 | 2.12 | 1.56 |
| 4 | Hotel & Restaurants | 19 | 29.9 | 14.57 | 24.07 |
| 5 | Markets | 6 | 20.39 | 11.01 | 12.08 |
| 6 | Institutions/ schools, offices | 7 | 14.75 | 5.51 | 10.62 |
| 7 | Street sweepings | 14 | 31.3 | 13.87 | 19.28 |
| 8 | Hospitals(Non-infectious) | 2 | 4.22 | 3.6 | 6.64 |
| 9 | Slaughter house | 2 | 5.26 | 2.25 | - |
| 10 | Construction & Demolition | 7 | 17.0 | 13.6 | 11.0 |
| | Total | 170 | 295.26 | 154.70 | 213.53 |
| | Per capita generation (g/day/head) | 434 | 482 | 476 | 477 |

**Table.1.2. Waste Generation Scenario in Kerala in 2006**

| Type of MSW | Kollam | | Kochi | | Thrissur | | Kozhikode | |
|---|---|---|---|---|---|---|---|---|
| | Collection point | Dump site | Collection point | Dump site | Collection point | Dump site | Collection point | Dump site |
| Paper | 3.10 | 4.38 | 4.87 | 4.42 | 2.74 | 3.36 | 3.32 | 5.71 |
| Plastic | 2.95 | 4.39 | 4.83 | 4.10 | 2.26 | 2.46 | 2.05 | 2.36 |
| Metals | 0.32 | 0.51 | 0.35 | 1.03 | 0.25 | 0.61 | 0.71 | 0.38 |
| Glass | 0.76 | 1.06 | 1.06 | 2.04 | 0.47 | 1.36 | 1.85 | 0.68 |
| Rubber & Leather | 0.84 | 1.53 | 1.50 | 1.42 | 1.31 | 2.17 | 1.50 | 0.93 |
| Inerts | 0.77 | 0.00 | 1.74 | 1.81 | 1.06 | 1.82 | 1.44 | 1.85 |
| Ash& fine earth | 1.90 | 2.45 | 1.68 | 3.68 | 6.43 | 3.47 | 2.75 | 5.06 |
| Compostable organics | 88.34 | 84.32 | 79.78 | 77.14 | 82.51 | 81.85 | 83.9 | 79.28 |
| Domestic Hazardous | 0.17 | 0.38 | 0.28 | 0.74 | 0.33 | 0.62 | 0.93 | 0.46 |
| | 0.85 | 0.96 | 3.90 | 3.64 | 2.63 | 2.26 | 1.55 | 3.29 |

**2.1.2 Municipal Solid Waste Characterisation Study**

The physical composition of typical MSW at collection point and dumping sites obtained from studies are listed in Table.2.1. The average heavy metal content in MSW approximates about 2.84%, which has the potential to contaminate the composting product of the municipal solid waste. The result showed almost 80% of the MSW of the state is organic matter. Considering the

chemical properties of typical MSW from the state it is found that moisture content of MSW for the state is very high approximately about 70% (Table.2.2).

**Table.2.1 Physical Composition of MSW at Collection Point and Dumping site (%)**

| Type of MSW | Kollam | | Kochi | | Thrissur | | Kozhikode | |
|---|---|---|---|---|---|---|---|---|
| | Collection point | Dump site | Collection point | Dump site | Collection point | Dump site | Collection point | Dump site |
| Paper | 3.10 | 4.38 | 4.87 | 4.42 | 2.74 | 3.36 | 3.32 | 5.71 |
| Plastic | 2.95 | 4.39 | 4.83 | 4.10 | 2.26 | 2.46 | 2.05 | 2.36 |
| Metals | 0.32 | 0.51 | 0.35 | 1.03 | 0.25 | 0.61 | 0.71 | 0.38 |
| Glass | 0.76 | 1.06 | 1.06 | 2.04 | 0.47 | 1.36 | 1.85 | 0.68 |
| Rubber & Leather | 0.84 | 1.53 | 1.50 | 1.42 | 1.31 | 2.17 | 1.50 | 0.93 |
| Inerts | 0.77 | 0.00 | 1.74 | 1.81 | 1.06 | 1.82 | 1.44 | 1.85 |
| Ash& fine earth | 1.90 | 2.45 | 1.68 | 3.68 | 6.43 | 3.47 | 2.75 | 5.06 |
| Compostable organics | 88.34 | 84.32 | 79.78 | 77.14 | 82.51 | 81.85 | 83.9 | 79.28 |
| Domestic Hazardous | 0.17 | 0.38 | 0.28 | 0.74 | 0.33 | 0.62 | 0.93 | 0.46 |
| | 0.85 | 0.96 | 3.90 | 3.64 | 2.63 | 2.26 | 1.55 | 3.29 |

## 2.2. Waste Management Concept

There are a number of concepts about waste management which vary in their usage between countries or regions. The waste hierarchy (Fig.3) refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimisation. Activities at source like prevention, re-use and source reduction are given the most priority in solid waste management practices. The energy recovery from the waste is given the second priority, and finally the waste should reach the safe disposal sites.
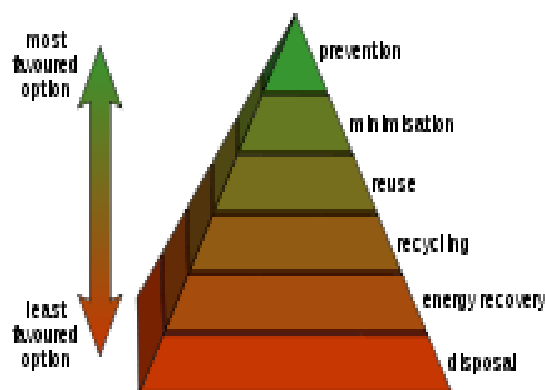
**Table.2.2. Chemical Characteristics of MSW at the Dumping Sites of major Cities**

(Dr.Ajaykumar varma,2006)

| Sl No. | Sampling Location /area | Density (Kg/m$^3$) | Moisture Content (%) | Calorific Value (K.Cal./Kg) | pH | C (%) | N (%) | C/N | Phospho rous as P$_2$O$_5$ |
|--------|------------------------|--------------------|----------------------|-----------------------------|------|-------|-------|-------|-----------------------------|
| 1 | Kollam | 207.06 | 74.32 | 1656 | 7.72 | 24.97 | 0.97 | 25.74 | 553.5 |
| 2 | Kochi | 267.81 | 55.29 | 1759 | 7.46 | 26.39 | 1.25 | 21.11 | 129.25 |
| 3 | Thrissur | 335.50 | 69.52 | 1744 | 7.40 | 28.68 | 0.93 | 30.84 | 1561.17 |
| 4 | Kozhikkode | 327.65 | 79.54 | 1816 | 7.12 | 32.72 | 2.43 | 13.46 | 1050.17 |
| | **Average** | **284.51** | **69.67** | **1744** | **7.43** | **28.19** | **1.40** | **22.79** | **823.52** |

## 2. 2.1 Waste Prevention and Minimisation

Prevention is the most desirable waste management option, as it eliminates the need for handling, transporting, recycling and disposal of waste. Also it helps the optimization of environmental resources. Minimisation is any process or activity that avoids, reduces or eliminates waste at its source or results in reuse or recycling. These two management options can be applied at all stages in the life cycle of a product. A case study suggested that "extended producer responsibility" criteria can be used in the selection of resources and the design of products, in the context of 'cradle to grave' evaluation of economic and environmental costs and benefits. The study suggested special tools like life cycle analysis and value chain analysis for the same [4].

Reuse is preferred over recycling if the purpose of use is same, as both energy and matter is saved. But the efficiency of the product may reduce in reuse and also certain products become hazardous in long run, pointing to the versatility of waste prevention and minimisation. The reuse of a building after remodelling is a sustainable option to minimise the construction waste [5].

Recycling involves the treatment or reprocessing of discarded waste to make it adequate for reuse. It conserves resources and energy but sometimes tedious, time consuming and result in net energy loss. General office waste like paper and cardboard are easier to recycle because they contain lots of strong fibers that can be reused to make new sheets, papers etc. The effectiveness of recycled glass as aggregate replacement in concrete improved the durability, impermeability, improved abrasion resistance, hardness, and enhanced flow properties of concrete without using plasticizers. Also the pozzolanic properties of glass aggregates benefit for partial cement replacement and filler [6].

Waste of electrical & electronic equipments (*WEEE*) consists of various reusable commodities and hazardous substances. But recovering both of these in an environment friendly manner is a major challenge. A study on multilateral recycling system in Asia especially proposed a cost-profit analysis model, considering the differentials of economic factors between developed and developing countries at first. Based on this model, a cost-profit analysis of multilateral recycling of four electronic products namely, refrigerator, television, air conditioner and personal computer was performed. The result of analysis showed that high profitability and recycling ratio can be achieved by multilateral recycling system in spite of its extra transportation cost, mainly due to low labour cost in developing countries [7].

Once the matter becomes waste, it should be collected in a systematic manner to transport the same in to a proper treatment or disposal site. The first step in collection includes the storage and separation of waste in different methods. The single bin system (collect all solid waste and liquid waste together), double bin system (collect solid waste and liquid waste separately) or triple bin system (collect biodegradables and non-biodegradables in solid waste separately) can be adopted.

Infectious wastes are biologically active and inherently capable of becoming putrescible. Hence it is essential to implement rapid delivery or temperature controlled transport for the same. Non-halogenated plastic containers should be used for incinerable wastes in place of PVC. Non-halogenated plastics or recycled materials to be purchased for packaging the wastes. Cyto-toxic wastes are to be collected in leak proof containers, clearly labeled as cyto-toxic waste. All Sharps should be collected in puncture proof containers for final disposal [8].

The biomedical waste is sorted based on color, segregated in to containers or bags at the point of generation (in accordance with Schedule II of Biomedical Waste management and handling Rules 1998). Biomedical waste should be transported within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose. Off site transportation vehicle should be marked with the name and address of carrier and biohazard symbol should be painted.

## 2.3 Methodology

The solid waste management techniques along with the challenges and opportunities of each one in a realistic approach should be analysed for suggesting a suitable solution. The literature review analysis method of research had lead to a number of technological options for the solid waste treatment of the Kerala state.

### 2.3.1 Composting

Composting is a really meritorious process of recycling waste as it can help us to keep our surroundings clean as well as green. It is an effective means of converting non-infectious and non-toxic biodegradable kitchen and other wastes into manure for useful purposes. A study on combination of vegetable waste, cattle manure and saw dust was utilised for high rate composting in a household rotary drum composter. The rotary drum composting process of mixed organic waste yielded suitable compost with moisture content reduction of 61% to 43% and the BOD/COD ratio reduced from 0.94 to 0.23, within composting period of 20 days [9]. The vermicomposting of domestic waste could be an effective technology to convert the negligible resource into some value-added products [10]. But a case study on heavy metal distribution in soil and plant in municipal solid waste compost amended plots revealed that there was an important load/transfer of metal ions from soils to wheat plants [11]. Vilappil composting plant at Thiruvananthapuram is an example for failure of composting technology in the state. The major reasons for these failures are the plants were designed for handling more waste than could be acquired; allocation of funds for plant maintenance was ignored; and local conditions were not considered while importing the technology. Also the chemical analysis by Centre For Earth Sciences Studies (CESS,2011) at Thiruvananthapuram showed that the city waste contains heavy metals like lead, cadmium and arsenic most probably which affected the composting process badly.Thus the composting method of solid waste disposal has to be analysed for detrimental effects, especially if industrial wastes are dumped in to municipal landfills.

### 2.3.2 Anaerobic Digestion

There are a number of anaerobic reactors, with solid waste feed, working successfully in the country. The anaerobic digestion of organic fraction of municipal solid waste had been conducted in pilot-scale reactor based on high-solid combined anaerobic digestion process yielded efficient bio-gas production [12]. Anaerobic digester (*AD*) found to be successful in reducing the volume of waste going to landfill, decreasing emissions of greenhouse gases and creating organic fertilizer, all at a profit. But many studies have proven that poor design issues along with elevated investment and operating costs are the limitations. The anaerobic digester plant at Sreekaryiam, Kerala is facing operational troubles due to the increase in nitrogen content to inhibitory levels which could lead to the failure of the digesters [13].

### 2.3.3 Mechanical Biological Treatment

The mechanical biological treatment (*MBT*) includes the mechanical stage of shredding of waste followed by removal of some recyclable material and the biological stage of composting or digesting the waste, usually done in an enclosed system. The potential advantage of *MBT* is that, it reduces the volume of residual waste and the biodegradability, thus reducing the methane and leachate production from the landfill. Potential hazardous waste contaminants of the waste stream will not reach municipal landfill sites due to the sorting of the waste prior to treatment. (Integrated Pollution Prevention and Control, European Commission – Directorate General Joint Research Centre, 2004).

### 2.3.4  Incineration

The incineration is the process of treating the waste by the combustion of organic materials.  Incinerators may reduce the volume of solid waste, but they do not dispose the toxic substances contained in the waste. They create the largest source of dioxins and emit a wide range of pollutants in their stack gases, ashes and other residues [14]. The special benefit of incineration is destruction and detoxification of particular wastes (e.g. combustible carcinogens, pathologically contaminated materials, toxic organic compounds and biologically active materials), rendering them more suitable for final disposal. However, most of the waste is composed of both combustible organics and non-combustible inorganic matter.

The PVC plastic component of medical waste is a major contribution to dioxin pollution when it is incinerated. So the safest option is to segregate the waste before going for incineration and thus reduce the amount of toxic emissions. The toxic emissions from incinerator plants can be reduced by fitting advanced air pollution control equipment. The cleaned city waste incineration energy used for the desalination purpose in a modelling study showed promising and can be studied on a pilot project [15].

### 2.3.5 Plasma Arc Treatment

A case study on the assessment of electronic waste treatment using the air plasma system in a batch operation showed that it is able to convert the electronic waste into combustible gas and inert solid residues. High mass loss rate of electronic waste was demonstrated in the experimental study, but the costly electrical energy involved in the process is still the main obstacle of plasma arc treatment technology [16].

### 2.3.6 LandFilling

Landfill is a land that is built up from deposits of solid refuse in layers covered by soil. The organic waste dumped in a landfill site will decompose with time, but the inorganic constituents will be remaining for long time. Since each landfill has its own constituents and the leachate quality of a particular landfill also changes over time; a flexible design is required to treat the varied influent stream.

The main environmental problem associated with land fill is the pollution of ground water. Rainwater percolating through the solid waste carry large amount of pollutants to the ground water aquifers. Hence the sanitary landfill design should include expensive and carefully constructed impermeable layers which prevent the leachate from contaminating the ground water resources [17]. The United Nations Environmental Programme (UNEP) study showed that leachate recirculation landfills (landfill bioreactors) are superior to the conventional single-pass leaching landfills. A case study showed that soil column had ample capacity to adsorb metal contaminants, making the determination of soil potential in land fill site selection inevitable [18].

Also the methane emissions from landfill to atmosphere increase the global warming with a factor of twenty times more than the same quantity of carbon dioxide (Climate Change Congress, 1995). In order to have a remedy for methane emissions, the ineffective clay capping is replaced by a new technique 'Phytocapping.' The study conducted at Rockhampton's Lakes Creek Landfill in Australia concluded that phytocaps can reduce surface methane emissions 4 to 5 times more than the adjacent un-vegetated site [19].

A Comparative study of municipal solid waste treatment technologies using life cycle assessment method concluded that landfill with energy recovery facilities is environmentally favourable. However, the large land requirement, difficult emission control system and long time span, are the limitations [20]. But it is a fact to be taken with due weightage that, the landfill is the final destiny of any type of waste. Open dumping is the common practice in Kerala instead of landfilling. The central government's Municipal Solid Wastes (Management and Handling) Rules, 2000 prohibit open dumping of unsegregated municipal waste; especially in residential areas. The dumping also violates Environment Protection Act, Kerala Paddy Land and Wetland Conservation Act, Kerala Ground Water Act and Coastal Zone Regulation Act.

### III.   WRITE DOWN YOUR STUDIES AND FINDINGS

### 3 RESULTS AND DISCUSSIONS

#### 3.1 The Major challenges and Opportunities –Socio-economical

The rapid urbanization, constant change in consumption pattern and social behavior have increased the generation of municipal solid waste in Kerala beyond the assimilative capacity of our environment, and management capacity of existing waste management system. Hence there is an urgent necessity of improved planning and implementation of comprehensive MSW management system for upgrading the environmental scenario of the state.

The existing waste dumping sites in the state are overloaded beyond capacity and under unsanitary conditions leading to the pollution of waster sources, proliferation of vectors of communicable diseases, foul smell and odours, release of toxic metabolites etc. It is difficult to get new dumping yards and open dumping is prohibited by law. This is particularly true for Kerala with severe

constraints of land availability, dense population, environmental fragility and expectation for management of solid waste relies on an overly centralised approach. The increasing quantities of plastics and non-biodegradable packaging materials in the municipal solid waste are making the management options more complicated. Therefore the excessive accumulation of solid wastes in the urban environment poses serious threat to the state.

The unhygienic septic character of municipal solid waste is the visible adverse effect leading to growth of disease spreading vectors and other organisms. The invisible effects of careless dumping of solid waste is the pollution of the ground water and soil of the nearby locality, and sometimes it will be spreading in to wider areas depending on the soil and ground water characteristics of the place. The simply dumping practice of municipal solid waste is not only revealing the technological scarcity but also the limitations of the existing technologies in the state. All these circumstances points out that the municipal solid waste management is a major challenge faced by the state and hence the research and development in this field is the necessity of the time. The present project set the goal to develop a sustainable treatment technology for the municipal solid waste of Kerala.

The economical aspects of various treatment technologies like composting, vermin-composting, anaerobic digestion/ biomethanation, incineration, gasification and pyrolysis and sanitary landfilling are studied. The composting is the most simple and cost effective technology for treating organic fraction of MSW. This method however is not very suitable for waste that is too wet and heavy rains affect the operation of open compost plants. Also the land area requirements for compost plants are very large and the flies nuisance and odour problems are prominent. The waste segregation if not properly carried out will lead to toxicity to the compost which prevents its safe application to agriculture [21]. Vermi-composting is preferred to microbial composting these days in small towns as it requires less mechanization and easy in operation. But the toxic material contamination in MSW will kill the earth worms active in composting.

Biomethanisation or anaerobic digestion is a comparatively well established technology for stabilization of sludge, deodourisation and disinfection. But it is suitable only for organic portion of MSW and it does not degrade complex organic matter and inorganic materials. Such materials found to interfere with anaerobic digestion units causing the failure of the unit itself, and hence result in huge economical burden. So the practical application of this technology is limited for MSW. The incineration of waste is another technology used in developed countries for treating MSW. But the high capital cost along with maintenance cost makes it economically non-viable. Pyrolysis /Gasification for MSW treatment also suffer energy recovery issue for solid waste with high moisture content.

The landfilling is the final disposal method of MSW which is also causing economical barriers due to scarcity of land and long distance transportation requirements, besides the ground water and surface water pollution issues and environmental hazards. The other methods of municipal solid waste management like recycling and reuse can be done only if the MSW is sorted. But the increased moisture content of the waste is affecting the sorting and storage of raw MSW and also result in increased volume of waste.

Literature analysis of solid waste treatment technologies pointed out the fact that the failure of the existing technological options is the cause for increased landfill volumes. The open dumping in the streets of the state also uncover the reality that increased volumes of solid waste beyond the assimilation capacity of the treatment facilities available is the major reason for solid waste handling problems. The decision to implement any particular technology needs to be based on its techno-economic viability, sustainability as well as environmental implications, keeping in view the local conditions and the available physical and financial sources. The search for a solution to this critical challenge leads to the technology "Biodrying" which is adopted in many developed nations as a solution to solid waste treatment menace. This technology is eminent in reducing the moisture in the waste and also the numerous end use possibilities are making it a sustainable option.

### 3.2 Gap Filling Technology

The biodrying is a relatively new sustainable technology for MSW treatment, which is successfully implemented in many developed countries, which seem to reduce the socio-economic limitations of the existing technology. Biodrying process is an aerobic convective evaporation process which reduces the moisture content of the waste, with minimum aerobic degradation. This process is different from composting in that the output of the composting process is stabilized organic matter, but the output of the biodrying process is only partially stabilized, which is useful for energy production from the biodried MSW. The biodrying process is of short duration one and hence the emission factors are also short lasting. The energy balance is also achieved (the calorific value of waste is increased to a sufficient level (from 7500 kJ/Kg to 15000 kJ/Kg) since lower air-flow rates are used.

This technology is meritorious to substantially reduce the amount of the waste going to landfill, and offers an alternative to mass burn incineration besides recovering energy from residual waste by producing a refuse derived fuel (RDF) that can be used instead of fossil fuels [22]. In biodrying process, the moisture content of waste is reduced to about 30 to 45 % and hence sorting and storage issues can be reduced to great extent besides the overloading of landfill can be reduced. The output from biodrying process can recover heat if used in incinerators. Also the volume of waste is reduced up to 45% [23]. Therefore biodrying process is expected to minimize the negative impacts of all the existing technologies in the state and hence research and development in this innovative technology is the need of the time.

## 4 CONCLUSION

The present study of solid waste treatment technologies in Kerala has revealed the critical issues related to solid waste management widely, with a special mention to the challenges faced by the state. This is the most solution seeking problem of the state today, since social, economical as well as the health environment is seriously affected by the improper solid waste treatment technologies in the state. Instead of repeating the failed technologies it is better to develop an innovative system which will be suited to the diversified and changing characteristics of municipal solid waste. The end use of the output from the biodrying process is making it versatile in terms of sustainability and hence it is found to be aspiring since the waste to energy concept should become a reality to meet the fossil fuel scarcity in the very near future.

## 5 ACKNOWLEDGMENT

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# Comparison of 3-valued Logic using Fuzzy Rules

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*Abstract*:   The information encoded on a computer may have a negative or a positive emphasis. Negative information refers to the statement that some situations are impossible. It is often the case for pieces of background knowledge expressed in a logical format. Positive information refers to observed cases. It is often encountered in data-driven mathematical models, learning, etc. The notion of an "if. . . , then. . . " rule is examined in the context of positive and negative information. We know that the classical logic is two valued TRUE and FALSE. In real life situations the true valued logic can be seen inadequate. We need logics which will allow the other truth values in between TRUE and FALSE. This paper gives an idea of the logic that needs to be put forward beyond classical two valued logic.

*Index Terms* −Fuzzy rule, antecedent, consequent, fuzzy implications.

## 1. INTRODUCTION

Fuzzy rules are often considered to be a basic concept in fuzzy logic [1]. Fuzzy rules were meant to represent human knowledge in the design of control systems, when mathematical models were lacking [2]. Topics like data mining, knowledge discovery and various forms of learning techniques have become an important challenge in information technology, due to the huge amount of data stored in information systems. Looking for meaning in data has become again a relevant issue. Even though the classical two-valued logic codifies and explains the human reasoning, it has been felt that it does not reflect whole gamut of our reasoning capabilities.

This leads to the three-valued representation of a rule, according to which a given state of the world is an example of the rule, a counterexample to the rule, or is irrelevant for the rule. This view also sheds light on the typology of fuzzy rules. It explains the difference between a fuzzy rule modeled by a many-valued implication, and expressing negative information, and a fuzzy rule modeled by a conjunction and expressing positive information.

The aim of this paper is:
1. to give a 3-valued logical account of Bochvar's and Heyting's Fuzzy.
2. to show that the typology of fuzzy rules, previously proposed by the authors [18,19] manages to reconcile the knowledge-driven logical tradition and data-driven engineering tradition;

## 2. PRELIMINARIES

### Definition 2.1: Fuzzy Rule

A fuzzy rule is of the form: R: If < x is P > then < y is Q >

where 'x is P' and 'y is Q' are fuzzy propositions.

The meaning of 'x is P', is called the rule antecedent and the meaning of 'y is Q', is called the rule consequent.

## Examples:

1. If < temperature is high > then < pressure will be low >
2. If < a tomato is red > then < it is ripe >
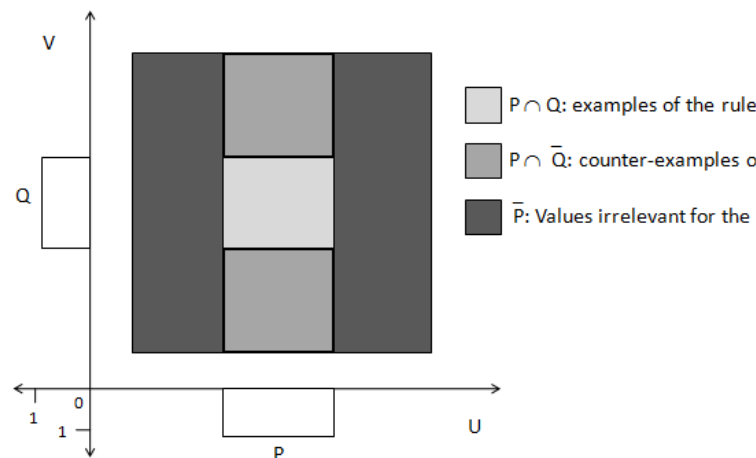


**Figure 1:** Partition on U x V induced by the rule "If x is P, then y is Q"

### Definition2.2. Negative view:
The rule is viewed as a constraint of the form "if  x is P , then y *must* be Q". In other words, if x∈ p and y∉ Q then (x,y)∉ R, or equivalently R ⊆ $\overline{P}$ ∪ Q.  This view emphasizes only the counter-examples to the rule. It is the implicative form

of the rule. Pairs of attribute values in $P \cap \overline{Q}$ are deemed impossible. Other ones remain possible, as shown on Fig
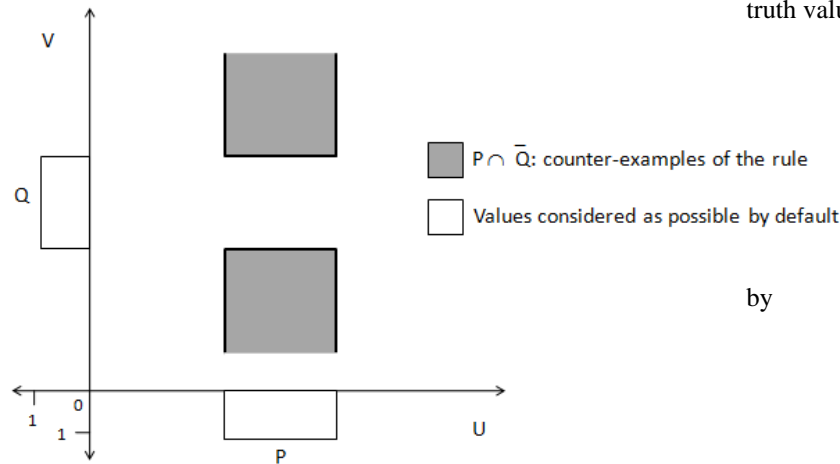


**Figure 2:** Negative view of the rule "If x is P, then y is Q"

### Definition2.3. Positive view:

The rule is viewed as a case of the form "if x is P, then y can be Q". In other words, if $x \in p$ and $y \in Q$ then $(x,y) \in R$, or equivalently $P \cap Q \subseteq R$. This view emphasizes only the examples to the rule. It is the conjunctive form of the rule. Pairs of attribute values in $P \cap Q$ are guaranteed possible. It is not known as other ones are possible or not, as shown on figure.
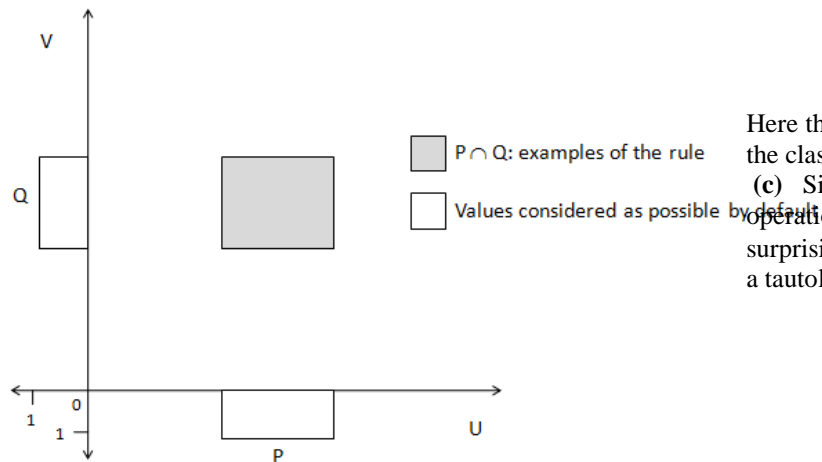


**Figure 3:** Positive view of the rule "If x is P, then y is Q"

### 3: Three-valued Logic & IF-THEN rules

(a) The 3- valued logic is same as in 2- valued logic, except that there are truth values: True, May be and False. These linguistic values are represented by 1, ½ and 0. In this 3- valued logic, denoted by L3, the truth value of any statement can be either 1 or ½ or 0.

i.e. T(p) = 1 or ½ or 0.

We define these 3 operations on the statements p, q, r, .... denoted by $p \vee q$, $p \wedge q$ and $\neg\, p$ analogous to the three operations OR, AND and NOT of classical logic. These are defined by their truth values as follows:

$$T(p \vee q) = \max \{T(p), T(q)\}$$

$$T(p \wedge q) = \min \{T(p), T(q)\}$$

$$T(\neg\, p) = 1 - T(p)$$

(b) Lukasiewicz, also defined the implication operator by

$$T(p \rightarrow q) = 1 - T(p) + T(q) \qquad \text{if } T(p) > T(q)$$

$$= 1 \qquad \text{if } T(p) \leq T(q)$$

Or simply as $(p \rightarrow q) = \min\{1, 1 - T(p) + T(q)\}$

Using this formula we derive the truth table of $\rightarrow$.

Table I

| $\rightarrow$ | 1 | 1/2 | 0 |
|---|---|---|---|
| 1 | 1 | 1/2 | 0 |
| 1/2 | 1 | 1 | 1/2 |
| 0 | 1 | 1 | 1 |

Here the four corner values are same as the condition operator of the classical logic.

(c) Similarly, we can frame the truth tables of the other three operations. This 3- valued logic has many distinguishing and surprising features. One of them is that WFF [p ∨ (¬p)] is NOT a tautology. This is given in the below Table 2.

Table II

| p | ¬p | p ∨ (¬p) |
|---|---|---|
| 1 | 0 | 1 |
| 1/2 | 1/2 | 1/2 |
| 0 | 1 | 1 |

Here we see that the last column does not have all entries equal to 1.

The above generalization of the classical logic by Lukasiewicz inspired many other generalizations.

## 4. COMPARISION OF BOCHVAR'S & HEYTINGS'S 3-VALUED LOGIC

 Here we have compared the Bochvar's and Heyting's  values in3- valued logic.

Table III: Bochvar's 3- valued Logic

| a | 0 | 0 | 0 | 1/2 | 1/2 | 1/2 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|
| b | 0 | 1/2 | 1 | 0 | 1/2 | 1 | 0 | 1/2 | 1 |
| ∧ | 0 | 1/2 | 0 | 1/2 | 1/2 | 1/2 | 0 | 1/2 | 1 |
| ∨ | 0 | 1/2 | 1 | 1/2 | 1/2 | 1/2 | 1 | 1/2 | 1 |
| → | 1 | 1/2 | 1 | 1/2 | 1/2 | 1/2 | 0 | 1/2 | 1 |

Table IV: Heyting's 3- valued Logic

| a | 0 | 0 | 0 | 1/2 | 1/2 | 1/2 | 1 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|
| b | 0 | 1/2 | 1 | 0 | 1/2 | 1 | 0 | 1/2 | 1 |
| ∧ | 0 | 0 | 0 | 0 | 1/2 | 1/2 | 0 | 1/2 | 1 |
| ∨ | 0 | 1/2 | 1 | 1/2 | 1/2 | 1 | 1 | 1 | 1 |
| → | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1/2 | 1 |

A fuzzy **IF –THEN** rule consists of an IF part (antecedent) and a THEN part (consequent).The antecedent is a combination of terms, where as consequent is exactly one term. In the antecedent the terms can be combined by using Fuzzy Conjunction, Disjunction and Negation.

## Conclusion:

This paper has emphasized two complementary types of information called negative and positive information and the idea of 3-valued Logics. Negative information acts as constraints that exclude possible worlds while positive information models observations that enable new possible worlds. It has been shown that "if. . . then. . . " rules convey both kinds of information, through their counter-examples and examples respectively. The existence of    if-then rules, whose representation is based either on implications or on conjunctions can be explained by the existence of these two antagonistic views of information, Fuzzy rules and especially conjunctive .T(¬ p) is common for Lukasiewicz and Bochvar's Logic, but it is not true for Heyting's

Logic. These 3-valued Logics can be framed as rules where it is combined by using fuzzy conjunction, disjunction and negation.

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# A Statistical Comparison of Organic and Inorganic Fertilizers for Sugarcane in Kolhapur District

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   **Abstract:**   In this study, two independent samples are taken from sugarcane growing farmers of Kolhapur district who use organic and inorganic fertilizers. These are called organic system and inorganic system farming. The collect information's are analyzed statistically (Mukhopadhyay 2006). It has been found that organic system is significantly better than inorganic system in respect of net gain and growth of gain. It is also observed that among the organic system of farming, proportion of joint family is significantly higher than the nuclear family and the farming system is depending on the type of family.  But there is no significant relation between the type farming and level of education.

**Index Terms***: organic system, inorganic system, pie-chart, Z-test for mean, proportion, Chi-square test of independence*

**1. Introduction**:  Organic farming is system of farm management to create an eco-system which achieves sustainable productivity without using chemical fertilizers and pesticides. It creates impressive effects on environmental and social aspects in the society. Sharma (2005), Palanippan and Annadurai (2003) gave theory and practice of organic system of farming.Dahama (2005) discussed the organic farming for sustainable development.Koli and Gosavi (2011) compared the organic system with inorganic system subjectively. The impact of organic farming on Economics of sugarcane cultivation in Maharashtra was studied by Kshirsagar (2011), Thakur and Sharma (2005) gives organic farming for sustainable agriculture and meeting the challenges of Food security in 21st Century. The main crop of Kolhapur district is sugarcane and the farmers are using both organic and inorganic fertilizers. In this study, two independent samples each of size 50 is taken from the farmers growing sugarcane using organic and inorganic fertilizers in Kolhapur district. These are often called organic and inorganic system of farming. The collected information are classified according various characteristics such as annual expenditure, income, net gain per acre, type of family and level of education of decision maker of the family for these two system of farming. It is also obtained the average net gain of organic farming during various years after inception. (Bishop, Fienberg and Holland.1975). These classified data are presented graphically in order to highlight the defined characteristic of these two systems. The comparison of parameters of above stated characteristics of these two systems are made statistically (Mukhopadhyay, 2006).In accordance with the analysis it is observed that the average net gain per acre is significantly higher in organic system than inorganic system. There is a very high positive correlation between average net gain and the number of years after inception of organic system. The study indicates that large number of organic farmers belongs to joint family, but there is no significant difference in the level of education and type of farming.

**2. Methodology and Analysis**: The Kolhapur district is the major contributor of sugarcane in state of Maharashtra. The total area under sugarcane cultivation is more than 113900 hector, in that about 2766 hectors of land is under organic system of farming. In this study two independent sample each of size 50 is selected from 409 villages of Kolhapur district among organic and inorganic system of farming. The collected data is classified according to the characteristics expenditure, income and net gain per acre of these two systems and the corresponding frequency distributions and their statistical analysis are as follows

(i)**Analysis of expenditure per acre**: The distribution of expenditure per acre in organic (OS) and inorganic (IS) system is

| EXP(000) | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 |
|---|---|---|---|---|---|---|---|---|---|---|
| No of OS | 02 | 04 | 07 | 10 | 12 | 07 | 04 | 02 | 01 | 01 |
| No of IS | 00 | 01 | 03 | 06 | 08 | 09 | 14 | 07 | 01 | 01 |

(a)The corresponding bar chart is
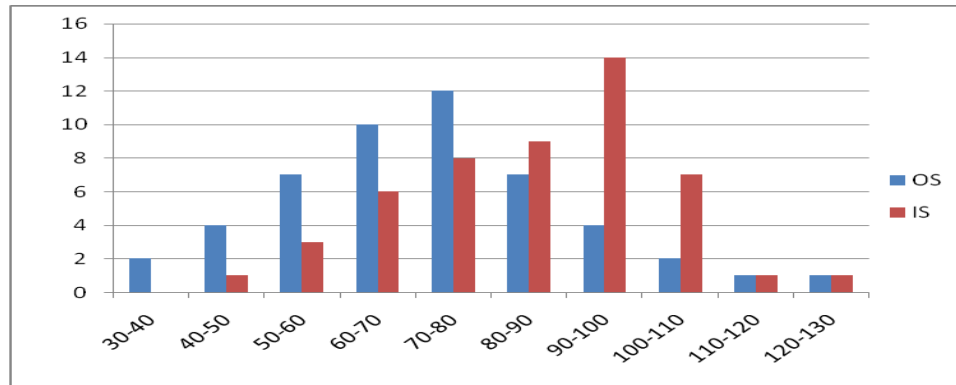


(b)Testing of hypothesis for equality of mean expenditure for organic and inorganic system of farming: Let $\mu_1$ be the mean expenditure per acre for organic system of farming and $\mu_2$ be the mean expenditure per acre for inorganic system of farming. The sample means are $m_1=72.2, m_2=85.4$ and standard deviations are $s_1=19.1875$ and $s_2 =16.84755$ thousands respectively. The hypothesis are $H_0:\mu_1 = \mu_2$ against $H_1:\mu_1 < \mu_2$. The value of Z-test statistic is $Z_0=-3.6554$. At level of significance $\alpha=.05$ the critical value is $Z_{0.05} =-1.64$ and $Z_0<-1.64$, therefore reject $H_0$. The sample modes are $M_{os}=72.8571$ and $M_{is}=94.1667$, therefore the corresponding value of coefficient of skewness are $S_{k(os)}= -0.03425$ and $S_{k(is)}=-0.5204$. This shows that $S_{k(os)} > S_{k(is)}$

(ii) **Analysis of income per acre**: The distribution of annual income per acre in organic (OS) and inorganic (IS) systems is,

| Income(000) | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | 140-150 |
|---|---|---|---|---|---|---|---|---|
| No of OS | 01 | 03 | 08 | 16 | 10 | 07 | 04 | 01 |
| No of IS | 01 | 05 | 08 | 10 | 11 | 07 | 06 | 02 |

(a)The corresponding bar chart is,
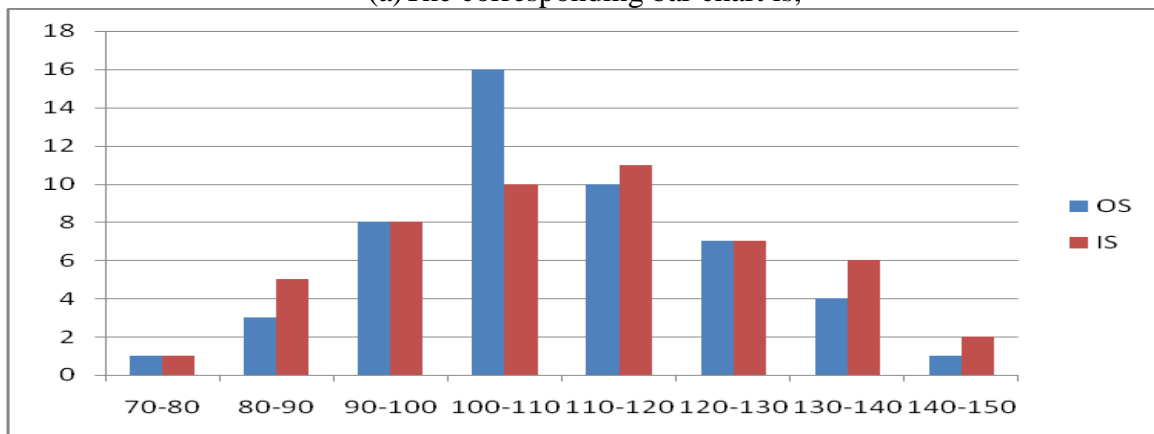


(b)Testing of hypothesis for equality of mean income for organic and inorganic system of farming: Let $\mu_1$ be the mean income per acre for organic system of farming and $\mu_2$ be the mean income per acre for inorganic system oh farming. The sample means are $m_1=109.6, m_2=111.0$ and standard deviations are $s_1=14.725488$ and $s_2 =16.970563$ thousands respectively. The hypothesis are $H_0:\mu_1=\mu_2$ against $H_1:\mu_1<\mu_2$. The value of Z-test statistic is $Z_0=-0.4409$. At level of significance $\alpha=.05$ the critical value is $Z_{o.05} =-1.64$  $Z_0>-1.64$, therefore accept $H_0$.

**(iii) Analysis of net gain per acre**: The distribution of net gain per acre in these two systems is,

| Net gain  | 00-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 |
|-----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| No of OS  | 02    | 04    | 07    | 10    | 12    | 08    | 03    | 03    | 01    |
| No of IS  | 03    | 05    | 16    | 13    | 06    | 04    | 02    | 01    | 00    |

(a)The corresponding bar chart is,
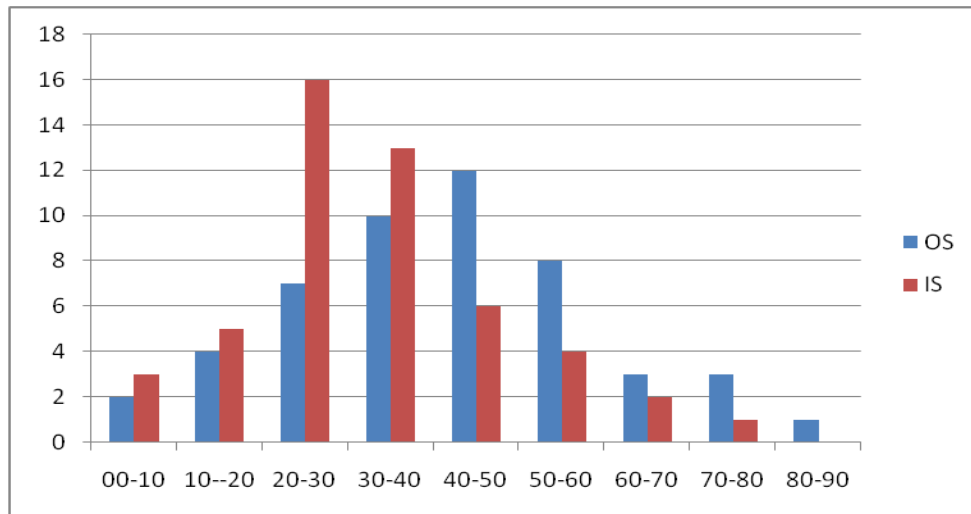


(b)Testing of hypothesis for equality of mean net gain for organic and inorganic system of farming: Let $\mu_1$ be the mean net gain per acre for organic system of farming and $\mu_2$ be the mean net gain per acre for inorganic system oh farming. The sample means are $m_1=41.6, m_2=32.8$ and standard deviations are $s_1=18.06765$ and $s_2=15.2696$ thousands respectively. The hypothesis are $H_0:\mu_1=\mu_2$ against $H_1:\mu_1>\mu_2$. The value of Z-test statistic is $Z_0=2.6304$. At level of significance $\alpha=.05$ the critical value is $Z_{0.05}= 1.64$ and $Z_0>1.64$, therefore reject $H_0$.

**(iv) Distribution of average net gain and number of years after inception:**

| Years   | 1    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13 | 14   | 15   | 16   | 18   | 20   | 21 |
|---------|------|------|------|------|------|------|------|------|------|------|------|----|------|------|------|------|------|----|
| Av.gain | 15.2 | 20.4 | 27.9 | 47.8 | 37,8 | 34.2 | 41.8 | 37.7 | 35.7 | 44.3 | 36.6 | 39 | 38.3 | 47.8 | 39.6 | 43.2 | 42.1 | 47 |

The correlation coefficient between these characteristics is **0.683887**
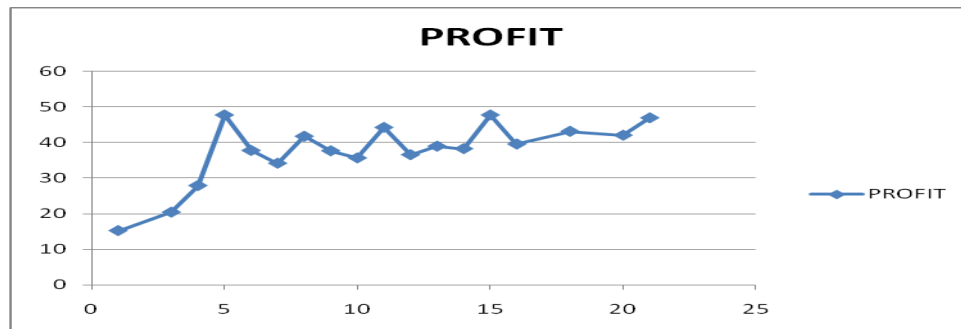


 **(v) Analysis of type of family and type of farming**: The 2X2 contingency table representing the type of family and farming type is as follows.

| TYPE OF FAMILY |        | TYPE OF FARMING |          |       |
|----------------|--------|-----------------|----------|-------|
|                |        | ORGANIC         | INORGNIC | TOTAL |
|                | JOINT  | 42              | 31       | 73    |
|                | NUCLEAR| 8               | 19       | 27    |
|                | TOTAL  | 50              | 50       | 100   |

(a)The bar chart of the above distribution is,
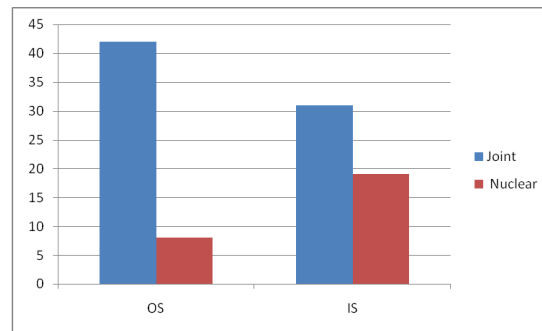
(b) Test for equality of proportions: Let $P_1$be the proportion of organic farmers belonging to the joint family and $P_2$ is the proportion of inorganic farmers belonging to the joint family. The corresponding sample proportions are $p_1$=0.84 and $p_2$=0.62, the hypothesis are, $H_0$:$P_1$=$P_2$ against the alternative $H_1$:$P_1$>$P_2$.Under $H_0$, the value of the Z-test statistic is $Z_0$=2.4778. At level of significance α=.05 the critical value is 1.64 and $Z_0$>1.64, therefore reject                                                                                                       $H_0$.

**(vi) Analysis of level of education and type of farming:** A 2X4 contingency table representing the level of education and type of farming is,

| Level of education | Primary and bellow | Secondary | Graduate | PG &other degree |
|---|---|---|---|---|
| OS system | 06 | 26 | 14 | 04 |
| IS system | 04 | 18 | 23 | 05 |

(a)The corresponding pie chart is,
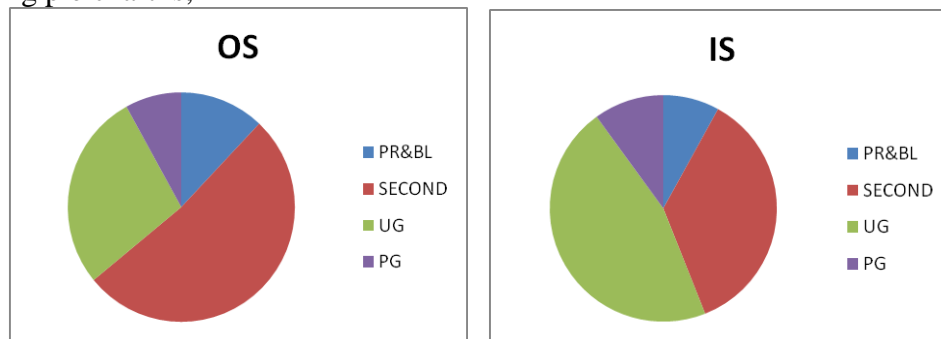


(b)The chi-square test of independence of two characteristics:Let A denote the type of farming and B denote the level of education of the farmers.Then the hypothesis for the test are $H_0$:A and B are independent against alternative $H_1$:A and B are not independent.Under $H_0$,the value of the chi-square test statistic is $\chi^2_0$=4.1548.At level significace α=.05 the critical value is 7.815 and $\chi^2_0$<7.815,therefore accept $H_0$.

The proportion of  organic farmers having higher(graduation and above) education is $p_1$=0.36 and proportion of inorgation farmers having higher education is $p_2$=0.56.The value of the test statistic for testing the hypothsis $H_0$:$P_1$=$P_2$  against $H_1$: $P_1$ < $P_2$  is $Z_0$=-2.0064.At level of significance α=.0.05 the critical value is $Z_{o.05}$=-1.64 reject $H_0$ .

 **3.Conclusions**:(i) The average expenditure per acre by organic system is significantly less than the average expenditure per acre by inorganic system.
(ii) There is no significant difference in the average income per acre in these two systems.
(iii)The average net gain per acre from organic system is significantly greater than the average net gain from inorganic system.
(iv) There is a very high positive correlation coefficient between number of years after inception of organic system and average profit per year.This shows that,there is a very good growth of gain by organic system.
(v)Large number of organic system of farmers belongs to the joit family than the inorgnic system of farmers.
(vi)There is no significant difference  in the level of education of the farmers of these two systems. But in general level of education of inorgnic farmers is igher than organic farmers.

**4.Findings**:(i) The organic system of farming is only 2.4284% of the total area.This shows that,there is a lack of encouragement for this system of farming.

(ii)Organic system of farming decreases the average  annual expenditure year by year after its inception .

(vi) Highly educated farmers prefers inorganic system than organic system.

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# Power Quality Enhancement using Dynamic Voltage Restorer (DVR): An Overview

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*Abstract*- The problem of voltage unbalance and its impacts on sensitive loads is well known. To solve these problems, custom power devices are used such as dynamic voltage restorer (DVR), which is most efficient and effective modern device. This paper discusses a review of the researches on the Dynamic voltage restorer (DVR) for power quality Improvement in power distribution networks. Sensitivity industrial loads, critical commercial operations, Utility distribution networks affected from different types of outages and service interruptions and which results in financial losses. This paper describes DVR principle of operation, basic component, DVRs topologies system in distribution system, types of DVR control strategies, and compensation techniques.

## I. INTRODUCTION

Power quality is the delivery of sufficiently high grade electrical services to the customer. A power quality problem is an occurrence manifested as a non-standard voltage, current or frequency that results in failure or mis-operation of end user equipment's. Power distribution systems, ideally should provide customer with an uninterrupted flow of energy at smooth sinusoidal voltage at the contracted magnitude level and frequency [1], but in practice distribution systems, have nonlinear loads, which affects the purity of waveform of supply. Some events both usual (e.g. Capacitor switching, motor starting) and unusual (e.g. Faults) could also inflict power quality problems [7]. Faults at distribution level causes voltage sag or swell, which can cause sensitive equipment to fail as well as create a large current unbalance that could blow fuses or trip breakers. Under heavy load conditions, a significant voltage drop may occur in the system. A dip is usually taken as an event lasting less than one minute when voltage decreases to between 0.1 and 0.9 p.u. (dip greater than 0.1 p.u. is usually treated as an interruption) or Voltage sag can occur at any instant of time, with amplitudes ranging from 10-90 % and a duration lasting for half cycle to one minute [2]. These effects can be very expensive for the customer, ranging from minor quality variation to production downtime and equipment damage [8].

The concept of custom power was introduced by N.G.Hingorani in 1995. Custom Power Devices (CPD) is a powerful tool based on semiconductor switches to protect sensitive loads [9]. The most effective type of CPD devices is considered to be dynamic voltage restorer (DVR).

Power quality in the distribution system can be improved by using DVR, as assures pre-specified quality and reliability of supply. This pre-specified quality may contain a combination of specification of following: low phase unbalance, low harmonic distortion in load voltage, no power interruptions, acceptance of fluctuations, and poor power factor loads without significant effect on the terminal voltage, low flicker at the load voltage, magnitude and duration of overvoltage and under voltage within specified limits [10].

DVR is still preferred because the SVC has no ability to control active power flow [3]. Secondly DVR costs less compared to the UPS and it also requires a high level of maintenance because batteries leak and have to be replaced every five years [4,11] .Other reasons include that DVR is smaller in size and costs less compared to DSTATCOM [3,10,16].

## II. DYNAMIC VOLTAGE RESTORER (DVR)

First Dynamic voltage restorer was built in U.S by Westinghouse for the Electric Power Research Institute (EPRI), and first installed in 1996 on Duke Power Company grid system to protect an automated yarn manufacturing and weaving factory [63]. DVR is a series connected solid state device that is used for mitigating voltage disturbances in the distribution system by injecting voltage into the system in order to regulate the load side voltage [17]. . DVR maintains the load voltage at a nominal magnitude and phase by compensating the voltage sag/swell, voltage unbalance and voltage harmonics presented at the point of common coupling [18,19,20]. Its primary function is to rapidly boost up the load side voltage in the event of a disturbance in order to avoid any power disruption to load [4,13].

IEEE 519-1992 and IEEE 1159-1995 describe the voltage sags/swells shown in fig.1.
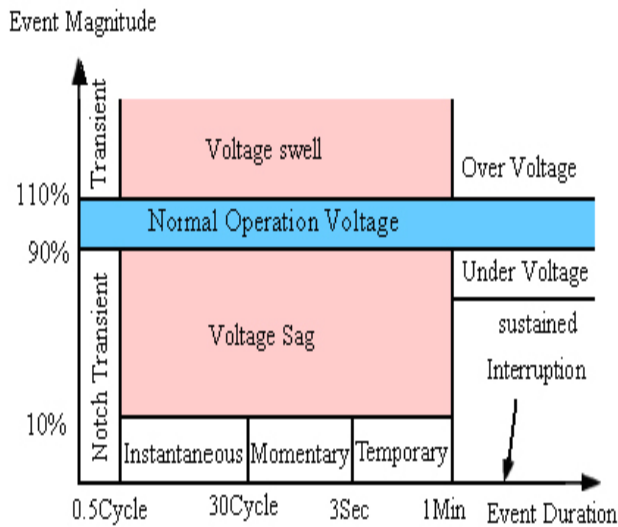
**Fig.1.Voltage Reduction Standard of IEEE Std. 1159-1995 [88].**

Voltage sags caused by unsymmetrical line-to line, line to ground, double-line-to-ground and symmetrical three phase faults is affected to sensitive loads [5].

*The basic components of a DVR:*

DVR can be applied for medium voltage [16, 23, 24] and in low voltage application [25]. The DVR components have been discussed in [26, 27]. Figure 2 shows   conventional circuit configuration of the DVR .
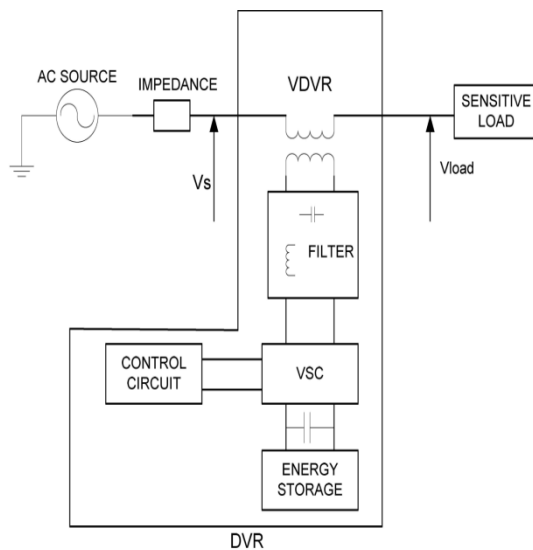


**Fig.2.conventional circuit configuration of the DVR [14].**

DVR is connected in series between the source voltage or grid and sensitive loads through injection transformer [6,21]. DVR inject the difference between voltage source and the sensitive load. The DC energy storage rating determines the maximum injection capability of DVR. Controller is an important part of the DVR for switching purposes. The switching converter is responsible to do conversion process from DC to AC. The inverter ensures that only the swells or sag voltage is injected to the injection transformer.

This device is based on voltage source converter a PWM that can produce a sinusoidal voltage with any angle required of the amplitude, frequency and phase [34]. The DVR system consists of two important components: a power circuit and a control unit. Power circuit of DVR basically consists of a voltage source inverter, a series connected injection transformer, an inverter output passive filter, and an energy storage device that is connected to the dc link [31, 28,29,32,30] as follows:

- Series Voltage Injection/booster Transformers
- Voltage Source Inverter (VSI)
- Passive Filters
- DC charging circuit
- Control and Protection
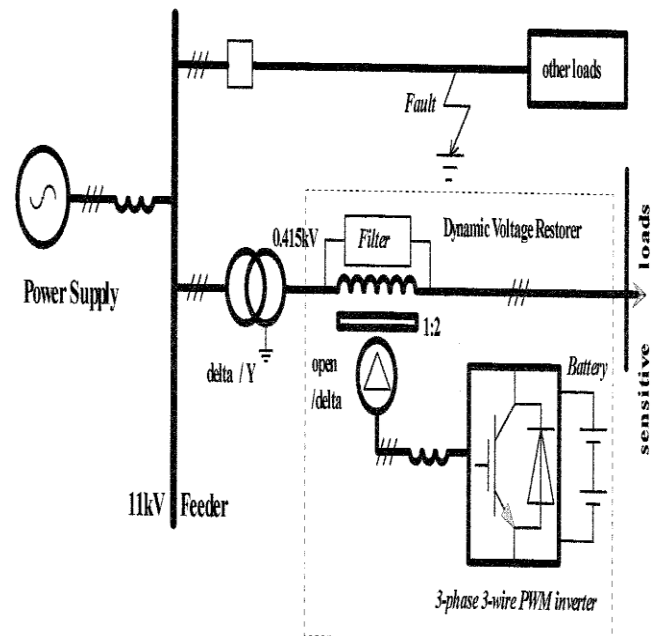


**Fig.3. Schematic power circuit diagram of a DVR [37].**

Power Circuit of a DVR is shown in Figure 3. It has VSI and the injection transformer. The VSC consist of six IGBT's (insulated gate bipolar transistor), three ac inductors and capacitor's respectively, one dc capacitor and energy storage [9, 33, 35].

In DVR the control circuit is used to derive the parameters (magnitude, frequency, phase shift, etc.) of the control signal that has to be injected by the DVR. Based on the control signal, the injected voltage is generated by the switches in the power circuit, in order to protect DVR from any disturbances a hybrid switch been used [26,17].
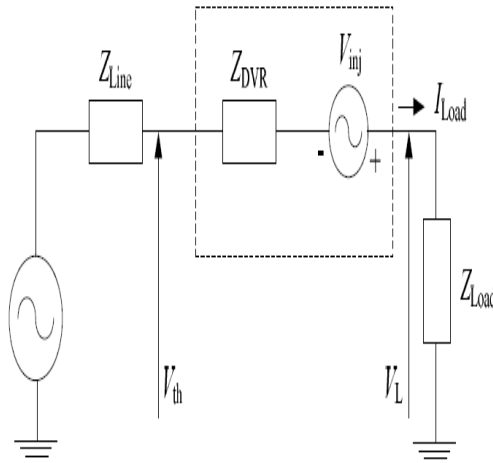
**Fig.4. DVR equivalent circuit.**

### I.     *Series Voltage Injection/booster Transformers:*

The injection/booster transformer limits coupling of noise and transient energy from primary to secondary side[36]. Generally High voltage side of the injection transformer is connected in series to the distribution system and the power circuit of the DVR can be connected at the low voltage side[37]. When unbalance fault occur in the high voltage side, the zero sequence current flowing is almost zero, if the distribution transformer connection is Δ-Y with the grounded neutral. In such connection, the DVR only mitigate the positive and negative sequence components [38].

### II.     *Voltage Source converter (VSC):*

A VSC is power electronic system consists of a storage device and switching devices. It generates a sinusoidal voltage at any required frequency, magnitude, and phase angle.

The function of an inverter system in DVR is used to convert the DC voltage supplied by the energy storage device into an AC voltage [60] and to temporarily replace the supply voltage or to generate part of supply voltage which is missing[50].

Various circuit topologies are available for VSC [12,51]. Widely used method is two level or multilevel three-phase converter [62] which shares a dc capacitor between all phases, which absorbs harmonic ripple and has a relatively small energy storage requirement.

- *Switching devices*

Metal Oxide Semiconductor Field Effect Transistors (MOSFET), Gate Turn-Off thyristors (GTO), Insulated Gate Bipolar Transistors (IGBT), and Integrated Gate Commutated Thyristors (IGCT) are four main types of switching devices. IGBT is considered to be a newer device compared to MOSFET and GTO, first introduced in the early 1980s and has become a popular device because of its superior characteristics [53]. It is a three terminal controllable switch that combines the fast switching times of the MOSFET with the high voltage capabilities of the GTO and it has a medium speed controllable switch capable of supporting the medium power range [36, 52, 53, 54, 57].

- *Storage devices*

The DVR needs real power for compensation during voltage disturbances in the distribution network which must be supplied by energy storage when the voltage disturbances exit.

Storage devices supply the necessary energy to the VSC via a dc link for the generation of injected voltages. The application of the energy storage in DVR depends on the design rating required and total cost [39]. The capacity of the stored energy directly determines the duration of the sag which can be mitigating by the DVR. There are different kinds of energy storage devices [12,29]:

**Superconductive magnetic energy storage (SMES)** has been used for very critical applications, but its cost limits its use to industries where the losses are great if there is a disturbance e.g. semiconductor fabrication.

**Batteries** can be highly effective if a high voltage battery configuration is used, and have a short lifetime which requires battery management system, which can be costly.

Storage systems with auxiliary supply are used to increase the system performance when the grid of DVR is weak [40, 41].

**Ultra-capacitors** have a wider voltage range than batteries and can be directly paralleled across the input bus and have a specific energy density less than that of a battery, but a specific power greater than a battery, making them ideal for short (up to several seconds) pulses of power.

**Flywheel Energy Storage** system utilizes a single AC/AC power converter for the grid interface as opposed to a more conventional AC/DC/AC converter, leading to higher power density and increased system reliability but has the disadvantage of high maintenance cost (bearings etc.) [42,46,47].

### III.     *LC Filter:*

In DVR, filters convert the inverted PWM waveform into a sinusoidal waveform, by eliminating the unwanted harmonic components generated by the VSI action[37,43]. Higher orders harmonic components distort the compensated output voltage [44]. The unnecessary switching harmonics must be removed from the injected voltage waveform to maintain an acceptable Total Harmonics Distortion (THD) level. The passive filters can be placed either in the high voltage or in low voltage side winding of the series injection transformer [45, 48, 49].

### IV.     *DC charging circuit:*

The dc charging circuit has two main functions: The first is to charge the energy source after a sag compensation event and second is to maintain dc link voltage at the nominal dc link voltage. To charge the dc-link various topologies are used.

### V.     *Control and protection:*

The control process generally consists of hardware with programmable logic. In past it consists of Digital Signal Processing boards which provide controls like detection and correction. Filters can also be used. There are different types of filter algorithm: Fourier Transform (FT), Phase-Locked Loop (PLL), and Wavelet Transform (WT), out of which Fourier Transform is the most common type. Direct feed forward type control architecture maximizes dynamic performance of DVR

and compensation of voltage sags can be achieved in a fast response time (approximately 1ms) [58,59].

## III. OPERATION OF THE DVR

A typical DVR configuration is used for voltage compensation in the distribution line. Operation of the DVR consists of three operation mode:

**Protection mode**: Bypass switch can be used as a protection device to protect DVR from the over current in the load side due to short circuit on the load or large inrush currents [20]. The DVR can be protected by the action of the bypass switches by supplying another path for current.
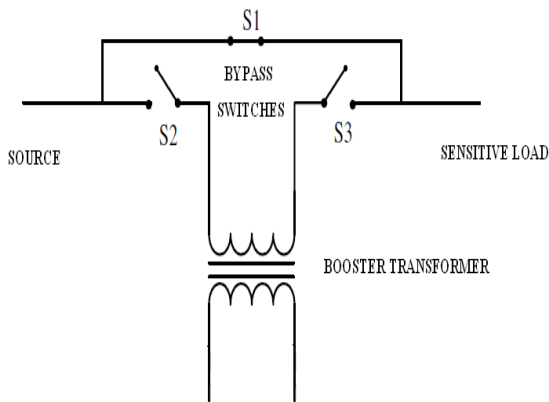


**Fig 5: Protection mode**

**Standby mode:** DVR will be most of the time in this mode (VDVR = 0). The two lower IGBT's in each phase of the inverter remains turned on where as two upper IGBT's turned off. Low voltage winding of injection transformer is shorted through inverter. A short circuit across the secondary (inverter side) windings of the series transformer through LF is obtained eliminating the use of bypass switches. In this mode of operation, no switching of semiconductors occurs so as to create a short-circuit path for the transformer connection, individual inverter legs are triggered. As a result, in this current loop, only comparatively low conduction losses of the semiconductors, contribute to the losses [67].
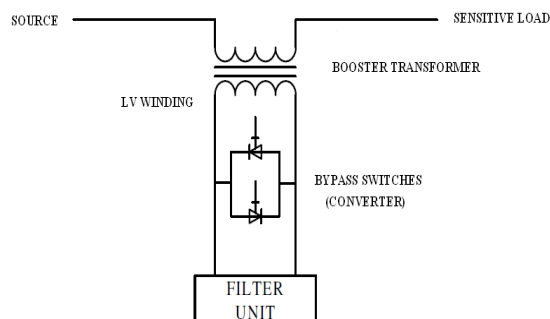


**Fig 6 Standby mode**

**Injection mode:** The DVR goes into injection mode (VDVR > 0) when the sag is detected [38]. Various voltage injection strategies are: pre-sag, phase advance, voltage tolerance and in phase method. DVR should have unchanged load voltage with minimum energy dissipation for injection due to the high cost of capacitors [20]. With required magnitude, phase and wave shape, three single-phase ac voltages are injected in series for compensating voltage sag, whose possibility is determined by types of voltage sags, load conditions and power rating of DVR [64].

## IV. DVRS TOPOLOGIES IN DISTRIBUTION SYSTEM

DVR injects an appropriate voltage to recover the voltage at the load during disturbances in a network, by exchanging active and reactive power with the system. There are two types of DVR topologies system comprising of no energy storage and with energy storage [14].

### DVR with no Energy Storage:
This can be divided into:
    **Type 1:** The energy is taken from the incoming supply or grid connected side through a passive shunt converter connected to the supply side or source side.
    **Type 2:** The energy is taken from the grid connected side through a passive shunt converter connected to the load side.
This type of DVR system with no energy storage utilizes the fact that a considerable part of the source voltage is maintained during the disturbances and this can be used to provide the boost energy required to maintain full power at its nominal voltage [63].

### DVR with Energy Storage:
The performance of the DVR can be improved by using energy storage even though storing electrical energy is expensive. If DVR is used for compensation process and there is a disturbance in the distribution system, stored energy supplies the real power requirements of the system.
    **Type 3:** This type of topology is simple and a variable dc-link voltage is utilized. The energy storage required to activate the DVR is proportional to the square of the rated dc-link voltage. In this system DVR with energy storage is employed where the variable DC-Link Voltage is used and energy is stored in the DC Link Capacitor [14].
    **Type 4 :** Energy storage such as SMES, batteries or super-capacitors can be used as a direct energy storage which is applied in DVR. Constant DC-Link Voltage is applied to this topology. Using an inverter, large energy storage can be transferred to smaller rated dc-link storage, during the disturbances in the network.

## V. CONTROL STRATEGIES IN DVR

The main purpose of control scheme is to maintain constant voltage magnitude at the point where a sensitive load is connected under system disturbances .Most of the DVR systems are equipped with a control system that mitigates voltage sags/swells. Some DVR applications include power flow control,

reactive power compensation, and limited responses to power quality problems [22, 28, 72, 73]. The control of DVR is very important and it involves detection of voltage sags (start, end and depth of the voltage sag) by appropriate detection algorithms which work in real time. The control system only measures the r.m.s voltage at the load point, hence no reactive power measurements are required. The voltage sags can last from a few milliseconds to a few cycles, with typical depths ranging from 0.9 p.u. to 0.5 p.u. of a 1-pu nominal [37, 29]. Inverter is an important component of DVR and performance of the DVR is directly affected by the control strategy of inverter. The inverter control strategy comprises of two types of control as following:

**1.LINEAR CONTROL:** Linear control is most common method of DVR control.

(a).feed forward control: is a simple method of DVR. This technique does not sense the load voltage. It calculates the injected voltage based on the difference between the pre-sag and during-sag voltages [81, 63, 82].

(b).feedback control strategy: It calculates the load. The difference between the reference load voltage and actual load voltage is required injection voltage [82]. The feedback control methods based on state space systems, which can be set up closed-loop poles in order to make faster time response can also be used. Feedback and the feed forward control strategy may be implemented by vector or scalar control techniques [85,86,65,87].

(c).composite control strategy: it can improve voltage compensation effect. It is a control method with grid voltage feed forward and load side voltage feedback, which has the strengths of feed-forward and feedback control strategy [83]. The combination with feed forward control can improve the system dynamic response rate, shortening the time of compensation significantly. If the feedback control in the composite control is designed to double-loop, it can improve system stability, system performance and the adaptability of dynamic load. [85].

**2.NON LINEAR CONTROL**

DVR is categorized as non-linear device due to the usage of power semiconductor switches in the VSI. When the system is unstable, model developed does not fully control target so all the linear control methods cannot work properly due to their limitations.

(a).artificial neural network control (ANN): It has adaptive and self-organization capacity and can be classified in: local approximation neural networks, feedback neural networks, feed forward neural network, and fuzzy neural network based on structure. Without detail mathematical model, ANN control can keep a careful check on the nonlinear relationship based on input and output [80].

(b).fuzzy control: This can be used in DVR for voltage injection [78]. These controllers are implemented into DVR when precise mathematical formulations are not possible. It is derived from fuzzy set theory introduced [79]. The advantage of this controller is its capability to reduce error and transient overshoot of PWM .

(c).space vector PWM control: In low switching frequency conditions, this strategy uses a voltage inverter space vector of the switch to get quasi-circular rotating magnetic field instead of

the original SPWM, so better performance of the exchange is gained [17]. A double-loop vector control can also be used [74]. Controls for single phase voltage sag detection methods in distribution system are also available: Mathematical Morphology theory based low-pass filter [76], Soft Phase Locked Loop (PLL) [75], Instantaneous Value Comparison Method [77].

## VI. COMPENSATION TECHNIQUES IN DVR

Concept of compensation techniques which are applied in DVR, can be divided into categories as follows;

*1.REACTIVE POWER COMPENSATION:*

In this only small energy storage is required and it does not require any active power, DVR provides reactive power compensation. The phasor diagram is illustrated in Figure [69]. The injected voltage is in quadrature with the load current. [28,70].
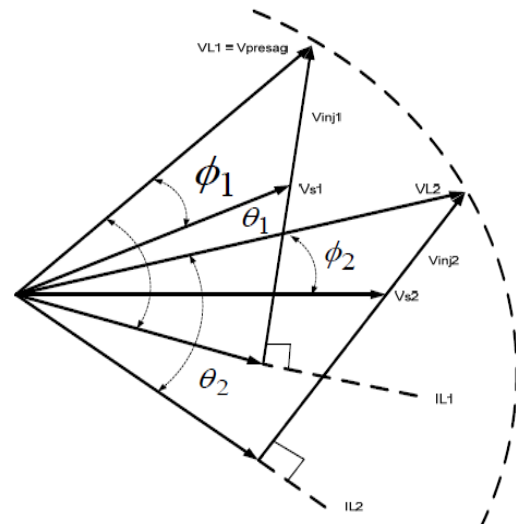


**Fig.7 : Reactive Power Compensation .**

**2.ACTIVE AND REACTIVE POWER COMPENSATION:**
*(a).Pre-Sag Compensation:*

In this method it is important for both magnitude and the phase angle to be compensated. The difference during sag and pre-sag voltage are detected by DVR and it injects the detected voltage, hence phase and amplitude of the voltage before the sag has to be exactly restored [26,28]. Figure.6 shows the pre-sag compensation technique before and after the voltage sags. [66,70].

**Fig.8 . Pre-sag compensation**

**(b).In- Phase Compensation:**

In this method, injection voltage is in phase with the source voltage [68]. When the source voltage drops due to sag in the distribution network, then injection voltage produced by the Voltage Source Inverter (VSI) will inject the missing voltage according to voltage drop magnitude [28,70]. This method can be shown in Figure.7 [66].
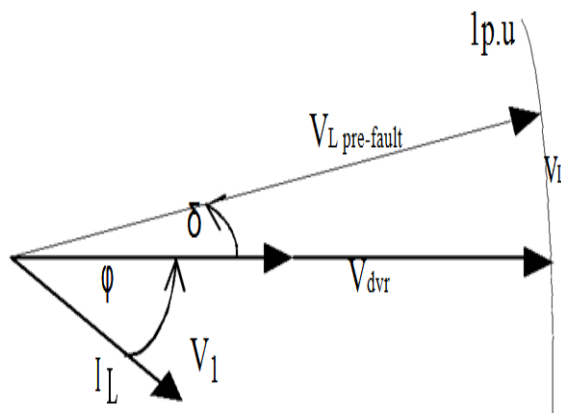


**Fig.9 . In–Phase compensation**

**(c).Phase Advanced or Minimum Energy Compensation:**

This method reduces the energy storage size. Active power $P_{DVR}$ depends on the angle $\alpha$. During the sag, phase of load voltage jump's a certain step that causes difficulties for load [28, 70, 71]. The magnitude of the restored load voltage that is maintained at pre-fault condition is shown in fig.8. [7].



**Fig.10 . Phase advanced compensation**

## VII.  CONCLUSION

This paper represents a detailed review of power quality problems and DVR which is a powerful custom power device. The main function of a DVR is the protection of sensitive loads from voltage disturbances in the distribution system. Various topologies and their controllers applied in DVR are explained in this paper. It also provides knowledge for the researchers to build a new design of DVR to mitigate voltage disturbances in distribution system. There is more to come, both in terms of technical development and economic solutions to existing problems.

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# Simulation and Analysis of Three-Phase Asynchronous Motor

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*Abstract-* This paper presents when unbalanced is introduced in the stator circuit, the result is obtained in the form of unbalanced of stator current , rotor current,torque and speed of the machine. In this study unstaisfactory parameters of stator current , rotor current ,torque and speed via simulation are presents. In this paper single phase supply apply on the two pahses of induction machine.The simulation results are also given which shows the performance of asynchronous (induction) motor.This simulation results  justify the abnormality in the speed and torque of the machine.In this study results  obtained under unbalance are also compared with the results under  balanced condition.

*Index Terms*- asynchronous motor, simulink, stator current ($i_s$), rotor current($i_r$),speed($\omega_m$), torque($t_e$)etc

## I. Introduction

Due to their reliability, simple construction and low cost, these motors are widely used in industrial drives. It has good speed regulation and high starting torque. Furthermore, it requires little maintenance. It has a reasonable overload capacity. For industrial and many other application three-phase asynchronous motors are prime movers for the vast majority of machines. In modern industrialized countries, more than half the total electrical energy used in those countries is converted to mechanical energy through AC induction motors. It has also estimated that 70% to 80% of all electricity in the world is consumed by these motors. Due to the recent developments in speed control methods of the induction motor have led to their large scale use in almost all electrical drives.  They are truly elegant machines in that there are no moving parts except the rotor. Damage of stator insulation is the most frequent failure in electrical motor. Protection of the induction motor against different internal faults would limit the fault duration and prevent motor from substantial damage, but unbalanced voltage is one of the most frequent disturbances in electrical systems.

## II. Circuit Model

Considering the three phases to be balanced, when the three-phase voltages are applied to the stator windings, a rotating magnetic field is established. As the magnetic field rotates, currents are induced in the conductors of the squirrel-cage rotor. The interaction of the induced currents and the magnetic field produces forces that cause the rotor to also rotate.

The per phase equivalent circuit of an asynchronous motor is shown below
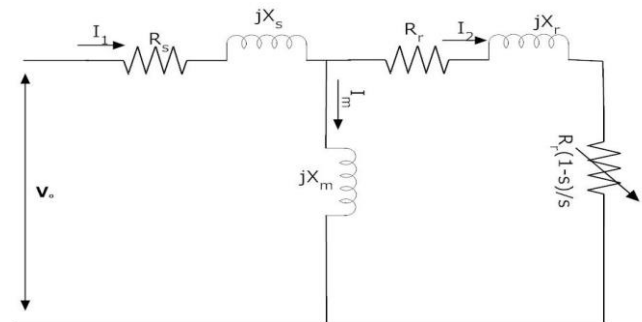


Where $R_s$ stator  resistance , $X_s$ stator  reactance, $R_r$ rotor resistance and $X_r$ rotor reactance

Rotor current is:

$$I_2 = \frac{V_0}{[\left(R_2 + \frac{R_r}{s}\right) + j(X_s + X_r)]}$$

Maximum torque, thus

$$T_{max} = \frac{3V_0^2}{2\omega_s \left[R_r \pm \sqrt{[R_s^2 + (X_s + X_r)^2]}\right]}$$

The rotor circuit of an induction motor has low resistance and high inductance. At starting, the rotor frequency is equal to the stator frequency (i.e., 50 Hz) so that rotor reactance is large compared with rotor resistance. Therefore, rotor current lags the rotor e.m.f. by a large angle, the power factor is low and consequently the starting torque is small. When resistance is added to the rotor circuit, the rotor power factor is improved which results in improved starting torque. This, of course, increases the rotor impedance and, therefore, decreases the value of rotor current but the effect of improved power factor predominates and the starting torque is increased.

## III. Simulation Test And Results

The facilities provided by the Simulink software of MATLAB are used to implement the block diagram. In this study simulation test is performed to measure the effect of unbalanced supply on stator circuit of three phase asynchronous (induction) motor. In this work a squirrel cage asynchronous motor is tested.
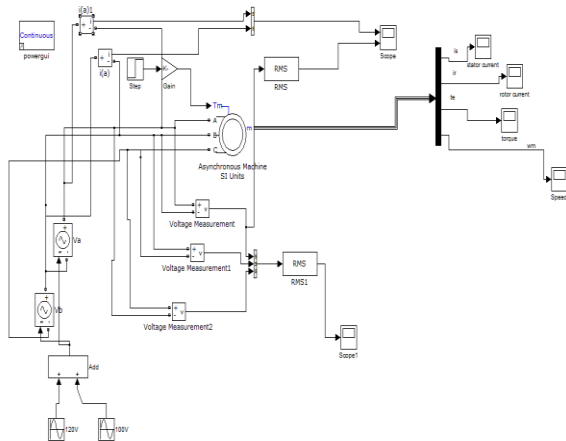
**Fig 1 simulation model of 20 hp induction machine when 1 phase supply applied**
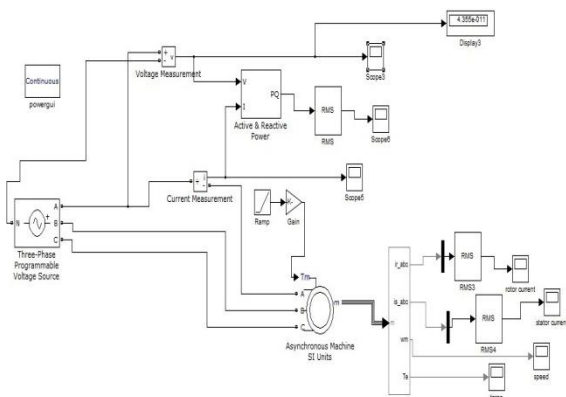


**Fig 2 simulation model of 20 hp motor when three phase supply applied**

A 20 hp 460V, 1760 rpm motor is used for this purpose i.e. operation is performed on 20hp three phase motor. When the unbalanced is interduced in the stator circuit ,the result can be observed in the form of unbalanced parameter of stator current , rotor current,torque and speed of the machine as shown in figs.
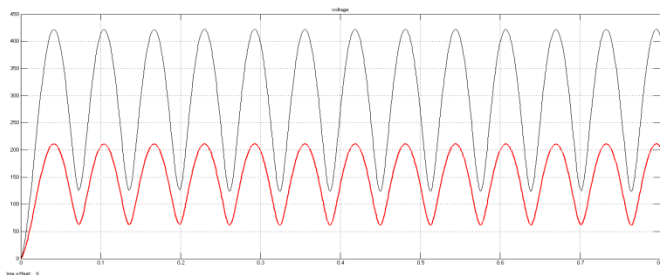


**Fig3 voltage between two phases**
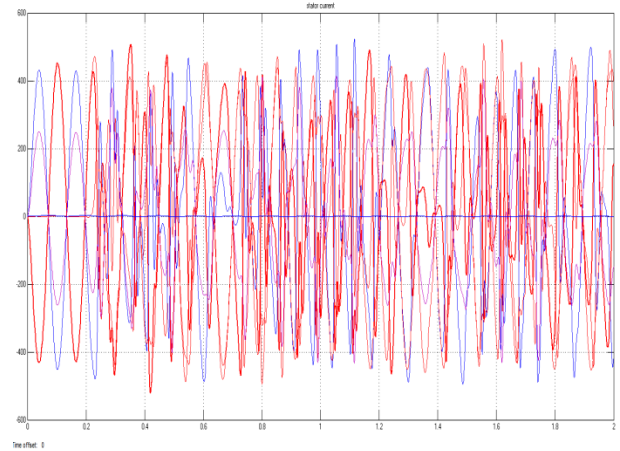


**Fig 4 stator current ($i_s$) under unbalanced voltage condition**
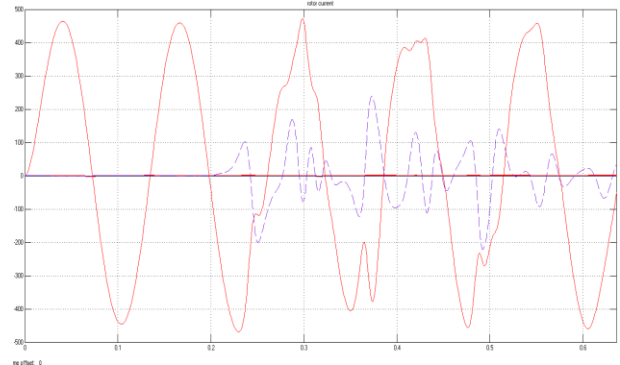


**Fig 5 rotor current ($i_r$) under unbalanced voltage condition**
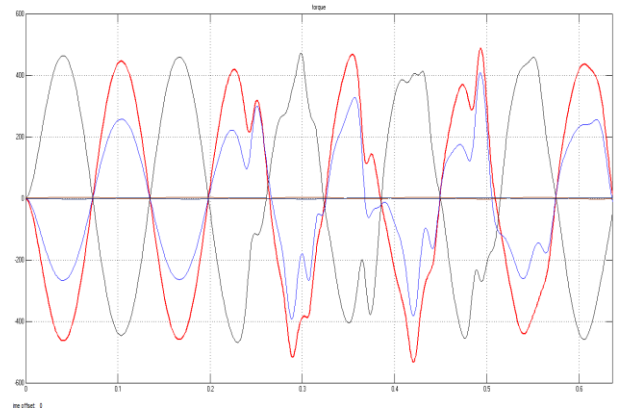


**Fig 6 Torque ($t_e$) curve under unbalanced condition**
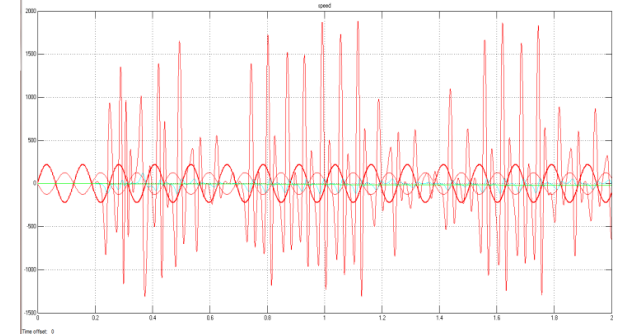


**Fig 7 speed ($\omega_m$) when single phase supply apply on two phase of machine**
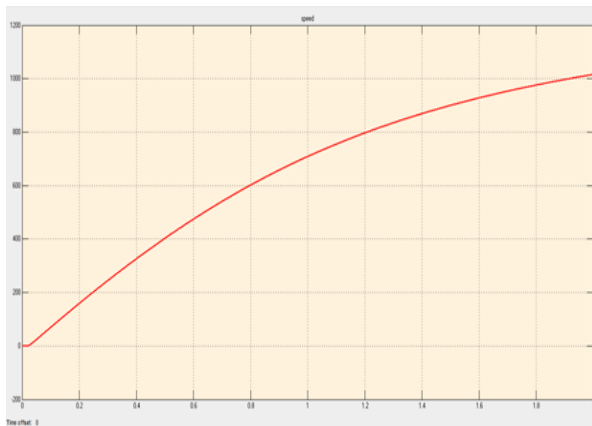
**Fig 8 speed $(\omega_m)$ when three phase supply apply**
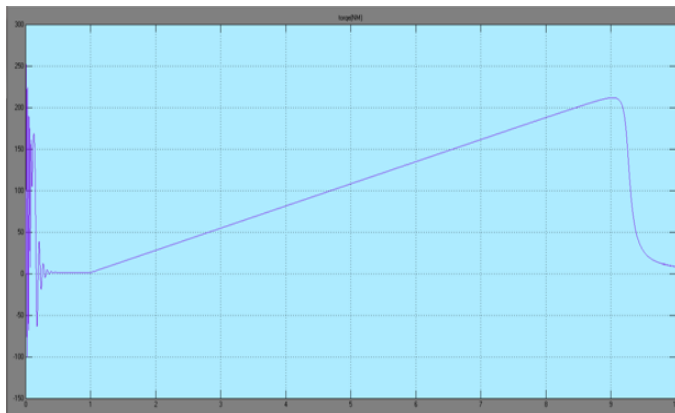


**Fig 9 Torque ($t_e$) curve when three phase supply apply**
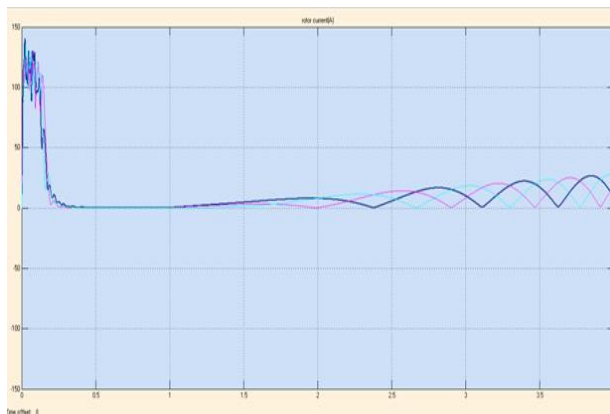


**Fig10 rotor current under balanced condition**

After studied it is observed that, during starting of an induction motor, the stator resistance and the motor inductance (both rotor and stator) must be kept low to reduce the steady state time and also to reduce the jerks during starting. On the other hand, higher value of rotor resistance leads to lesser jerks while having no effect on the steady state time.

## IV. CONCULSION

From the simulink result, it is found that an unbalanced supply voltage produces rotating magnetic field moving at a non-

uniform rate and strength. This will cause unbalanced heating in the stator winding, which will lead to unequal heating. The variation in supply voltage affects the speed, torque of the motor, starting current, full-load current, starting torque, maximum torque as well as operating temperature of various parts of the machine. These lead to unsatisfactory operation of the machine. Also the unbalancing in the voltage source can cause excessive losses, heating, noise, vibration, torsional, pulsations, slip and motor accelerating torque.

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# Chemical, Nutritive Value and Organoleptic Attributes of In-Built Products of Fermented *Afzelia africana* Tender Leaves and Shoots

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*Abstract-* *Afzelia africana* was identified in four selected communities in Idemili North Local Government Area as important wild vegetable tree. The tender leaves and shoots are known and consumed as delicacies in yam dish. This wild vegetable that substitutes cultivated vegetables in dry season is on the verge of extinction. This is because farmers produce and consume more commonly known vegetable. Planting, processing, food use and organoleptic attributes of its in-built product for food diversification is scanty in Nigeria literature. *Afzelia africana* tender leaves and shoots were collected from forest in the four study areas. The leaves and shoots were divided into four portions. One portion was sun-dried as control. The other three portions were exposed for 30 minutes to sun to wither, squeezed in partially burnt fresh banana leaves wrapped and allowed to ferment in locally made basket by inherent microflora for 4, 7 and 10 days. The fermented samples were sun-dried until they become brittle for pulverization into fine powder. These samples were used for both chemical analysis and formation of diets for adult rats for a 12-day N balance study and liver composition. The in-built product (yam dish) has a promising food diversification use. A 4-day fermentation of *Afzelia africana* leaves and shoots produced much more nutrient density and desirable organoleptic attributes. The dietary protein based on a 4-day fermented *Afzelia africana* leaves and shoots fed adult rats increased N digestibility and retention, net protein utilization and liver composition.

## I. INTRODUCTION

Most of the recent studies reported that the incidence of malnutrition is higher in rural areas and urban slums particularly protein and micronutrient (Vitamin A, iron and iodine) deficiencies. This was attributed to food gap and seasonality (Hart, Azubuike, Barimalaa & Achinewhu, 2005). People in these areas experience food abundance, especially vegetables during rainy season and severe scarcity during dry season. This seasonality is attributed to lack of irrigation facilities and opportunities, ignorance of the nutritional value of wild vegetables, leaves of forest trees and many lesser-known legumes and tubers.

Most staple foods are consumed with some measure of supplementation, complementation and fortification. This is limited in scope due to ignorance, poor food processing methods and poverty. Some of the available food stuffs, fruits and vegetables are neglected due to some socio-culture hindrances such as taboos, fads, fallacies and poor nutrition education of the people, particularly the rural dwellers. Some popular foods such as fish, meat, crayfish, milk, egg and some vegetables are expensive. However, there are other lesser-known fruits and vegetables traditionally cultivated or collected from forests in Nigeria. These are used to supplement those collected from farms and home gardens.

*Afzelia africana* is one of them. It grows widely in farmlands and forests in Nigeria. It survives the harshest weather conditions such as harmatan and effects of some global climate change. Fruits and vegetables are major sources of micronutrients. It is imperative to make serious efforts to identify, process and popularize other locally available and cheap, nutritious vegetables and their dishes to meet the protein and micronutrient needs of the nation – Nigeria. It is of need to lay much more emphasis on nutrition education, the importance of vegetables especially green leafy vegetables to the nutrition quality of diets of both children and adults. Traditionally, vegetables are added to foods to improve the "eye" appeal rather than for the nutrients and phytochemicals they contain. In dry season in Nigeria, yam is consumed with plain palm oil, yam porridge without any vegetables, plain sauces thickened with cocoyam or rice without vegetables. This is exactly the case in some of the town in Idemili North Local Government Area where the research therein was conducted on fermented *Afzelia africana* – "akpalataa" tender leaves and shoots.

*Afzelia africana* has many tender leaves and young shoots readily available in the forests and farmlands during the dry season. The processing methods adopted by the indigenes and the nutrition implication of the use of fermented *Afzelia africana* as vegetable has not been adequately investigated and reported in Nigeria literature. This work investigated the chemical composition and food uses of fermented *Afzelia africana* tender leaves and shoots. This study also investigated the nitrogen (N) and mineral balance as well as liver composition of adult rats fed diets containing fermented *Afzelia africana* tender leaves and shoots as sole source of N (protein).

## II. MATERIAL AND METHODS

The *Afzelia africana* tender leaves and shoots were obtained from gardens and farms in Ogidi, Abatete, Uke and Umuoji in Idemili North Local Government Area of Anambra State, Nigeria. The purpose was to obtain baseline information concerning their knowledge of availability, processing,

preparation and use of fermented *Afzelia africana* tender leaves and shoots as vegetable.

About 8kg of *Afzelia africana* tender leaves and shoots were obtained and divided into four equal portions. A portion was sun-dried and the other three portions were fermented by its microflora content, and sun-dried. Fermentation was as follows: Fresh leaves and shoots were sun-dried for 30 minutes to whither, wrapped in heat-treated fresh banana leaves and fermented in locally make wooden basket for 4, 7 and 10 days, respectively as shown in figure 1. After fermentation, the *Afzelia africana* leaves were spread on trays, sun-dried and pulverized into fine powder. The samples were packaged in name-labeled polythene bags and stored until used for various analyses.

## III. CHEMICAL ANALYSIS

The proximate, mineral and anti-nutrient content of the samples were determined using AOAC (2000) procedures. Nitrogen and mineral balance was determined using adult rats to determine the bioavailability of nutrients in the fermented samples. Four diets were formulated to furnish 10% of the dietary protein. Mineral, vitamins, vegetable oil, and sucrose were added to meet the adequate nutrient requirements of the rats. The composition of experimental diets is shown in Table 1. Each diet and rat served as its own control in a-12 day study. A 12 day animal feeding, collection of metabolic wastes (feaces and urine), analysis of diets, feaces, urine and determination of liver composition of the rats were the methods of Obizoba and Atii (1994). The data generated was analyzed using Steel and Torrie (1960) statistical methods.

*Afzelia africana tender leaves*
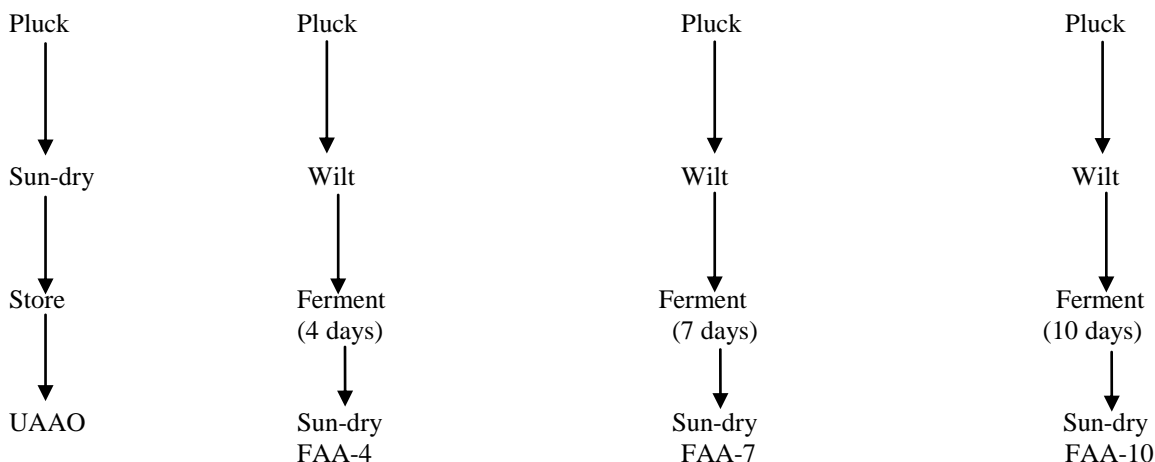


**Fig. 1: Flow chart for processing *Afzelia africana* leaves**

Key:
| | |
|---|---|
| UAAO | Unfermented *Afzelia africana* leaves |
| FAA4 | Four-day fermented *Afzelia africana* leaves |
| FAA7 | Seven-day fermented *Afzelia africana* leaves |
| FAA10 | Ten-day fermented *Afzelia africana* leaves |

**Table 1: Composition of the four all-vegetable protein diets based on 10% protein from fermented *Afzelia africana* leaves (g).**

| Diets | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| UAAO | 571 | - | - | - |
| FAA4 | - | 623.78 | - | - |
| FAA7 | - | - | 601.60 | - |
| FAA10 | - | - | - | 579.71 |
| Fat | 48.00 | 48.00 | 48.00 | 48.00 |
| Mineral | 4.32 | 4.32 | 4.32 | 4.32 |
| Vitamin | 2.40 | 2.40 | 2.40 | 2.40 |
| Sucrose | 334.28 | 281.50 | 303.68 | 325.57 |
| Total | 960.00 | 960.00 | 960.00 | 960.00 |

Key:
| | |
|---|---|
| UAAO | Unfermented *Afzelia africana* leaves |
| FAA4 | Four-day fermented *Afzelia africana* leaves |
| FAA7 | Seven-day fermented *Afzelia africana* leaves |
| FAA10 | Ten-day fermented *Afzelia africana* leaves |

## IV. RESULTS

**Proximate composition:**

The protein content of the samples differed. Fermentation decreased *Afzelia africana* protein when compared with the unfermented leaves (18.00 to 15.4%). Fat values increased, regardless of fermentation period. There were increased in ash content except for the 4-day fermentation with slightly decreased

ash value when compared with the control (UAAO) (9.94 vs 9.76%). The highest increase occurred in the 10-day fermentation period (11.01%). Fermentation increased crude fibre content of the samples when compared with the control (11.48 vs 10.30%). Fermentation precipitated decreases in carbohydrate except for 7-day fermentation that recorded a slight increase (61.03 vs 61.41%).

**Table 2: Proximate composition of fermentation *Afzelia africana* (Aa) leaves based on dry weight (%)**

| Code | Protein | Fat | Ash | Crude fibre | Carbohydrate |
|---|---|---|---|---|---|
| UAAO | 18.00±0.01 | 0.40±0.04 | 9.94±0.01 | 10.30±0.01 | 61.03±0.02 |
| FAA4 | 16.93±0.01 | 1.47±0.014 | 9.76±0.02 | 11.48±0.02 | 60.08±0.02 |
| FAA7 | 15.40±0.01 | 1.45±0.014 | 10.86±0.02 | 11.26±0.02 | 61.41±0.012 |
| FAA10 | 17.72±0.00 | 1.18±0.021 | 11.01±0.3 | 10.67±0.01 | 57.39±0.021 |

Key:
| | |
|---|---|
| UAAO | Unfermented *Afzelia africana* leaves |
| FAA4 | Four-day fermented *Afzelia africana* leaves |
| FAA7 | Seven-day fermented *Afzelia africana* leaves |
| FAA10 | Ten-day fermented *Afzelia africana* leaves |

Micronutrient and anti-nutrient content of fermented *Afzelia africana* leaves

Table 3 presents the micronutrient and anti-nutrient content of the samples. The zinc composition of the leaves was low and varied. Iron values had the same trend as zinc. The values ranged from 0.02 to 0.04mg for zinc and 0.11 to 0.13mg for iron. The 4-day and the 10-day fermented samples had 0.01mg iron more than the control (0.13mg and 0.12mg vs 0.11mg). Iodine values were identified by treatments. The 7-day fermentation decreased

iodine (218.50mg). On the other hand, the other fermentation periods increased the value (Table 3). Fermentation had varied effects on tannins content of the vegetables. The 4-day fermentation of Aa slightly increased tannins (0.85 to 0.93mg). The 10-day fermentation decreased it drastically (0.07mg). The 7-day fermentation surprisingly reduced phytate and oxalate. The 7-day fermentation slightly reduced phytate. However, 10-day fermentation nearly doubled that of the control (313.32 vs 167.72mg). Fermentation influenced oxalate levels.

**Table3: Micronutrient and anti-nutrient composition of fermented *Afzelia africana* leaves (mg/100g)**

| | Zinc | Iron | Iodine | Tannins | Phytate | Oxalate |
|---|---|---|---|---|---|---|
| UAAO | 0.03±0.02[a] | 0.11±0.22[c] | 223.09±0.8[a] | 0.85±0.01[a] | 167.72±20[b] | 56.67±0.1[a] |
| FAA4 | 0.02±0.02 | 0.13±0.02[c] | 234.45±0.4[a] | 0.93±0.1 | 172.50±20[b] | 48.98±0.1[b] |
| FAA7 | 0.04±0.03 | 0.11±0.02[c] | 218.50±0.4[b] | 0.71±0.1[b] | 156.87±0.13[c] | 54.75±0.2[a] |
| FAA10 | 0.03±0.03[a] | 0.12±0.22[c] | 236.67±0.2[a] | 0.07±0.1[c] | 313.32±20[a] | 46.30±0.2[b] |

Key:
| | |
|---|---|
| UAAO | Unfermented *Afzelia africana* leaves |
| FAA4 | Four-day fermented *Afzelia africana* leaves |
| FAA7 | Seven-day fermented *Afzelia africana* leaves |
| FAA10 | Ten-day fermented *Afzelia africana* leaves |

**Bioavailability studies**

Table 4 presents food and N intake, feacal and urinary N, digested and retained N, biological value and net protein utilization of adult rats fed four all vegetables protein diets based on *Afzelia africana* diet had the least food intake (40.90g) followed by that of the group fed the 10-day fermented samples

(47.80g). The group of rats fed the 4-day fermented *Afzelia africana* diet had the highest intake (69.43g). On the other hand, the group of rats fed the unfermented *Afzelia africana* diet had slightly higher food intake than the group fed the control diet (casein) (56.49 vs 54.80g)

## Nitrogen intake

The N intake of both the control and the test groups of rats fed the four all vegetable protein diets differed. It ranged from 0.66 to 1.11g. The group of rats fed FAA4 had N intake significantly different from that of the rats fed 7-day fermented diet (1.11 vs 0.66g) (p<0.05). On the other hand, the group fed casein diet had N intake that was comparable to those fed UAAO (0.99 vs 0.90g). The group of rats fed FAA10 had lower N intake that those of rats fed FAA4 (0.77 and 1.11g respectively) (p<0.05). The group of rats that had the highest food intake also had the highest N intake (69.43 and 1.11g, respectively).

## Feacal N

The values for fecal N for all the groups of rats were 0.07, 0.04, 0.05 and 0.06g for the UAAO, the FAA4, the FAA7 and the FAA10, respectively. There we no differences in faecal N output regardless of the treatment (p>0.05).

## Digested N

The digested N values for the group of rats fed casein and four all-vegetable protein diets based on fermented *Afzelia africana* leaves differed. The animals fed casein (control) had 0.94g digested N which was higher than those of the groups fed the FAA7 and the FAA10 diets (0.94 vs 0.61 and 0.71g) (p<0.05). On the other hand, the group of rats fed the FAA4 highest digested N (1.07). Nevertheless, the values from CA, UAAO, FAA4 groups were similar (p>0.05). However, the digested N of the group of rats fed the unfermented *Afzelia africana* and casein had comparable values (0.94 and 0.83g respectively). The digested N of the group of rats fed FAA7 and

FAA10 diets slightly differed. However, the difference was insignificant (p>0.05).

## Urinary N

The urinary N of the group of rats fed the FAA4 and FAA7 diets were similar (0.002g) and the unfermented sample (UAAO) and 10-day fermented samples were equally similar (0.001g). On the other hand, the group of rats fed casein had the highest urinary N (0.11g) and differed from the rest (p<0.05).

## Retained N

The retained N values differed. However, the group of rats fed the FAA4 had higher retained N that was different from those of rats fed both control and test diets (p<0.05). The casein group had 0.83g retained N. The rats fed the FAA7 had the lowest N retention (0.61g) followed by the group fed the FAA10 (0.71g) (p>0.05).

## Biological value

The biological value of the group of rats fed the unfermented sample (UAAO) was higher than others fed the samples fermented for varying periods (99.9% vs 99.9, 99.7, 99.96%). However, these differences were not significant (p>0.05).

## Net protein utilization (NPU)

The NPU of these groups of rats fed four all-vegetables protein diets based on fermented *Afzelia africana* leaves were 92.1, 92.2, 92.12, 92.08 for the UAAO, the similar (p>0.05) and differed only from that of casein (p<0.05).

**Table 4: Food and nitrogen intake, feacal and urinary nitrogen, digested and retained nitrogen, biological value and net protein utilization of adult rats fed four all vegetable protein diet based on fermented *Afzelia africana* leaves.**

| Diet | CA* | UAAO** | FAA4** | FAA7** | FAA10** |
|---|---|---|---|---|---|
| Food intake (g) | $54.8\pm3.3^b$ | $56.49\pm3.39^a$ | $69.43\pm4.91^a$ | $40.96\pm5.4^c$ | $47.90\pm2.7^c$ |
| Nitrogen intake (g) | $0.99\pm0.1^b$ | $0.90\pm0.09^b$ | $1.11\pm0.08^a$ | $0.66\pm0.09^a$ | $0.77\pm0.00^c$ |
| Feacal nitrogen (g) | $0.05\pm0.01^a$ | $0.07\pm0.06^a$ | $0.04\pm0.01^a$ | $0.05\pm0.01^a$ | $0.66\pm0.01^a$ |
| Digested nitrogen (g) | $0.94\pm0.95^a$ | $0.83\pm0.02^a$ | $1.07\pm0.08^a$ | $0.61\pm0.09^b$ | $0.71\pm0.00^b$ |
| Urinary nitrogen (g) | $0.11\pm0.03^a$ | $0.001\pm0.00^b$ | $0.002\pm0.00^b$ | $0.002\pm0.00^b$ | $0.001\pm0.00^b$ |
| Retained nitrogen (g) | $0.83\pm0.06^b$ | $0.83\pm0.0^6$ | $1.07\pm0.08^a$ | $0.61\pm0.09^c$ | $0.71\pm0.1^c$ |
| Biological value (%) | $83.3\pm0.01$ | $99.9\pm0.01^a$ | $99.9\pm0.01^a$ | $99.7\pm0.02^a$ | $99.96\pm0.00^a$ |
| Net protein utilization (%) | $83.3\pm0.06^b$ | $92.1\pm0.57^c$ | $96.22\pm0.06^c$ | $92.12\pm0.48^c$ | $92.08\pm0.06^c$ |

**Key:** **\*Obizoba (1989)**
  **\*\*Mean**±SEM of 5 rats = 7-day food intake (means with similar superscript are similar)

CA      Casein
UAAO   Unfermented *Afzelia africana* leaves
FAA4    Four-day fermented *Afzelia africana* leaves
FAA7    Seven-day fermented *Afzelia africana* leaves
FAA10  Ten-day fermented *Afzelia africana* leaves

## Mineral bioavailability

Table 5 presents mineral intake, feacal and urinary, absorbed and retained in four groups of adult rats fed four all-vegetable protein diets based on fermented *Afzelia africana* leaves.

## Iron

The iron intake of the various groups of rats fed different diets differed. It ranged from 0.61 to 1.04mg. The rats fed a 10-day fermented *Afzelia africana* diet had the highest intake (1.04mg). The 7-day fermented *Afzelia africana* diet fed group of adult rats had the least intake (0.63mg). On the other hand, the rats fed the 4-day fermented *Afzelia africana* diet had the second highest iron intake (0.80mg). The fecal iron output of all groups

of rats was comparable (p>0.05). The absorbed iron values were influenced by feacal excretions. The group of rats that had higher iron intake also had higher absorbed iron (1.03mg) than the other groups. The absorbed iron followed the same trend as the iron intake and vice versa. The urinary iron output varied. It ranged from 0.18 to 0.27mg. The 7-day fermented samples had the least output (0.18mg). On the other hand, the 10-day group of rats had the highest (0.27mg). The unfermented and 4-day group of rats had slightly comparable values (0.22 and 0.21mg, respectively). The urinary output had considerable values adverse effect on retained iron. Regardless of the higher iron excretion of rats fed the 10-day fermented diet, it still had the highest iron retention (0.76mg) as against the values for the other three groups of rats (p<0.05). The group of rats fed unfermented and the 7-day samples had similar values of 0.40 and 0.42mg, respectively (p>0.05). The rats fed 4-day had an edge (0.58mg) over the other groups of rats fed unfermented and 7-day fermented diets (p<0.05).

### Zinc

The zinc intake varied. It ranged from 0.90 to 1.61mg. The group of rats fed the 4-day (1.61mg) consumed more zinc than the other three groups of adult rats. There were difference in zinc intake among other three groups (1.27, 0.90 and 1.01mg). The group of rats fed the 7-day diet had the least (0.90mg) that differed from others. The faecal zinc for the four groups of rats ranged from 0.06 to 0.10mg. The values were comparable (p>0.05). The low faecal zinc for the four groups of adult rats influenced absorption values. The rats fed the 4-day fermented diet that had the highest zinc intake and lowest output had the highest absorbed zinc (1.55mg). This value differed from the other three groups of rats (p<0.05). The rats fed the 7-day fermented diet that had lower intake and high faecal value had the least absorbed zinc (0.82mg) followed be those rats fed the 10-day fermented diet (0.93mg). On the other hand, the rats fed the unfermented diet had much more absorbed zinc than those

fed the 7-day and 10-day fermented diets (1.17 vs 0.82mg, and 0.93mg each). The urinary zinc of all the four groups varied. It varied from 0.204 to 0.224mg. These values seriously affected retained zinc. The rats fed the 7 and 10-day fermented samples had comparable zinc retention (0.613 and 0.482mg each). On the hand, the 4-day sample had higher zinc retention (1.334mg) irrespective of its high urinary zinc output.

### Iodine

The iodine intake of the four groups of rats differed. It ranged from 18.64 to 25.43mcg. The rats fed the 7-day fermented diet had the highest iodine intake (25.43g). However, those rats fed the unfermented and 10-day fermented samples had similar values (18.64 and 18.68mcg, respectively) (p>0.05). The rats fed the 4-day fermented diet had the second highest intake (24.42mcg). The faecal iodine for the four groups of rats varied. The variation was from 0.33 to 0.55mcg. The rats fed unfermented and the 7-day fermented diets had comparable values (0.55 and 0.50mcg) as well as those fed the 4 and 10-day fermented diets (0.33 and 0.44mcg each) (p>0.05). The absorbed iodine for the four groups of rats ranged from 18.09 to 24.85mcg. The group of rats fed the 7-day and the 4-day fermented diets had 24.85 and 24.09mcg absorbed iodine respectively. On the other hand, the rats fed the unfermented and the 10-day fermented diet had comparable values (18.09 to 18.28mcg, respectively) (p>0.05). The urinary iodine values for all the groups of rats were high and comparable. It ranged from 4.75 and 4.95mcg, respectively, respectively. The high urinary iodine again affected its retention. The iodine retention ranged from 12.57 to 19.34mcg. The unfermented group of rats had the least followed by the 10-day fermented group of rats (12.57 and 13.33mcg, respectively). The 4-day fermented diet that had the least urinary output (4.75mcg) in turn had the highest iodine retention (19.34mcg) followed by the rats fed the 7-day fermented diet (14.09mcg).

**Table 5: Intake, faecal, urinary, absorbed, and retained minerals in groups of adult rats fed four all-vegetable protein diets based on fermented *Afzelia africana* leaves.**

| Mineral | UAAO | FAA4 | FAA7 | FAA10 |
|---|---|---|---|---|
| Iron intake (mg) | $0.63\pm4.81^c$ | $0.80\pm5.81^b$ | $0.61\pm10.20^c$ | $1.04\pm7.13^a$ |
| Faecal iron (mg) | $0.01^a$ | 0.01 | 0.01 | 0.01 |
| Absorbed iron (mg) | $0.62\pm0.03^{ca}$ | $0.79\pm0.2b^a$ | $0.61\pm0.4^{ca}$ | $1.03\pm0.03^{aa}$ |
| Urinary iron (mg) | $0.22\pm0.01^b$ | $0.21\pm0.03^b$ | $0.18\pm0.02^b$ | $0.27\pm0.01^a$ |
| Retained iron (mg) | $0.40\pm0.03^c$ | $0.58\pm0.04b^b$ | $0.43\pm0.02^c$ | $0.76\pm0.05^a$ |
| | | | | |
| Zinc intake (mg) | $1.30\pm0.03^b$ | $1.61\pm0.05^a$ | $0.90\pm0.05^c$ | $1.01\pm0.02^b$ |
| Faecal zinc (mg) | $83.3\pm0.06^b$ | $0.06\pm0.01$ | $0.08\pm0.01^c$ | $0.08\pm0.01$ |
| Absorbed zinc (mg) | $1.17\pm0.02^b$ | $1.55\pm0.03^a$ | $0.82\pm0.02^c$ | $0.93\pm0.02^c$ |
| Urinary zinc (mg) | $0.20\pm0.03^a$ | $0.22\pm0.04^a$ | $0.21\pm0.00^a$ | $0.22\pm0.00^a$ |
| Retained zinc (mg) | $0.97\pm0.02^a$ | $1.33\pm0.03^a$ | $0.61\pm0.02^b$ | $0.48\pm0.01^b$ |
| | | | | |
| Iodine intake (mcg) | $18.64\pm1.13^b$ | $24.42\pm1.76^a$ | $25.34\pm11.5^a$ | $18.68\pm1.2^b$ |
| Faecal iodine (mcg) | $0.55\pm0.03^a$ | $0.33\pm0.02^a$ | $0.50\pm0.01^a$ | $0.40\pm0.02^a$ |
| Absorbed iodine (mcg) | $18.09\pm0.01^b$ | $24.12\pm0.02^a$ | $24.84\pm0.02^a$ | $19.28\pm0.03^a$ |
| Urinary iodine (mcg) | $5.52\pm0.09^a$ | $4.75\pm0.08^a$ | $5.25\pm0.05^a$ | $4.95\pm0.04^a$ |
| Retained iodine (mcg) | $12.57\pm0.09^b$ | $19.37\pm0.04^a$ | $19.59\pm0.03^a$ | $13.33\pm0.04^b$ |

Key:
a,b,c,    Values with the same superscript letters are similar (p>0.05)
UAAO    Unfermented *Afzelia africana* leaves
FAA4    Four-day fermented *Afzelia africana* leaves
FAA7    Seven-day fermented *Afzelia africana* leaves
FAA10    Ten-day fermented *Afzelia africana* leaves

**Liver composition of adult rats fed four all-vegetable protein diets**

Table 6 presents the liver composition of adult rats fed four all-vegetable protein diets based on fermented *Afzelia africana* leave. The animals fed the 4-day fermented sample had the least liver weight (1.37g). The animal fed the unfermented sample had 1.64g liver weight. The control had the highest liver N (121.6mg). The rats fed the UAAO and the FAA4 diets had different values. However, the differences were not significant (p>0.05). The other two groups of rats (FAA7 and FAA10) had similar N (0.15 and 0.16mg). The UAAO rats had the highest moisture (75.5%). However, the value was higher than that of casein group and the other test groups of rats. The casein group had the least liver moisture (35.0%). The other three test groups of rats had values that were not different from each other (p>0.05). The liver lipids for all groups of rats ranged from 0.438 to 0.518%. The casein group had the highest (9.3%), which was different from other (p<0.05). The group of rats fed the UAAO, the FAA4 and the FAA10 diets had approximately 0.52, 0.50 and 0.51% respectively. These values were different from that of the FAA7 (0.44%). However, the difference were comparable. The liver ash of the four test groups ranged from 0.32 and 0.41%. The FAA4 and the FAA7 groups had comparable values (0.32 and 0.34%, respectively). The zinc and iron values for all groups of rats were not different from each other (p>0.05). However, the values for iodine were quite high (6.80 and 8.56mg). The UAAO and the FAA10 rats had the highest iodine 7.54 and 8.56mcg, respectively. As one would expect, the FAA4 and FAA7 had varied values that were not different (p>0.05).

**Table 6: Liver composition of adult rats fed four all-vegetable protein diets based on fermented *Afzelia africana* leaves**

| Composition | Casein* | UAAO** | FAA4** | FAA7** | FAA10** |
|---|---|---|---|---|---|
| Average Liver wt (g) | 5.0±0.01 | 1.64 | 1.37 | 1.59 | 1.79 |
| Dry Liver N (mg) | 121.6±0.37 | 0.193±0.01 | 0.178±0.01 | 0.154±0.01 | 0.1613±0.02 |
| Liver Moisture% | 3.50$^c$±4.0 | 75.58$^a$ | 71.97$^b$ | 72.72$^b$ | 70.69$^b$ |
| Liver Lipids % | 9.30 | 0.518±0.05 | 0.50±0.02$^b$ | 0.438±0.03 | 0.508±0.04 |
| Liver ash% | - | 0.41±0.04$^a$ | 0.32±0.02$^b$ | 0.34±0.02$^b$ | 0.40±0.03$^a$ |
| Zinc (mg) | - | 0.002±0.0002$^a$ | 0.001±0.0$^a$ | 0.001±0.0$^a$ | 0.003±0.002$^a$ |
| Fe (mg) | - | 0.0007±0.0003 | 0.003±0.00002 | 0.001±0.00006 | 0.001±0.00002 |
| I$_2$(mcg) | | 7.54±0.74 | 6.80±0.36 | 6.98±0.45 | 8.56±0.61 |

**Key:**    **\*\*Mean**±SEM of 5 rats = 7-day food intake (means with similar superscript are similar)
    **\*Obizoba (1989)**

CA    Casein
UAAO    Unfermented *Afzelia africana* leaves
FAA4    Four-day fermented *Afzelia africana* leaves
FAA7    Seven-day fermented *Afzelia africana* leaves
FAA10    Ten-day fermented *Afzelia africana* leaves

## V. DISCUSSION

**Proximate and mineral composition of fermented *Afzelia africana* Leaves**

The nutrient content of fermented vegetable which was much more improved was not a surprise. Udofia (2005) reported that many workers had observed similar phenomenon in their studies. The protein content of these fermented vegetables was higher than that obtained in most commonly consumed Nigerian green leafy vegetables and foods other than animal and legume products (Oyenuga, 1968).

Oboh (2005) and Ajibade, Balogun, Afolabi and Rapoati (2006) among other studies reported the proximate value for a very common green leafy vegetable fluted pumpkin. The protein value was 9.0, 11.6 and 20.7%, respectively. This wide disparity was attributed to varietal differences, soil and season. Aletor and Adeogu (1995) reported that the dry vegetables contain 19.3g/100g crude protein and 15.3g/100g crude fibre. Fresh products contain very low nutrients which was attributed to the higher nutrient density of dried products as against the fresh vegetables. Atawodise, Bulus, Ibrahim, Ameh, Nok, Manumom and Galadima (2003) observed that lesser popular vegetables improve nutritional status of rural families, especially during period of scarcity.

**Anti-nutrient content of fermented *Afzelia africana* leaves**

The anti-nutrient content of fermented *Afzelia africana* leaves varied with those of Gupta, Kakshmi, Manjunalaa and Prakash (2005), especially in the oxalate. Fermented *Afzelia africana* tannins was lower than in most fresh green leafy vegetables. The values ranged from 61-205mg/100g. The choice to consume tender *Afzelia africana* leaves reduces anti-nutrient which are higher in older plants. Heaney, Weaver and Fitzsimons (1991) observed that phytate in foods affects mineral absorption, especially intrinsic calcium due to low normal phytase activity. Seven-day fermentation produces higher phytate which was attributed to high fibre. Bruce, Rossender, Hallberg, Greemp and Sandberg attributed high fibre affects phytate and phosphate composition of bread from cereal fibre flour.

**Bioavailability studies**

Food intake: The high food intake for the group of rats fed the 4-day fermented *Afzelia africana* diet could be attributed to the release of desirable aromatic flavour during fermentation. Flavour is the greatest factor that influence food intake in both rat and man. The higher consumption of the 4-day fermented diet more than the other diets might be associated with flavour. Food intake is affected by many factors. Appearance, odour, taste, texture, temperature and other sensory properties of food determine palatability. The 4-day fermentation appeared to be the optimum time because the 4-day sample had much higher palatability than counterparts, as such, the rats consumed more of it. Fermentation of *Afzelia africana* leaves is traditionally for 4 days. The communities ferment *Afzelia africana* leaves for 4 days without knowing the nutritional implications. The 4-day fermentation period is most appropriate in rural areas. The high food intake of the rats supports this traditional method of fermentation to obtain the best food potentials of *Afzelia africana* leaves. The off-flavour for the 7-day fermented products might be associated with increased production of astringent compounds. Eka (1990) reported that fermentation of food samples beyond optimum conditions produced unacceptable products in cornstarch porridge and locust bean. Food intake is affected by many metabolic and physiological signals including those which arise from the ingestion of food and its nutrients (Grosvenor and Samoline, 2002).

Digestibility of food materials affects food intake in animal because food that has high satiety value tend to reduce food intake. Higher fibre and fat intake is known to reduce food intake. The major criteria for determination of the optimum period are the development of peculiar aroma in *Afzelia africana* leaves and increased tenderness of squeezed leaves. Combination of aroma and texture of the fermenting mass ensure its readiness. A 7-day fermentation has negative impact on food intake. Palatability is the major factor that influence food intake. The higher food intake or rats fed 4-day fermented diet ate more and maintained more body weight than those fed casein. This observation was associated with increased flavour, palatability and protein due to microflora enzyme hydrolysis and release of free and absorbable components during fermentation. Combination of aroma, texture and colour had strongest influence on food intake.

**N Intake**

The higher N intake of the rats fed the 4-day fermented *Afzelia africana* leave diet was due to its high palatability which influenced the rats to eat more. The higher N intake of the group of rats fed 4-day fermented *Afzelia africana* diet demonstrated that 4-day is optimum fermentation period for microflora proteolytic enzymes to hydrolyze *Afzelia africana* protein to increase its bioavailability. The 4-day fermentation results agreed with the method of processing *Afzelia africana* leaves in Idemili North Local Government Area. The higher N digestibility (0.94g) of the same group of rats was solely due to very low faecal N excretion (0.04g). The higher retained N, biological values as well as net protein utilization were attributed to high N intake and low faecal and urinary N excretion. The higher food and N intake, retained and digested N, biological value and net protein utilization that plant protein mixture could be equal to or higher than that of casein, in this work, if properly processed and prepared for consumption.

**Faecal and urinary N and biological value**

The lower faecal and urinary N excretion of rats fed fermented *Afzelia africana* diets indicated its high digestibility and retention. It is known that protein that has lower faecal and urinary N output has high digested and retained N. Equally, the higher biological value and net protein utilization of the group of rats fed *Afzelia africana* diets indicates that protein tends to be higher than those of rats fed casein (control). This observation is not a surprise because it is known that when plant protein is properly processed and utilized as source of protein, its protein might be equal to or higher than those of animal sources.

**Mineral bioavaliblity**

Iron absorption is often enhance by other components of the diet such as vitamin C, and antinutrients such phytate, calcium, and iron binding phenolic compounds inhits their absortion (FAO/WHO, 2002).Moreover, many have studied the iron-zinc

interference in human-nutrition. In the present study, the interaction might have contributed to the observed higher retained zinc (1.33mg) when compared with iron (0.59mg).

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# Nutrient assessment of processed rice (*Oryza sativa*), Soybean (*Glycine max* Merr) flours/ groundnut (*Arachis hypogea*) paste and sensory attributes of their composites)

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**Abstract:** This work was carried out to determine the nutrient composition of soaked/dehulled/fermented rice, soybean and groundnut, and the sensory attributes of their blends. Rice (*Oryza sativa*); soybean (*Glycine max*. Merr) and groundnut (*Arachis hypogea*) were purchased from Nsukka in Enugu State, Nigeria. Local rice was washed, soaked for 3h and sundried and toasted. Soybean was blanched, fermented for 24h and dehulled, sundried and toasted. These foods were separately milled into fine flour. Shelled raw groundnut was blanched, roasted, dehulled and milled to obtain its paste. The treated samples were separately analysed for proximate and mineral composition using standard assay techniques. Blends of these samples were produced to provide 16g Nitrogen (N)/ 1000g cookies. These composites were used to prepare cookies. Wheat flour based cookies served as the control. Data generated were statistically analysed with standard analytical methods to separate mean differences. The proximate values for soybeans and groundnut showed similarity in crude protein (22 vs 23%, respectively) and crude fibre (3.73 vs 3.22%, respectively). They differed widely in fat (19.3 vs 49.8% respectively) and carbohydrate (45.5 vs 19.3% respectively). The rice flour showed the least values in protein and fat but higher value (72.9%) in carbohydrate than soybean and groundnut. In mineral analysis, the values for phosphorus, zinc and copper were comparable in the samples. Soybean and groundnut showed superior values in calcium (65 and 56mg/100g, respectively) to rice (22.4mg/100g). However, rice contain appreciably more iron (7.23mg/100g) than both soybean and groundnut (1.25 and 0.16mg/100g). Sensory evaluation showed that control had better acceptability when compared with the other cookies. However, the test cookies had good acceptability (rice/groundnut – 7.18 and rice/soybean – 6.43). their differences were not significant (P>0.05).

## Introduction

Snacks could be fun to eat but most of it are of low nutritive value. If they are taken in large quantities can suppress the appetite for the actual meal in the day. For this reason Somchai, Duangchan and Tavidsa (2000) stated that snack with high protein and high fiber should be developed as a supplementary diet. However, these snacks should be produced and sold at a reasonable price. Snack foods such as biscuits, cookies and crackers receive less attention than bread; however they offer several important advantages including: wide consumption, relatively long shelf life, good eating quality, highly palatable and acceptable in most countries and can be modified to suit specific nutritional needs of any target population (Elkhalifa & El-Tiny, 2002). These characteristics make protein rich biscuits attractive for target areas especially School Feeding Programmes (Ibrahim, 2009).

Cookies are snacks which are widely consumed all over the world especially by children. Okpala and Ekwe (2013) stated that wheat flour which is used to produce cookies is unavailable in many regions of the world resulting in importation of flour by regions with limited supplies. There is therefore a compelling need to develop an adequate substitute for wheat flour. Composite flour can be defined as a mixture of several flours obtained from roots and tubers, cereals, legumes etc. with or without the addition of wheat flour (Adeyemi & Ogazi, 1985). Composite flours have been used extensively in the production of baked goods. In fact, several

attempts have been made to produce cookies from different types of composite flours (McWatters, Ouedraogo, Resurreccion, Hung, & Phillips, 2003; Nwabueze & Atuonwu, 2007; Okpala & Chinyelu, 2011). In countries, including Nigeria where malnutrition poses a serious problem especially among children, composite flours which have better nutritional quality would be highly desirable.

Proteins in human diets are gotten from several sources that include cereals, vegetables, root crops, legumes, meat, egg, milk and fish. Of all these, sources from animals are regarded as the best because of its amino acid content (Alabi & Anuonye, 2007). However, the cost of animal protein is increasing on daily basis, thus making it unavailable for most people in developing countries like Nigeria. This unavailability has given rise to other alternative protein sources.

Soybean is considered as a cheap source of protein. The protein quality of soybean is deficient in some essential amino acids (methionine + cystine) but is rich in essential amino acids (lysine) (Dhingra & Jood, 2000). Its protein quality can be improved by fortification with the protein source from cereals such as rice which are rich in methionine and cystine but deficient in lysine (Keregero & Mtebe, 1994).

## Materials and Methods

### Materials and sources

Rice, groundnut, soybean, wheat flour, eggs, and flavourings used for this study were purchased from local retailers in Nsukka main market in Enugu State, Nigeria.

The thrust of this work was therefore to produce cookies with adequate protein value from locally cultivates and therefore, cheap crops. This is proposed to be part of nutrition intervention for snack-consuming population especially children.

## Methods

### Sample preparation

(These samples were processed during dry season)

*Processing of rice* – Ten kilogram of local rice grains (*Oryza sativa*) were sorted to remove debris and coloured grains, and washed repeatedly to remove dust. The grains were soaked in cold clean tap water in the ratio of 1:3 (grain to water) for 3 hours. Thereafter, the soaking water was drained out and the grains were spread out thinly for a 24h-sundrying at a temperature of about $30^{o}C$. The grains were milled into flour, sieved (70 mesh screen) and packaged in labeled air-tight polythene bag for use.

***Processing of groundnut*** – Five kilogram of raw groundnut (*Arachis hypogea*) was sorted to remove spoilt groundnut and other unwanted materials. The nuts were blanched for 3 minutes with boiling clean tap water and drained completely. Thereafter, they were toasted (clean white sand was the medium) under moderate temperature (to avoid charring) until they were light brown. They are cooled, dehulled manually by rubbing them between palms, winnowed and ground to obtain a straw-coloured paste-like food product "peanut butter". The product was packaged in coloured glass container with tight lid.

***Processing of soybean*** – Five kilograms of soybean (*Glycine max*. Merr) was sorted to remove spoilt grains, stones and other debris. The grains were parboiled for 30 minutes. The boiling water was drained out, and the grains steeped in clean tap water in a ratio 1:3 (grain-to-water) for a 24h fermentation. Thereafter, the grains were washed, dehulled, thinly spread out and sun-dried for 24h at a temperature of about $30^{o}$C. After sun-drying, they were roasted under moderate heat to obtain light brown coloured grains. The brown grains were milled, sieved (76 mesh screen), and packaged for use.

**Product development:** The flours were blended (at 10% protein level) in the ratio of 60:40 (cereal to legume) to obtain two blends, namely, rice/ groundnut and rice/soybean. The composite flour was used to prepare cookies. The following ingredients were used together with 400g of the respective composite flour to prepare the cookies. Margarine (250g); sugar (160g); liquid vanilla flavor (5ml); baking powder (2.5g); salt (2.5g); and eggs (2 medium). Cookies prepared with 100% wheat flour instead of the composite flour served as the control.

**Chemical analysis**

The moisture, ash, fat, protein and crude fibre content of the flours/ paste were determined using AOAC (2005) methods. Carbohydrate content was obtained by difference. AOAC (2005) was also used to determine mineral values.

**Sensory evaluation:** Fifty-two judges made up of final year and post-graduate students of the Department of Home Science, Nutrition and Dietetics of the University of Nigeria, Nsukka, Nigeria were selected. The selection was based on their previous experience, knowledge and exposure to sensory evaluation of foods.

A 9-point hedonic scoring instrument was developed for this study. It included test for appearance (colour), texture, flavor, taste and general acceptability. For colour, texture, flavor and taste, nine degrees of likeness were recorded under the following options: (a) Like extremely (b) Like very much (c) Like moderately (d) Like slightly (e) Neither like nor dislike (f) Dislike slightly (g) Dislike moderately (h) Dislike very much (i) Dislike extremely. In the case of general acceptability, the options were (a) I will eat this at every opportunity (b) I will

eat this often (c) I will eat this occasionally (d) I will eat this sparingly (e) I will eat this when available (f) I don't this but would manage it (g) I would hardly ever eat this (h) I would only eat this if I were forced (i) On no account would I eat this.

For analysis, the score of nine (9) was assigned to the highest degree of likeness and one (1) to the least acceptable on the hedonic instrument.

**Statistical analysis**

All chemical analysis on the sample were done in triplicates. Means, standard deviation, standard error of the mean, percentages, analysis of variance (ANOVA) of one way classification to compare means, and Duncan's new multiple range test (Steal and Torrie, 1960) were statistical tools used to analyse will data generated from chemical analysis and sensory evaluation.

Table 1: Proximate and energy composition of processed rice, soybeans flours and groundnut paste (%)

| Food | Moisture% | Protein % | Fat % | Ash % | Crude Fibre % | CHO % | Energy (Kj) |
|------|-----------|-----------|-------|-------|---------------|-------|-------------|
| Rice (*Oryza sativa*) | 9.33±0.3 | 8.92±0.01 | 0.99±0.00 | 3.28±0.00 | 72.91±0.02 | 72.91±0.02 | 1405.44 |
| Soybean (*Glycine max* Merr.) | 5.33±0.04 | 22.44±0.04 | 19.30±0.05 | 3.65±0.05 | 3.73±0.02 | 45.55±0.06 | 1904.66 |
| Groundnut (*Arachis hypogea*) | 2.06±0.02 | 23.20±0.05 | 49.85±0.08 | 2.35±0.08 | 3.22±0.02 | 19.32±0.07 | 2586.29 |

Mean±SD of three determination
*CHO = carbohydrate
Kj = kilojoule

Table 1 shows the proximate and energy content of the processed rice, soybean and groundnut. The moisture content of the samples differed. It ranged from 2.06 to 9.33%. Rice flour had the highest moisture (19.33%) and groundnut the least (2.06%). Groundnut and soybean flour had comparable protein (23.22 and 22.44%, respectively). The fat values differed widely with groundnut having the highest value (49.85%) followed by soybean (19.30%) and the leaf being rice flour (0.99%). There was slight variation in ash values and it ranged from 19.32 to 72.91%. Rice flour had the highest carbohydrate value of 72.91% followed by soybean 45.55%. Nevertheless, groundnut had the highest energy value (2,586.29Kj).

Table2: Mineral content of rice, soybean flour and groundnut paste (mg/100g).

| Food | Ca | Fe | P | Zn | Cu |
|---|---|---|---|---|---|
| Rice (*Oryza sativa*) | 22.40±0.02 | 7.23±0.04 | 317.40±0.47 | 2.44±0.02 | 0.003±0.00 |
| Soybean (*Glycine max* Merr.) | 65.00±0.02 | 1.25±0.01 | 388.40±1.47 | 2.55±0.02 | 0.003±0.00 |
| Groundnut (*Arachis hypogea*) | 56.08± | 0.16±0.00 | 354.60±3.29 | 2.38±0.02 | 0.003±0.00 |

Mean±SD of three determination

There was variation in the calcium values. The range was 22.40 to 65.00mg/100g. Soybean had the highest value (65.00mg/100g) followed by groundnut (56.08mg/100g). The iron level in the rice flour was the highest (7.23mg/100g) while soybean and groundnut had 1.25 and 0.16mg/100g, respectively. The samples recorded slight variations in phosphorus values (354.60 to 371.40mg/100g) and in zinc (2.38 to 2.55mg/100g) and the copper values were similar (0.003mg/100g)

Table 3: Sensory evaluation of cookies produced from blends of rice (*Oryza sativa*), groundnut (*Arachis hypogea*), and soybean (*Glycine max*. Merr) flours.

| Cookies | Colour/appearance | Flavor | Taste | Texture | GA |
|---|---|---|---|---|---|
| RC:GR | 7.18±0.24[b] | 6.59±0.29[c] | 6.67±0.26[b] | 6.92±0.23[b] | 7.18±0.23[b] |
| RC:SY | 6.43±0.23[c] | 7.05±0.24[b] | 6.57±0.24[b] | 6.54±0.26[b] | 6.43±0.23[c] |
| WHEAT | 8.00±0.15[a] | 7.93±0.14[a] | 7.74±0.22[a] | 8.00±0.14[a] | 8.00±0.15[a] |

Mean±SD of three determination
GA* - General Acceptabililty
RC:GR – Rice: Groundnut cookie (60:40 – protein basis)
RC:SY – Rice: Soybean cookie (60:40 – protein basis)
WHEAT – Wheat flour cookie (control)

Table 3 shows the sensory attributes of cookies produced from blends of rice, groundnut and soybean. In all the attributes, the control showed superior values that the test samples. In colour attributes, they differed significantly ($P<0.05$). The control had the highest score (8.00) followed by RC:GR blend (7.18) and the least RC:SY (6.43). There were also differences in flavor. RC:SY had better flavor than RC:GR ($P<0.05$). However, there were no significant difference between RC:GR and RC:SY in terms of taste and texture ($P>0.05$). Differences existed significantly ($P<0.05$) in their general acceptability. The control was the most preferred (8.00) compared with RC:GR (7.18) and RC:SY (6.43). Nevertheless, the scores for the test samples in terms of acceptability were more than 5, indicating acceptability.

**Discussion**

The low moisture content for processed rice, soybeans flours and groundnut paste has nutritional implications. This could be so due to processing methods the samples were exposed to. It is known that the lower the moisture content of a given food the higher would be the keeping quality and shelf life (Bothast, Anderson, Warner & Kwolek, 1991). Groundnut and Soybean had more protein than rice. This is expected because

legumes are generally richer in protein than cereals. The high values for protein, fat and ash (22.44%, 19.4% and 3.65%) in soybean supports the findings of Ugwuona *et al.* (2012) who reported that fermentation increased protein, fat, ash and calcium and phosphorus content but decreased crude fibre and total carbohydrate. This could also be attributed to increased phytase activities which resulted in the release of soluble protein and minerals. Groundnut paste had a high fat content (49.85%). This is beneficial as it improves the satiety quality of the cookies. The high total carbohydrate of rice flour is expected. Cereals store starch as source of energy and are low in protein, fat and ash. Ugwuona, Ogara and Awogbena (2012) reported similar observation.

There was a higher observed value for minerals in soybean flour and groundnut paste than in processed rice flour. The high calcium, iron and zinc content of the flours have nutrition implications. Minerals are essential in human diets. Calcium is needed for bone and teeth formation; it is also required for clotting of blood and control of fluid movement through the cell membrane. Iron is a component of haemoglobin which carries oxygen and is related to the rate of growth and to blood loss or gain. The high values for iron and zinc in the food samples might be due to their release from organic complex during fermentation. According to Reddy and Love (1991) fermentation increases the bioavailability of minerals such as iron, zinc, calcium and other minerals that would have been chelated and made unavailable. Adul and Yu (2000) reported that fermentation and roasting reduced dietary bulk and increased nutrient availability, shelf life and safety of local staples.

The texture, colour and appearance, taste and general acceptability were much more acceptable compared to the control. However the control had a superior acceptability than the text samples. RY:SY had better flavor than RC:GR (P<0.05), this could be due to the effect of fermentation on soybean. The decrease in overall acceptability was due to decrease in color, flavor, taste, texture and crispness scores. These results were in close agreement with those of observed in earlier studies (Pasha, Butt, Anjum & Shahzadi, 2002; Butt, Sharif, Nasir, Iftikhar &Rehman, 2004; Sharif, Butt, & Huma, 2005). Cookies are considered better for supplemented flours due to their wide consumption, relatively long shelf-life, ready-to-eat form and excellent eating quality (Tsen, Peters, Schaffer & Hoover 1973). Cookies with high sensoric attributes have been produced from blends of millet/pigeon pea flour (Eneche, 1999), raw rice and wheat (Singh *et al*., 1989), blackgram and wheat (Singh, Bajaj, Kaur, Sharma & Sidhu, 1993), chickpea and wheat (Singh, Harinder, Sekhon, Kaur, 1991), wheat, fonio and cowpea (McWatters, *et al.*, 2003) and soybean, chickpea or lupine with wheat (Hegazy and Faheid, 1990).

## Conclusion

From this work it was concluded that replacement of wheat flour with rice flour is possible without adversely affecting the sensory properties of cookies. Rice flour supplementation significantly improved the mineral, protein content and dietary fibre of the cookies.

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# Continuous Hydrogen Production by Dark Fermentative Process in a Big Lab Scale

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*Abstract-* Noting that most of investigations about hydrogen production were done in a small bioreactor volume (from few milliliters – 5 liter) the aim of this investigation was to observe possibility of biological hydrogen production in a continuous culture in a big lab scale with volume of 25 liter. First task of investigation was to design and set up of bioreactor for continuous biological hydrogen production. The bacterial culture used was cultivated in a batch reactor from identified bacterial mixture taken from sludge of plant wastewater treatment. Cultivation was done under anaerobic condition. Synthetic minimal medium was used as a feeding, which contained 5 gram of glucose per liter. The current investigation demonstrates the possibility of hydrogen production by dark fermentative processes in a big lab scale.

*Index Terms*- hydrogen production, big lab scale, mixed bacterial culture, continuous culture, dark fermentative processes.

## I. INTRODUCTION

Elementary conditions for life in earth such as concentration of $CO_2$ and $O_2$ in atmosphere, thickness of ozone layer in stratosphere and climatic temperature results from ecosystem balance established from accumulation of life activity for many thousands and millions of years.

Burning of fossil fuels such as oil and coal results in increasing of $CO_2$ level in atmosphere. This atmospheric pollution is not only unhealthy but it might cause significant climate change globally. Concerns about global warming have increased interest in hydrogen as a fuel. Also during the energy crisis of the 1970s, hydrogen was touted as the ''fuel of the future''. (Benemann, 1996).

Hydrogen is the most plentiful element in the universe, making up about three-quarters of all the matter. The atmosphere contains about 0.07% hydrogen, while the earth's surface contains about 0,14% hydrogen. The main product of its combustion is water, thus hydrogen is regarded as a clean non-polluting fuel. As compared to other gaseous fuels, hydrogen is harmless to human and the environment (Das and Veziroglu, 2001).

One attractive way to produce hydrogen is biological production, and it can be done through either by dark fermentation of low cost substrate from waste or by photo processes through photolysis by splitting water. However, production of $H_2$ by dark fermentative processes is technically much simple than photo processes. The dark processes generate hydrogen from a large number of carbohydrates frequently obtained as refuse or waste products (Nandi and Sengupta, 1998).

Biological process for hydrogen production is very complex and the most important factors that influence process are: pH, temperature, type of substrate, bacterial culture and partial pressure of hydrogen.

As far as substrates are concerned, current hydrogen studies mainly focus on household solid waste or pure substrate, like glucose. One difficulty related to these waste types is that they contain ligninocellulosic material. Lignin is non-biodegradable and strongly hampers the utilization of cellulose and hemicelluloses under anaerobic conditions. Lignin is often inhibitory to microbial growth (Reith et al., 2003).

Conversion of waste to hydrogen has the environmental advantage because it contributes to decreasing of amount of waste. However, it is still too early to predict which of the many possibilities will be ultimately successful, or how they would appear in practice – as large-scale production process or roof-top conversion devices (Benemann, 2001).

## II. MATERIALS AND METHODS

As bacterial culture was used sewage of sludge for methane fermentation taken from plant for waste water treatment. In Table 1 are given some physical-chemical parameters of sludge used for the current investigation.

Table 1: Physical-chemical parameters of sludge

| Physical-chemical parameters | Values |
|---|---|
| pH | 7.1 |
| Sasia e ujit ( % ) | 96.7 |
| Sasia e substances se thatw ( % ) | 3.5 |
| Sasia e substancws sw avulluar ( % ) | 55.3 |
| Sasia e substancws sw mbetur ( % ) | 44.7 |

Sewage sludge represents a naturally occurring mixed culture of microorganisms which are able to produce hydrogen by degradation of organic compounds (Mossophin, 2008).

In these mixed bacteria in adition to facultative anaerobic bacteria the strict anaerobic bacteria (methanogenic) were also present. These type of bacteria are very sensitive in presence of oxygen, therefore in order to avoid their growth, cultivation were done under forced aeration using an air pomp for few hours. For optimum growth of facultative anaerobic bacteria during cultivation, the pH was set to 7.

Minimal synthetic medium was used as substrate, which contained 5 gr/l of glucose, some mineral salts and trace elements. To amortize pH shifts which can occur because of formation of organic acids during fermentation, in working medium were added also some buffer. Chemical composition of medium is given in table 2.

Table 2: Chemical composition of medium

| Type of chemical substance | Amount (gr/l) |
|---|---|
| Glucose | 5 |
| $K_2HPO_4$ | 7 |
| $KH_2PO_4$ | 5 |
| NaCl | 2.5 |
| $MgSO_4 \times 7H_2O$ | 1 |
| $FeSO_4$ | 0.0022 |
| $CuSO_4$ | 0.00044 |
| $MnSO_4$ | 0.0014 |

While cultivation of microorganisms was done at pH 7, process of hydrogen production was done at pH 6 in temperature of 45-50°C. In case of pH oscillations, NaOH 30 % solution or H2SO4 20% solution was used to maintained pH.

**Reactor set up**

First task of investigation was to design and set up a reactor for continuous culture (chemostat) with a volume of 25 liters. Reactor was made up of stainless still and wrapped with thermal insulation. Constant temperature as an important parameter was maintained by a electrical heater, which is installed into the reactor. The pH was measured by a pH electrode which is inserted in reactor. The fed flow from reservoir to reactor was provided by a peristaltic pomp, and the constant liquid level in reactor was maintained by overflow of the effluent through a port on the upper side of the reactor. The schematic description of reactor for continuous culture, type of chemostat is presented in fig. 1.
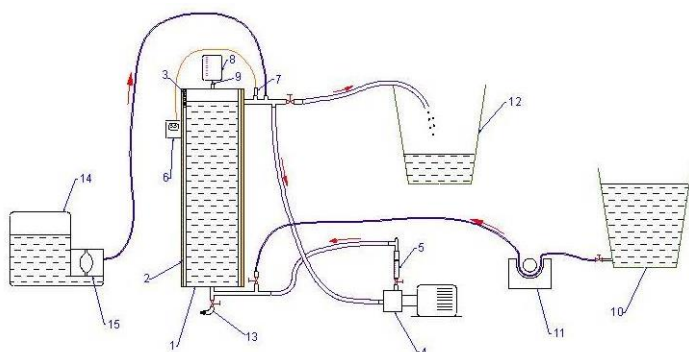


**Fig. 1: Schematic view of the reactor for the continual production of hydrogen,** 1-Bioreactor, 2-Thermal insulation, 3-Electrical heater, 4-Recirculation pump, 5-Liquid flow meter, 6-pH meter, 7-pH detection electrode, 8-Gas sumpling bag, 9-Reactor filling inlet, 10-Feeding reservoar, 11-Peristaltic pump, 12-Effluent collection reservuar, 13-Reactor descharch, NaOH container, 15-Dosier pH pump

**Gas analysis**

Produced gas was collected in plastic bag (PHYWE- Gotingen), its volume was 1.5 liter. Amount of hydrogen was measured by means of Drager sampling tubes.

### III.   RESULTS

Peristaltic pomp was switched after 24 hours means immediately after cultivation of microorganisms with dilution rate of 0.06 h$^{-1}$. In Fig. 2 it is shown that production of gas stared after 24 hour and it is stopped after 120 hours. At the same period of time, hydrogen is produced but its amount is small compared to the amount of gas (Fig. 3).
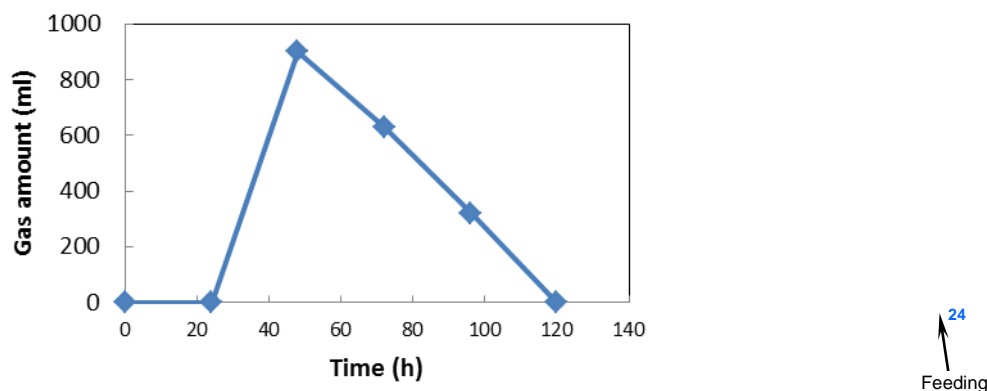


**Fig. 2: Gas productin in function of experiment duration time**
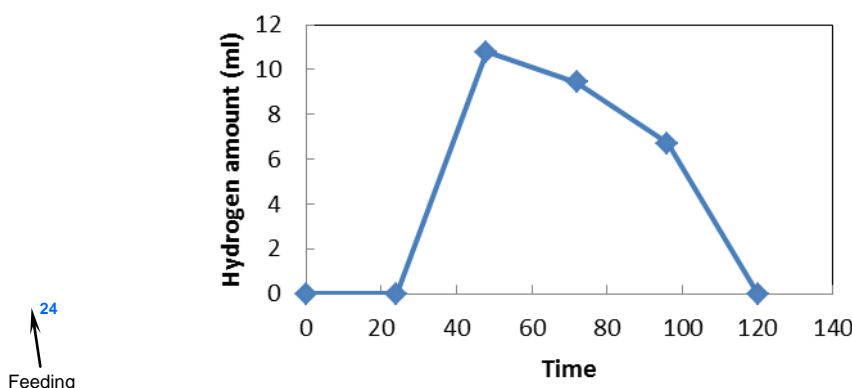
**Fig. 3: Hydrogen productin in function of experiment duration time**

The correlation between pH and hydrogen production as an important parameter influencing hydrogen production is presented in Fig. 4.
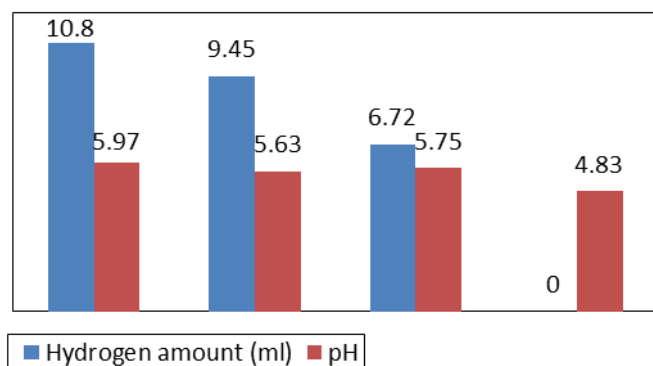


**Fig. 4: Correlation between hydrogen and pH value**

## IV.   DISCUSION

The aim of the present work was hydrogen production by dark fermentation process in continuous culture type of chemostat in a big lab scale in order to provide data for industrial hydrogen production plants.

Hydrogen production was investigated from many authors in batch or continuous culture. However in the current work as continual culture was used chemostat which may offer a significant increase in productivity over batch or fed-batch operation. Increased productivity is the result of reduced fermentor down time per unit of product manufactured (Herbert, Elsworth and Teilling, 1956)

One of the most important aspects of industrial microbiology and biotechnology is transfer of process from laboratory plants to industrial plants. This procedure goes to several steps, beginning from small laboratory vessel (few milliliters) till commercial reactor with volume of 10 000 – 50 000 liters. Understanding of difficulties of up-scaling process is especially important because microbial process do not develop equally in big reactor and small lab vessel.

Seeing from this aspect, current investigation is an attempt toward process commercialization.

The results of current work indicates that hydrogen can be produced in a big lab scale through dark fermentative process with mixed culture of microorganisms using glucose (5gr/l) as a substrate.

Biological hydrogen production is very complex and is influenced from many parameters one of the most studied parameter is pH. Results of many authors showed that maximal hydrogen production is achieved in pH 4-7 (Kumar and Dass, 1999; Tanisho, Suziki and Wakao, 1987)

Related to this in the present work, maximal hydrogen production is achieved in pH 5.97.

In the future focus should be on optimization of working parameters on order to achieve increased hydrogen production.

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# Design Tradeoff Analysis and Implementation of Digital Binary Adders Using Verilog

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**Abstract:** Hardware designs targeting communication and DSP applications consists of a large number of data path elements such as adders, multipliers, comparators, shifter etc. These elements are main contributors to the power consumption of digital circuits. At present, most of the popular hardware synthesis tools give higher priority to delay. So the synthesis tools tend to generate data path architecture for faster implementation.

An Adder is one of the key hardware blocks in most digital and high performance systems such as FIR filters, digital signal processors and microprocessors etc. With advances in technology, many researchers have tried and are trying to design Adders which offer either of the following- high speed, low power consumption, regularity of layout and hence less area or even combination of them in Adders. The delay of an adder circuit often determines the clock cycle time of a processor, especially if it falls in the critical path of the design. One of the primary causes, for the delay of an adder is the rippling nature of the carry. The key to fast addition is to compute carry bits for every bit position in parallel. Thus making them suitable for various high speed, low power, and compact VLSI implementations. However area and speed are two conflicting constraints. So improving speed results always in larger areas. So here we try to find out the best trade off solution among the both of them. Hence in this paper we have first tried to design different adders and then compare their speed and complexity of circuit i.e. the area occupied.

While comparing the adders we found out that Ripple Carry Adder had a smaller area while having lesser speed, in contrast to which Carry Select Adders are high speed but possess a larger area. And a Carry Look Ahead Adder is in between the spectrum having a proper tradeoff between time and area complexities. The result of our project helps us to make a proper choice of different adders in fabricating in different arithmetic units as well as making a choice among different adders in different digital applications according to requirements. All the programs and results have been given in the following sections. Further work on Low Power Techniques on different multipliers using these adders needs to be done in order to make us choose a proper multiplier in accordance with the requirements by making the best possible trade off choice between Speed and Power in different circumstances.

**Index Terms** – Binary Adders, Verilog, Xilinx ISE 12.1

## I. INTRODUCTION

Regarding the efficient implementation of an arithmetic unit, the binary adder structures become a very critical hardware unit. In any book on computer arithmetic, someone looks that there exists a large number of different circuit architectures with different performance characteristics and widely used in the practice. Although many researches dealing with the binary adder structures have been done, the studies based on their comparative performance analysis are only a few. In this project, qualitative evaluations of the classified binary adder architectures are given. Among the huge member of the adders we wrote Verilog code for Ripple-carry, Carry-select and Carry-look ahead along with one more adder that is Manchester carry adder to emphasize the common performance properties belong to their classes. In the following section, we give a brief description of the studied adder architectures.

With respect to asymptotic delay time and area complexity, the binary adder architectures can be categorized into four primary classes as given in
Table-1. The given results in the table are the highest exponent term of the exact formulas, very complex for the high bit lengths of the operands. The first class consists of the very slow ripple-carry adder with the smallest area. In the second class, the carry-skip, carry-select adders with multiple levels have small area requirements and shortened computation times. From the third class, the carry-look-ahead adder and from the fourth class, the parallel prefix adder represents the fastest addition schemes with the largest area complexities.

| Complex (A) | Delay (T) | Product (A*T) | Adder Class Schemes |
|---|---|---|---|
| $O(n)$ | $O(n)$ | $O(n2)$ | Ripple carry(1) |
| $O(n)$ | $O(n^{1/*1+1})$ | $O(n^{1+2/+1})$ | Carry select(2) |

| | | | Carry Skip(2) |
|---|---|---|---|
| O(n) | O(log n) | O(nlogn) | Carry look Ahead(3) |

**Table – 1          Categorization of addersw.r.t to
               delay time and class**

## II.   POWER CONSUMPTION IN CMOS CIRCUITS

Power has always been one of the foremost issues in system design. No matter what the design scale, there is a direct correspondence between power dissipation and performance/functionality, battery life, cost and size. A hand held device, for example, must be small. Similarly, a personal computer should be inexpensive; few are willing to pay for exotic cooling technologies. In fact, high performance processors have already reached the power density limit for cost effective cooling.

All these things limit the amount of power a processing chip can burn. Chip Power can be divided into two main components:
   a)   Dynamic power/Switching Power
   b)   Static Leakage Power

### a)  Dynamic Power

Dynamic power dissipation, ignoring short circuit current which is usually a small fraction of dynamic power is given by,

$$P = (1/2) CV f$$

Where,
C is the average total on chip capacitance switched per cycle.
f is the clock frequency and
V is the Supply Voltage.

### b)  Static Power

Static power dissipates when current flows through a transistor even when the transistor is off. The short circuit power is dissipated by a CMOS gate during a short period of time when both pull up and pull down networks conduct current. Static power is consumed even when chip is quiescent.
   1.   Rationed circuit's burn power in fight between ON transistors.
   2.   Leakage draws power from nominally OFF devices.

## III.   LOW POWER ADDER DESIGN

As we get closer to the limits of scaling in Complementary metal-oxide semiconductor (CMOS) circuits, power and heat dissipation issues are becoming more and more important. In recent years, the impact of pervasive computing and the internet have accelerated this trend. The applications for these domains are typically run on battery-powered embedded systems. The resultant constraints on the energy budget require design for power as well as design for performance at all layers of system design. Thus reducing power consumption is a key design goal for portable computing and communication devices that employ increasingly sophisticated and power hungry signal processing techniques. Flexibility is another critical requirement that mandates the use of programmable components like FPGAs in such devices.

The speed of addition is limited by the time required to propagate a carry through the adder in digital adders. The sum for each bit position in an elementary adder is generated sequentially only after the previous bit position has been summed and a carry propagated into the next position.

The CSA is used in many computational systems to alleviate the problem of carry propagation delay by independently generating multiple carries and then select a carry to generate the sum .In Carry select adder, blocks of bits are added in two ways: one assuming a carry-in of 0 and the other with a carry-in of 1.This results in two pre- computed sum and carry-out signal pairs. The correct output is selected based on the original carry-in. Generally multiplexers are used to propagate carries.

The RCA uses multiple full adders to perform addition operation. Each full adder inputs a carry-in, which is the carry-out of the proceeding adder. This selects the corresponding sum bit from the next block of data.

However, the CSA is not area efficient because it uses multiple pairs of Ripple Carry Adders to generate partial sum and carry by considering carry input Cin=0 and Cin=1, then the final sum and carry are selected by the multiplexers.

Thus, the carry select adder achieves higher speed of operation at the cost of increased number of devices used in the circuit. This in turn increases the area and power consumed by the circuits of this type of structure. Demands of low power devices growth of battery powered systems, Mobility, Portability, Reliability and Cost, Environmental effects.

## Ripple Carry Adders (RCA)

The well-known adder architecture, ripple carry adder is composed of cascaded full adders for n-bit adder, as shown in figure-1. It is constructed by cascading full adder blocks in series. The carry out of one stage is fed directly to the carry-in of the next stage. For an n-bit parallel adder it requires n full adders.

   i.     Not very efficient when large number bit numbers are used.

   ii.    Delay increases linearly with bit length.

**Logic Equations:**

$$g_i = a_i\,b_i$$
$$p = a_i \text{ xor } b_i$$
$$C_{i+1} = g_i + p_i c_i$$
$$S_i = p_i \text{ xor } c_i$$
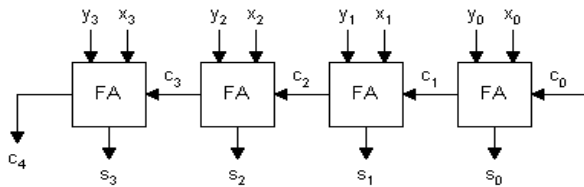


**Figure – 1**       *Parallel adder, A 4 bit Ripple Carry Adder*

## Carry Select Adders (CSA)

In Carry select adder scheme, blocks of bits are added in two ways: one assuming a carry-in of 0 and the other with a carry-in of 1.This results in two precomputed sum and carry-out signal pairs (s0i-1:k , c0i ; s1i-1:k , c1i) , later as the block's true carry-in (ck) becomes known, the correct signal pairs are selected. Generally multiplexers are used to propagate carries.

   i.Because of multiplexers larger area is required.

   ii.Have a lesser delay than Ripple Carry Adders (half delay of RCA).

   iii.Hence we always go for Carry Select Adder while working with smaller no of bits.

**Logic Equations:**

$$S_{i\text{-}1:k} = C_k\,S^{0}_{i\text{-}1:K} + C_k\,S^{1}_{i\text{-}1:K} \quad C_i = C_k\,C^{0}_{i} + C_k\,C^{1}_{i}$$
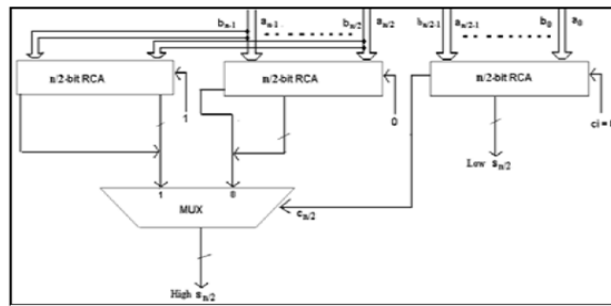
**Figure – 2          n-bit** *Carry Select Adder*

# Carry Look Ahead Adders (CLA)

Carry Look Ahead Adder can produce carries faster due to carry bits generated in parallel by an additional circuitry whenever inputs change. This technique uses carry bypass logic to speed up the carry propagation.

**Logic equations:**

The Propagate P and generate G in a full-adder, is given as:

> *Pi = Ai Bi Carry propagate*
> *Gi = AiBi Carry generate*

Notices that both propagate and generate signals depend only on the input bits and thus will be valid after one gate delay. The new expressions for the output sum and the carryout are given by:

> *Si = Pi Ci-1*
> *Ci+1= Gi + PiCi*

These equations show that a carry signal will be generated in two cases:
1) If both bits Ai and Bi are 1
2) If either Ai or Bi is 1 and the carry-in Ci is 1.
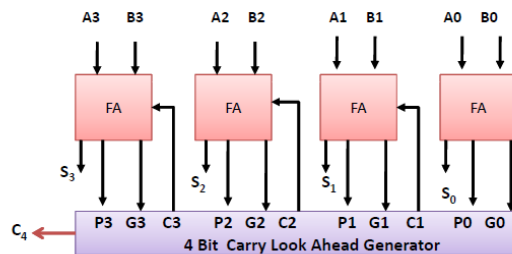


**Figure – 3          4 bit** *Carry Look Ahead Adder*

# MANCHESTER ADDER

The propagation time, when calculating the sum of two binary strings *A* and *B* using any generic parallel adder, can be speed up significantly if we utilize a **Manchester cell** in the design of that particular adder.

**Generation and Propagation**
Here we provide a brief summary of the underlying mechanics behind the decision to propagate or generate a carry out (refer to *carry skip mechanics* for a thorough explanation)

**Boolean Equations:**

**Gi = Ai⊕ Bi**        -- carry generate of ith stage
**Pi = Ai⊕ Bi**        -- carry propagate of ith stage
**Si = Pi ⊕Ci**        -- sum of ith stage
**Ci+1 = Gi + PiCi**-- carry out of ith stage

The condition for a carry generate (generation of a new carry) to occur at any stage of the addition is *Ai = Bi* making the carry out, *Ci+1*, depends solely on *Gi* (i.e. *Ci+1 = Gi*). A carry propagate, on the other hand, has the requirement that *Ai Bi*, hence producing *Ci+1 = Ci*.



**Figure – 4          4-bit Machester carry section**
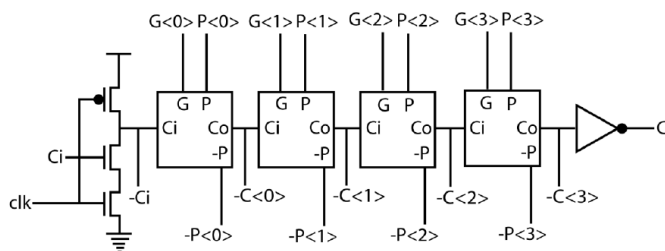
## IV.   PRACTICAL IMPLEMENTATION

Using Verilog programming language and Xilinx ISE 12.1 as synthesis tool we have implemented the  adders mentioned above for different word length and then generated synthesis report for comparing delay & device utilization of different adders.

## V.   RESULTS

| ADDERS | NUMBER OF SLICES | NUMBER OF 4 I/P LUTS |
|---|---|---|
| 4 bit Ripple carry Adder | 4 | 8 |
| 8 bit Ripple carry Adder | 9 | 16 |
| 4 bit Carry look ahead adder | 7 | 13 |
| 16 bit Carry look ahead adder | 19 | 33 |
| 4 bit Carry select adder | 6 | 11 |
| 16 bit Carry select adder | 29 | 34 |
| 4 bit Manchester adder | 1 | 1 |
| 16 bit Manchester adder | 18 | 32 |

**Table –2    Device utilization comparison of Adders**
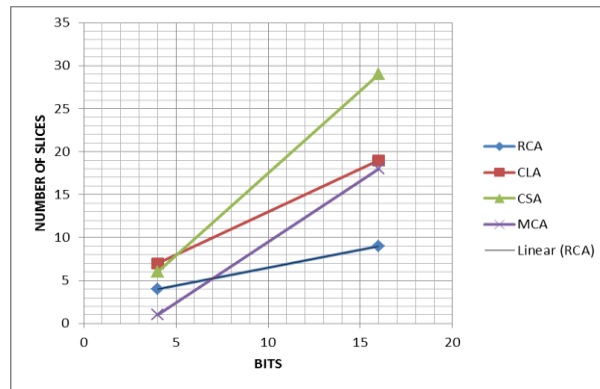
**Figure – 5**  *Comparison of utilization of number of*

*Slices*
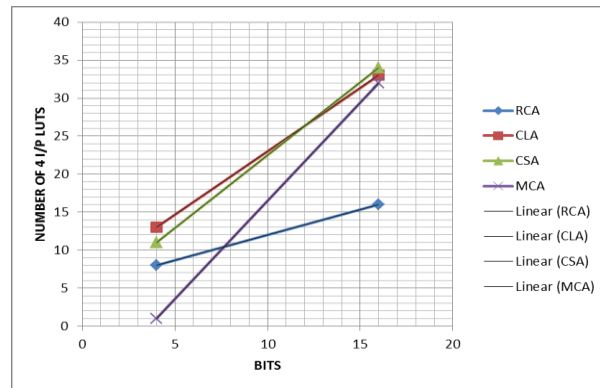


**Figure – 6**  *Comparison of utilization of number of 4*

*i/p LUTS*

| ADDERS | Logic Level | Delay (in ns) |
|---|---|---|
| 4 bit Ripple carry Adder | 6 | 5.959 |
| 8 bit Ripple carry Adder | 10 | 13.203 |
| 4 bit Carry look ahead adder | 5 | 7.962 |
| 16 bit Carry look ahead adder | 17 | 20.388 |
| 4 bit Carry select adder | 6 | 8.580 |
| 16 bit Carry select adder | 11 | 14.725 |
| 4 bit Manchester adder | 3 | 5.895 |
| 16 bit Manchester adder | 18 | 21.690 |

**Table –3     Delay comparison of Adders**
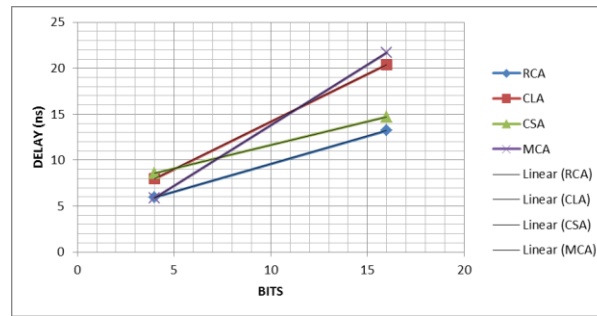
**Figure – 7** *Comparison of delay*

## VI.    CONCLUSION

We studied about different adders theoretically as well as practically and by implementation and among compared them by different criteria like Area, Delay and then Area-Delay Product etc. so that we can judge to know which adder was best suited for situation. Comparing the performance metrics of adders for different word lengths using Verilog and Xilinx as synthesis tools, and the tradeoffs becomes apparent. As can be seen there exist an inverse relationship between time delays, operating speed, and circuit area, in this case the number of slices / LUT (measure of the area). The ripple carry adder, the most basic of flavors, is at the one extreme of this spectrum with the least amount of LUTs but the highest delay. The carry select adder on the other hand, is at the opposite corner since it has the lowest delay (half that of the ripple carry's) but with a larger area required to compensate for this time gain. Finally, the carry look-ahead is middle ground. Along with that another adder which is Manchester adder can be used for designing of larger adder designs by slight modification in its architecture thus all we came to a conclusion that Carry Select Adders are best suited for situations where Speed is the only criteria. Similarly Ripple Carry Adders are best suited for Low Power Applications. But Among all the Carry Look Ahead Adder had the least Area-Delay product that tells us that, it is suitable for situations where both low power and fastness are a criteria such that we need a proper balance between both as is the case with our research.

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# Ethnomedicinal Plants Diversity of Bhadrawati Tahsil of Chandrapur District, Maharashtra, India

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*Abstract-* The present study deals with ethnomedicinal plants use by the people of Bhadrawati tahsil of District Chandrapur (M.S.), India. The people from these region with a vast heritage of diverse ethnic culture and rich biodiversity is said to be a great emporium of ethnobotanical health. The use of plants as medicine antedates history. All most all civilization and culture have employed plants in the treatment of human sickness. Bhadrawati is surrounded by dense forest and the people collect the medicinal plant by their traditional knowledge which is used for some common diseases. But due to deforestation, loss of biodiversity and indiscriminate exploitation of wild and natural resources many valuable herbs are at the stage of extinction. The present survey was conducted for documented of traditional knowledge and practices of plants. The present paper enumerates traditional uses of 62 different plant species.

*Index Terms*- Ethnomedicinal plants, Bhadrawati tahsil, Uses.

## I. INTRODUCTION

Ethnomedicinal plants, since times immemorial, have been used in virtually all cultures as a source of medicine. The widespread use of herbal remedies and healthcare reparations, as those described in ancient texts such as Vedas and the bible, and obtained from plants has been traced to the occurrence of natural products with medicinal properties. The plants have been the important source of medicines used by man from prehistoric times for relieving suffering and curing ailments. The need for the integration of local indigenous knowledge for a sustainable management and conservation of natural resources received more and more recognition (Posey, 1992). In India, it is reported that traditional healers use 2500 plant species and 100 species of plants serve as regular source of medicine (Pie, 2001).

The quest for documentation of traditional knowledge has been concentrated especially around traditional health practices. In India, many indigenous plants are used in herbal medicine to cure diseases and heal injuries. Tribal people have been in the practice of preserving a rich heritage of information on medicinal plants and their usage. They have both the know-how and do-how for preparing the medicine and its administration. If this information is yet to be collected systematically and comprehensively and maintained in databases in a manner they would help in protecting their knowledge. The objective of this study is to document the traditional medicinal plants used by the peoples of Bhadrawati tahsil of Chandrapur district (M.S.), India.

## II. MATERIAL AND METHODS

Bhadrawati is a tahsil place nearly 25 Km North of Chandrapur and 125 Km South East from Nagpur. It is situated at about 211m above the mean sea level and is at 20˚ 06' 35.67" N latitude and 79˚ 07' 7.33" E longitude. Bhadrawati is a historical place over by the sucessors of Wakatak, Gondraja and Raghuji Bhosale from Nagpur. Bhadrawati town has witnessed industrial growth during last decades and now is well known for the Ordanance Factory, Power Grid Corporation of India Ltd., Coal mines, Cement industry, Ceramic industry and many Bricks manufacturing units and Rice mills.

The traditional knowledge about the plants for treating the common diseases was collected from peoples, especially traditional healers and village medicine-men from January 2012 to December 2012. Monthly visit and interviews of local and tribal peoples of villages were carried out for gathering the information about the ethnomedicinal plants and documents their knowledge for future generation.

## III. RESULT AND DISCUSSION

The present study was primarily aimed to investigate the plants used by the local and tribal peoples of villages for their medicinal values. During the present investigation 62 different plants species used for a medicinal purposes by local and tribal peoples.

A brief information including botanical name, family, local name, parts used and their medicinal value by the peoples is given in Table No.1. The local people and the tribal villagers are using these plants to cure many diseases like Cough, Diarrhea, Dysentery, Wound healing, Diabetes, Jaundice, Sunstroke, Fever, Vomiting, Skin diseases, Fatigue, Blood purifier, Antipreganancy, Urinogenital disorder, Toothache, Menstrual disorder, Hypertension, Headache etc. They prepare the plant product as decoction, oral treatment, ointment etc. The parts of the plants used for medicinal purposes are root, stem, leaves, fruits or whole plant use as a medicine. The extracts and the paste are the two main methods for treatments of diseases.

The number of researcher work and studied on ethnomedicinal plants in Maharashtra and other states of India by Ahmed and Sinha, (2009); Ahmed and Perween, (2009); Prasad (2009); Borkar and Theng, (2010); Iqbal *et al.,*(2010); Ahir *el al.,* (2011), Borkar *et al.,* (2012); Zingare, (2012); Khonde *et al.,* (2012); Dhore *et al*., (2012); Zingare *et al.,* (2013); Shrirame and Hiwale, (2013); Watile, (2013); Wadekar *et al.,* (2013); Ghoshal and Saoji, (2013); Puranik, (2013); Gond, (2013) and Pocchi, (2013).

The ethnomedicinal plants are under threat due to deforestation, overgrazing and their neckless utilization. It indicates the urgent need of their conservation for sustainable development (Burlakoti and Kunwar, 2008; Kunwar and Dawadee, 2003). The local uses of plants as a cure are common particularly in those areas, which have little or non access to modern health services (Faulk, 1958), such as the innumerable villages and hamlets in India.

Due to commercial harvesting deforestation, uncontrolled grazing the medicinal plant diversity is being largely threatened and many species have come under critically endangered category. With the active support of local and villagers, importance of these economically important plants could be utilized for the benefits of our future generations. It is essential that ethnomedicinal investigation should persistently be carried on and efforts should be made for proper protection, cultivation and conservation of these precious medicinal plants in a large scales so that professional requirements can be fulfilled (Muller, 2003).

**Table 1: List of ethnomedicinal plants with their uses.**

| Sr. No. | Botanical Name with Family | Local Name | Patrs Used | Name of the Disease/Uses |
|---|---|---|---|---|
| 1 | *Adathoa vasica* Acanthaceae | Adulsa | Leaves, roots, flowers and stem bark | Cough and cold |
| 2 | *Mangifera indica* Anacardiaceae | Amba | Leaves, barks, fruitsand seeds | Diarrhea, Dysentery |
| 3 | *Phyllanthus emblica* Euphorbiaceae | Awala | Leaves, fruits and seeds | Vitamin deficiency |
| 4 | *Tamarandus indica* Caesalpiniaceae | Chinch | Fruits, seeds and roots | Scorpion bites |
| 5 | *Curcuma longa* Zinziberaceae | Haldi | Rhizomes | Antibacterial, Wound healing |
| 6 | *Sapindu emarginatus* Sapindaceae | Ritha | Bark, fruits and roots | Healthy hair, Antibacterial |
| 7 | *Cassia tora* Fabaceae | Tarota | Leaves | Diabetes |
| 8 | *Euphorbia geniculata* Euphorbiaceae | Dudhi | Aerial parts | Jaundice |
| 9 | *Tinospora cordifolia* Menispermaceae | Gulvel | Aerial parts | Flue |
| 10 | *Aegel marmelos* Rutaceae | Bel | Leaves, root and fruits | Anti-dysentery |
| 11 | *Punica granatum* Pinicaceae | Darimb | Fruits and bark | Anti-dysentery |
| 12 | *Semicarpus anacardium* Anacardiaceae | Biba | Fruits | Piles, worm |
| 13 | *Madhuca indica* Sapotaceae | Moha | Bark, heart-wood, fruits and seeds | Wounds |
| 14 | *Tectona grandis* Verbanaceae | Sagwan | Leaves and barks | Snake bite |
| 15 | *Butea monosperma* Fabaceae | Palas | Barks, leaves, fruits, seeds and gums | Diabetes |
| 16 | *Ficus bengalensis* Moraceae | Wad | Bark, leaves, fruits, seeds and latex | Anti-diabetic, wound |
| 17 | *Mimosa pudica* Mimociaceae | Lajalu | Whole plant | Stimulant |
| 18 | *Ficus religiosa* Moraceae | Pipal | Bark, leaves, fruits, seeds and latex | Treating skin disease |
| 19 | *Azadiracta indica* Meliaceae | Kadunimb | Bark, leaves, flowers and seeds | Antibacterial |
| 20 | *Zizyphus sp.* Rhamnaceae | Bor | Fruits | Vit-B |
| 21 | *Psidium guajava* Myrataceae | Jam | Leaves, fruits and root | Anti-diarrhea |

| 22 | *Terminalia arjuna* Combretaceae | Arjun | Bark | Diuretic, Cardio tonic |
| 23 | *Ricinus communis* Euphorbiaceae | Yerandi | Leaves and seeds | Anti swelling |
| 24 | *Centella asiatica* Simorouba excelsa | Bramhi | Whole plant | Memory stimulant |
| 25 | *Syzigium cumini* Myrataceae | Jambul | Bark, leaves and fruits | Diabetes, Acidity |
| 26 | *Murraya koienigii* Ruteaceae | Godnimb | Leaves | Stimulant, Digestive |
| 27 | *Acacia nilotica* Fabaceae | Babul | Pods, leaves, bark and gums | Dental use |
| 28 | *Ficus racemosa* Moraceae | Umbar | Fruits | Anthelmentic |
| 29 | *Annona squamosa* Annonaceae | Shitafal | Leaves, roots, fruits and seeds | Reducing weight |
| 30 | *Pongamia pinnata* Fabaceae | Karanj | Leaves, flowers, seeds and bark | Wound healing |
| 31 | *Cyanodon dactylon.* Poaceae | Harari | Leaves | Astringent |
| 32 | *Dendrocalamus strictus* Gamineae | Bambu | Culms | T.B., Cough |
| 33 | *Michelia champaca* Magnoliaceae | Chamapa | Leaves and flowers | Expectorant, Purgative |
| 34 | *Alstonea scholaris* Apocyanaceae | Saptparni | Leaves | Snake bite |
| 35 | *Pithocellobium dulce* Fabaceae | Vilayati chinch | Fruits | Antioxidant |
| 36 | *Vitex nigunda* Verbanaceae | Nirgudi | Flowers and roots | Anti-inflammatory Bone fracture |
| 37 | *Bahunia reacemosa* Leguminosae | Apta | Leaves | Wound healer |
| 38 | *Tridax procumbems* Asteraceae | Kambarmodi | Leaves | Kraking foot |
| 39 | *Feronia limonia* Moraceae | Kawath | Leaves and fruits | Shwet prader |
| 40 | *Nyctanthes arboritristis* Oleaceae | Parijat | Leaves, flowers and seeds | Rheumatism |
| 41 | *Vinca rosea* Apocynaceae | Sadafuli | Leaves and flowers | Leukemia |
| 42 | *Calatrophis procera* Asclepiadaceae | Rui | Whole plant | Cough |
| 43 | *Hibiscus cannabinus* Malvaceae | Ambadi | Leaves and fruits | Sunstroke |
| 44 | *Allium sativum* Liliaceae | Lasun | Bulbs | Cough |
| 45 | *Cymbopogon citrates* Poaceae | Gawti chaha | Whole plant | Cough |
| 46 | *Ocimum sanctum* Lamiaceae | Tulas | Whole plant | Fever |
| 47 | *Termanilia bellirica* Combretaceae | Behada | Bark and fruits | Vomiting, skin diseases |
| 48 | *Trapa natans* Trapaceae | Singada | Fruits | Diarrhea, dysentery, fatigue |
| 49 | *Momordica charantia* Cucurbitaceae | Karella | Fruits and seeds | Diabetes, blood purifier and antihelminthic |
| 50 | *Aloe vera* | Korphad | Leaves | Abortifacient |

| | | | | |
|---|---|---|---|---|
| | Liliaceae | | | |
| 51 | *Abrus precatorius* Fabaceae | Gunja | Roots | Scorpion bite, skin damage, swelling |
| 52 | *Argemone Mexicana* Papaveraceae | Dhatura | Leaves | Body heat |
| 53 | *Diospyros melanoxylon* Ebnaceae | Tendu | Fruits | Antipreganancy |
| 54 | *Acacia catechu* Mimosaceae | Khair | Pods, leaves, bark and gum | Urinogenital disorder, diarrhea, dysentery, toothache |
| 55 | *Catharanthus roseus* Apocynaceae | Jaganthi | Leaves and roots | Diabetics, menstrual disorder, hypertension |
| 56 | *Centella asiatica* Apiaceae | Bramhi | Whole plant | Measles, jaundice |
| 57 | *Chrysanthemum indicum* Asteraceae | Sevanthi | Flowers | Headache, hypertension |
| 58 | *Buchnania lanzan* Anacardiaceae | Char | Fruits | Cough,Skin diseases, Bronchitis, |
| 59 | *Diospyrous melanoxylon* Ebenaceae | Tembhurni | Fruits and seeds | Cough, Diabetes, Asthma, Blood purifier |
| 60 | *Manilkara hexandra* Rubiaceae | Khirani | Fruits | Arthritis, Blood purifier, Heat burning, Wormicide, Jaundice. |
| 61 | *Phoenix sylvestris* Palmae | Sindhi | Fruits | Piles, Arthritis, Headache, Fever, Tonic, Cold flu. |
| 62 | *Zizipus oenophelia* Rhamnaceae | Yeruni | Fruits and roots | Anthelmintic, Digestive, Antiseptic, Hyper acidity. |

**Fig. 1: Photographs of some ethnomedicinal plants in Bhadravati region**



*Adathoa vasica*



*Abrus precatorius*

*Annona squamosa*



*Termanilia arjuna*



*Azadirachta indica*



*Calotropis procera*

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# Biodiversity and seasonal abundance of Zooplankton and its relation to physico – chemical parameters of Jamunabundh, Bishnupur, India

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*Abstract*: Ponds are natural water sources that are used by man for various purposes. Zooplankton constitutes an important food item for fishes . Zooplankton also play an important role and serve as bioindicators as well as to assess the pollution status of water .In this present study, we tried to asses the zooplankton species richness, diversity and evenness and to state the condition of a freshwater tropical perennial pond , Jamunabundh, of Bishnupur Bankura. The plankton density and physicochemical parameters were recorded during the period of January 2012 to December 2012 . A total of 20 taxa were recorded in which 6 were rotifers , 3 copepoda , 4 cladocera , 3 of ostracoda and 4 larva and protozoa were recorded . Cladocera constituted the main dominant group in this pond contributing 45.2% of the total zooplanktons followed by Rotifera 43.3%, Copepoda 8.3% and Ostracoda 1.7% during January being 360 No/l and February being 347 No/l . Lowest density was observed during June and July 234 No/l and 246 No/l respectively. These data are in accordance with the negative significant correlation between Zooplankton and temperature $(r = -0.593)$ . Highest species diversity was observed during December, January and February being 2.96, 2.99 and 2.92 respectively. Highest evenness was also observed during January and February being 0.99 in both the months while the richness being 3.28,, 3.22 and 3.07 in these three months during December, January and February respectively.

**Index Term:** Jamunabundh, Perrenial pond; Physico-chemical characteristics of the water,. species diversity, richness.

## I. INTRODUCTION

Water is the prime necessity of life , without it , there would be no life. Most of the biological reactions uses water as the medium . So, the study of water bodies is equivalent to the study of life .Water is the habitat for a large number of aquatic organisms ranging from microscopic plankton to large aquatic animals and macrophytes. .But nowadays due to unplanned urbanisation, rapid industrialisation and unjustified use of chemical fertilisers in the fields is leading to the deterioration of the water quality both qualitatively and quantitatively and depleting the aquatic fauna (Sati and Paliwal, 2008). Moreover, there is a very close relationship between the metabolism of aquatic organisms and hydrobiological parameters in a freshwater body (Desmukh and Ambore , 2006).

The plankton community is a heterogenous group of tiny plants (phytoplankton) and animals (Zooplanktons) adapted to float in the sea and fresh waters. Their intrinsic movements are so feeble that they remain essentially at the mercy of every water current.

In freshwater ecosystem zooplanktonic organisms are important food sources for many aquatic animals specially fishes. The main for major carps like rui , catla and their hybrids were found to be plankton in origin ( Mozumder, P.K.and Naser,M.N., 2009) .

Zooplankton plays an important role in indicating the water quality, eutrophication status and productivity of a freshwater body. (Mikschi E, 1989). The planktons not only increases fish production but also helps in bioremediation of heavy metals and other toxic material. Plankton can also act as biomarker for water quality assessment for fish production (Arunava Pradhan, et al 2008) .

Thus, in order to find out the status of a freshwater body it is necessary to observe seasonal diversity and abundance of zooplankton . The present investigation is an attempt to study the biodiversity and seasonal abundance of zooplankton in a perennial freshwater pond , Jamunabundh of Bishnupur,West Bengal .

## II. STUDY AREA

The Jamunabundh is a major perennial pond of the Bankura district and located at Bishnupur which falls under latitude $23^o04'$ and longitude $87^o20'$. This 'bundh' had been artificially dug out by the rulers (Mallaraj) of this town to solve the problem of drinking , bathing and irrigation . This is a perennial pond with an average depth of about 25-30 feet.

## III. MATERIALS AND METHODS

Monthly zooplankton samples were obtained from each of these sites for the period January 2012 to December2012. Concurrently, water samples were taken for measuring selected physico-chemical variables. For zooplankton samples, we filtered 40 l of water using plankton net of 50 μm mesh size. Samples were collected from the surface (0.5 m) during the morning hours. Although we collected the samples for some months at fortnightly intervals, for presentation we pooled the data and expressed it on a monthly basis. Zooplankton samples were preserved in 10%formalin at the site itself.

At the time of sampling, we measured the surface water temperature and pH. A Celsius thermometer(scale ranging from 0℃ to 100℃) was used to measure surface water temperature. pH of water was measured directly in a digital electronic pH meter (Systronics,Model SYS - 335). Turbidity was measured with the help of a Turbiditmeter. Dissolved oxygen (DO), free carbon dioxide, total alkalinity, hardness and salinity was determined by titrimatric method (APHA, 2008).

For quantitative analysis, we counted the number of individuals for each species present in aliquot of 1ml from the concentrate (to 100 ml) of field collected zooplankton. The data were later converted to the actual quantity of water filtered from the lake. We used 3–4 aliquots for each sample. Density of zooplankton was expressed as number of individuals per liter.

## IV.  RESULT AND DISCUSSION

.  Eight physicochemical parameters were recorded from the study area during the study period.(**Table 1).**
In summer highest temperature was observed as $25^0C$ and lowest in the winter months $14^0C$. Water temperature in the range between $13.5^0C$ and $32^0C$ is found to be suitable for the development of the planktonic organisms (Kamat, 2000; Gaikwad et al., 2008). In this pond the zooplankton show negative correlation (-0.593) with the surface temperature of water  . Similar observation has been made by Ahmad et al,( 2012). **(Fig 1).**
Turbidity values ranges from 2.0 NTU in winter to 8.0 NTU, maximum in monsoon period. Water turbidity is negatively correlated (-.0551) wuith Zooplankton abundance in the study period.

pH   ranged from  6.5 in the month of july to 7.9 in the month of May . This high pH in summer may be due to low level of water and high photosynthesis of micro-,  macro - organism resulting in high production of free carbon dioxide which make the water a little alkaline (Trivedy, 1989; Shiddamallayya and Pratima, 2008). The pH range between 6.0 and 8.5 indicates medium productive nature of a reservoir.( Kurbatova,2005). Since the average value of pH is 7.1 the pond seems to be of medium productive in nature for Zooplankton production .

  Dissolved oxygen (DO) is very important aquatic parameter whose measurement is vital in the context of culture of any aquatic animal. Oxygen plays a crucial role in its life processes of all organisms. Dissolved oxygen ranges from 2.4mg/l during the post monsoon to 10.4 mg/l during the winter. This may be due to difference in water temperature. In high temperature the solubility of oxygen is lowered and also the organic substances are degraded. Concentration of D.O is inversely proportional to temperature at a given time.. DO value show significant the main dominant group in this pond contributing 45.2% of the total zooplankton followed by Rotifera 43.3%, Copepoda 8.3% and Ostracoda 1.7% **.(Fig2).**   A distinct seasonal fluctuations and composition of the zooplankton has been obseved in the Jamunabundh reservoir. It is productive during post monsoon and winter months (October to February), retardation during summer and monsoon months (March to September) . Highest density of Zooplankton were observed during January being 360 No/l and February being 347 No/l  . Lowest density was observed   during June and July 234 No/l and 246 No/l respectively.
Rotifera comprises of the second most abundant group of zooplankton The rotifera group was represented by 6 genera. The most dominant being *Brachionus sp.,* represented by 3 species viz., *Brachionus bidentata, B. qudridentata.and B. diversicornis.*  The others were*, Keratella tropica, Asplanchna* sp and *Filinia* sp..

positive correlation with zooplankton. Similar conclusion has been drawn by (Ahmad and Krishnamurthy, 1990; Singh and Singh, 1993)

 Free carbon dioxide is also one of the important factor in aquatic habitat. It is highly soluble in water and is the main source of carbon path way in the nature. Plants absorb the free carbon dioxide present in both atmosphere and water. Carbon dioxide in water bodies is contributed by the respiratory activity of animals. Carbon dioxide content ranges from 8mg/l to 20 mg/l. Carbon dioxide content of water has been found to be  negatively  correlated  (r= -0.385)     with  zooplankton abundance .

 Highest salinity 204 mg/l and lowest salinity 114 mg/l was observed. Salinity content of water has been found to be negatively correlated (r= -0.085) with zooplankton abundance.

Total alkalinity in the pond ranged from 22 mg/l to 68 mg/l. High alkalinity value was recorded during summer months, which is probably due to reduction of water. Such observation has been made by (Singh and saha ,1987). Alkalinity of water has been found to be positively correlated (r= 0.209) with zooplankton abundance. This suggests that high total alkalinity is related to high yield of zooplankton. (Singh et al., 2002; Sachidanandamurthy and Yajurvedi, 2006; Kiran et al., 2007).

The hardness of water is not a pollution parameter but indicates water quality. Waters are often categorized according to degrees of hardness as follows:
0 – 75 mg/L = soft, 75 – 150 mg/L= moderately hard , 150 – 300 mg/L= hard, above 300 mg/L= very hard . In the present investigation, total hardness level varied from 39.6 mg/l to 77.8 mg/L. Total hardness of water has been found to be positively correlated (r= 0.040)  with zooplankton abundance . Similar observations have been made by (Ratushnyak et al., 2006).

Monthly and seasonal abundance of zooplankton for one year of  investigation  has  been    presented  in  **Table  2**. The Zooplankton of Jamunabundh reservoir consists of Rotifers, Cladocera, Copepoda and Ostracoda. . A total of 20 taxa were recorded in which 6 were rotifers ,  3 copepoda , 4 cladocera , 3 of ostracoda and 4 larva and protozoa were recorded . Cladocera                                                         constituted
Presence of *Brachionus* sp is the indication that the pond is organically polluted. .This is in also agreed by (Ahmed ert al , 2012.). The density of rotifers ranged from 80 No/l in the month of June to 165 No./l in the month of January.

  Among Zooplankton, cladocera was the dominant group. . This group is represented by *Daphnia* sp., *Moina* sp., *Ceriodaphnia* sp. and *Bosmina* sp. Their density ranged from 115 No./l in the month of April to 150  No./l in the month of September. Cladocerans are important food source for fry; fingerlins and adult of many economically important fish species. Cladocerans are also reported to be the indicators of eutrophic nature of water bodies.(Sharma,2001) .
  Copepoda comprises of the third most abundant group of zooplankton . This group is represented by *Cyclops* sp., *Mesocyclops* sp., and *Diaptomus* sp Their density ranged from 14 No./l in the month of July to 38 No./l in the month of January.

Ostracoda comprises of the least abundant group of zooplankton. This group is represented by *Cypris* sp., and *Heterocypris* sp Their density ranged from 2 No./l in the month of July to 8 No./l in the winter months.

In addition Nauplius larva, Zoea larva, *Paramoecium* sp and *Euglena* sp. has also been found.

To relate the effect of environmental factors on zooplankton abundance, correlation were made between zooplankton and other physicochemical parameters.(**Table 3)** . Zooplankton showed negative significant correlation with water temperature (r = -0.593). Also negative correlation has been observed between zooplankton and turbidity (-0.551), , Free $CO_2$ (-0.385), and salinity (-0.085). A positive correlation has been observed between DO (0.102) ,pH(0.434), Total alkalinity (0.209) and Total hardness (0.040) .

Highest species diversity was observed during December, January and February being 2.96, 2.99 and 2.92 respectively . Highest evenness was also  observed during  January and February being 0.99 in both the months while the richness being 3.28,, 3.22 and 3.07 in these three months during December, January and February respectively**.(Table4).**

**Table 1. Monthly variation in Physicochemical factors of jamunabundh**

**Table 2.Monthly and seasonal abundance of zooplankton of Jamunabundh**

| Parameters | Jan-12 | Feb-12 | Mar 12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Nov-12 | Dec-12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temp($^0$C) | 16 | 14 | 24 | 24 | 25 | 24 | 21.6 | 21 | 25 | 22 | 20 | 18 |
| Turbidity(NTU) | 4.0 | 3.0 | 4.0 | 5.0 | 3.0 | 4.0 | 7.0 | 8.0 | 6.0 | 5.0 | 2.0 | 2.0 |
| pH | 7.0 | 7.8 | 7.5 | 7.8 | 7.9 | 6.7 | 6.5 | 6.5 | 6.7 | 6.8 | 7.1 | 7.1 |
| D.O.(mg/l) | 8.0 | 10.4 | 8.0 | 7.2 | 6.0 | 5.2 | 5.8 | 8.0 | 4.0 | 2.4 | 3.2 | 4.4 |
| Free $CO_2$.(mg/l) | 10.0 | 12.0 | 8.0 | 8.6 | 10.0 | 18.0 | 20.0 | 18.0 | 20.0 | 20.0 | 16.0 | 16.0 |
| Salinity.(mg/l) | 125.0 | 130.0 | 116.0 | 141.9 | 204.0 | 191.0 | 114.0 | 114.0 | 131.0 | 134.6 | 178.4 | 163.5 |
| Alkalinity (mg/l) | 35.0 | 24.0 | 24.0 | 35.0 | 24.0 | 60.0 | 64.0 | 68.0 | 26.0 | 24.0 | 22.0 | 28.0 |
| Total Hardness (mg/l) | 49.5 | 59.5 | 39.6 | 46.2 | 77.8 | 67.6 | 46.2 | 45.2 | 48.1 | 62.0 | 56.4 | 56.5 |

| Sl No. | Months/ Genera | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | June 12 | July 12 | Aug 12 | Sep12 | Oct 12 | Nov 12 | Dec 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cladocera** | | | | | | | | | | | | |
| 1 | *Daphnia* sp | 55 | 57 | 60 | 65 | 76 | 80 | 75 | 70 | 75 | 70 | 65 | 65 |
| 2 | Bosmina sp | 45 | 42 | 20 | 15 | 30 | 20 | 31 | 30 | 35 | 30 | 35 | 45 |
| 3 | Moina sp | 35 | 37 | 25 | 20 | 16 | 25 | 23 | 25 | 26 | 39 | 35 | 25 |
| 4 | Ceriodaphnia sp | 10 | 8 | 15 | 15 | 4 | 5 | 2 | 10 | 14 | 10 | 7 | 10 |
| | **Total** | **145** | **144** | **120** | **115** | **126** | **130** | **131** | **135** | **150** | **149** | **142** | **145** |
| | **Copepoda** | | | | | | | | | | | | |
| 5 | Cyclops sp | 12 | 8 | 3 | 4 | 7 | 3 | 2 | 5 | 6 | 5 | 8 | 9 |
| 6 | Mesocyclops Sp | 4 | 3 | 3 | 4 | 1 | 2 | 2 | 2 | 4 | 3 | 4 | 4 |
| 7 | Diaptomus sp | 22 | 21 | 14 | 10 | 10 | 15 | 10 | 18 | 18 | 14 | 20 | 20 |
| | **Total** | **38** | **32** | **20** | **18** | **18** | **20** | **14** | **25** | **28** | **22** | **32** | **33** |
| | **Rotifera** | | | | | | | | | | | | |
| 8 | Brachionus bidentata | 53 | 45 | 48 | 40 | 40 | 30 | 35 | 30 | 38 | 45 | 35 | 40 |
| 9 | Brachionus quadridentata | 38 | 38 | 30 | 38 | 40 | 20 | 25 | 21 | 30 | 26 | 31 | 34 |
| | Brachionus diversicornis | 25 | 29 | 20 | 12 | 20 | 10 | - | - | 16 | 20 | 20 | 22 |
| 10 | Keratella tropica | 30 | 25 | 28 | 33 | 35 | 18 | 30 | 20 | 20 | 26 | 26 | 25 |
| l11 | Filinia sp | 12 | 15 | 12 | 10 | 10 | - | - | 13 | 12 | 15 | 13 | 9 |
| 12 | Asplanchna sp | 7 | 8 | 10 | 12 | - | 2 | 5 | 6 | 9 | 8 | 10 | 5 |
| | **Total** | **165** | **160** | **148** | **145** | **145** | **80** | **95** | **90** | **125** | **140** | **135** | **135** |
| | **Ostracoda** | | | | | | | | | | | | |
| 13 | Cypris sp | 4 | 5 | 5 | 5 | 4 | 1 | 2 | 1 | 3 | 3 | 2 | 4 |
| | Stenocypris sp. | 2 | 1 | 2 | 2 | 2 | - | - | - | - | 1 | 2 | 1 |
| | **Total** | **8** | **8** | **9** | **7** | **8** | **1** | **2** | **1** | **3** | **5** | **6** | **6** |
| 15 | Nauplius larva | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |

| 16 | Zoea | 1 | 1 | 1 | 1 | - | - | 1 | 1 | - | 1 | 1 | 1 |
| 17 | Paramoecium Sp. | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| 18 | Euglena Sp. | 1 | - | - | - | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | **Total** | **4** | **3** | **3** | **4** | **3** | **3** | **4** | **4** | **5** | **4** | **4** | **4** |
| | **Grand Total** | **360** | **347** | **300** | **289** | **300** | **234** | **246** | **255** | **311** | **320** | **319** | **323** |

**Table 3. Corelation between zooplankton abundance and physicochemical parameters**

| | Temperature | Turbidity | pH | Dissolved Oxygen | Free $CO_2$ | Salinity | Alkalinity | Total Hardness |
|---|---|---|---|---|---|---|---|---|
| **Zooplankton** | -0.593 | -0.551 | 0.434 | 0.102 | -0.385 | -0.085 | 0.209 | 0.04 |

**Table 3. Total zooplankton,diversity index, richness and evenness in Jamunabundh during 2012**

| Months | Diversity Index | Species Richness | Species Evenness |
|---|---|---|---|
| **Jan-12** | 2.99 | 3.22 | 0.99 |
| **Feb-12** | 2.92 | 3.07 | 0.99 |
| **Mar-12** | 2.84 | 3.15 | 0.96 |
| **Apr-12** | 2.81 | 3.00 | 0.97 |
| **May-12** | 2.79 | 2.98 | 0.96 |
| **June-12** | 2.67 | 2.74 | 0.96 |
| **July-12** | 2.64 | 2.72 | 0.95 |
| **Aug-12** | 2.77 | 2.88 | 0.97 |
| **Sep-12** | 2.84 | 2.96 | 0.98 |
| **Oct—12** | 2.77 | 3.29 | 0.92 |
| **Nov-12** | 2.95 | 3.29 | 0.98 |
| **Dec-12** | 2.96 | 3.28 | 0.99 |
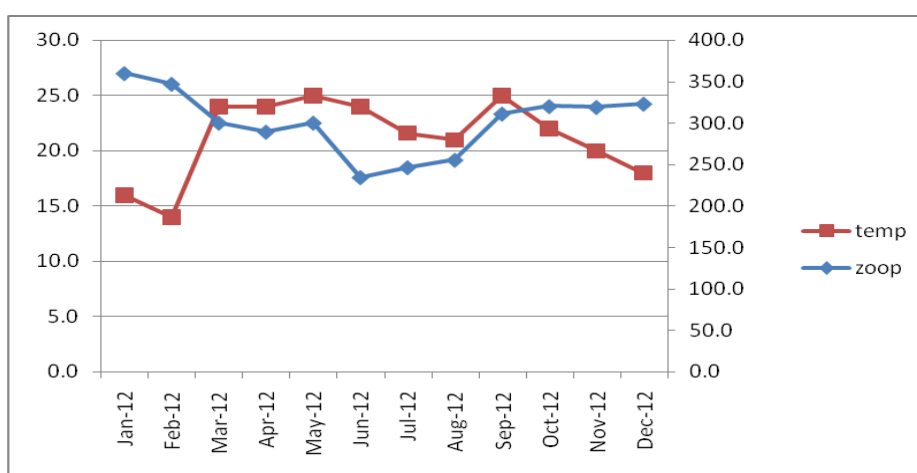


**Figure 1 Graphical representation of Temperature vs. Zooplankton abundance**
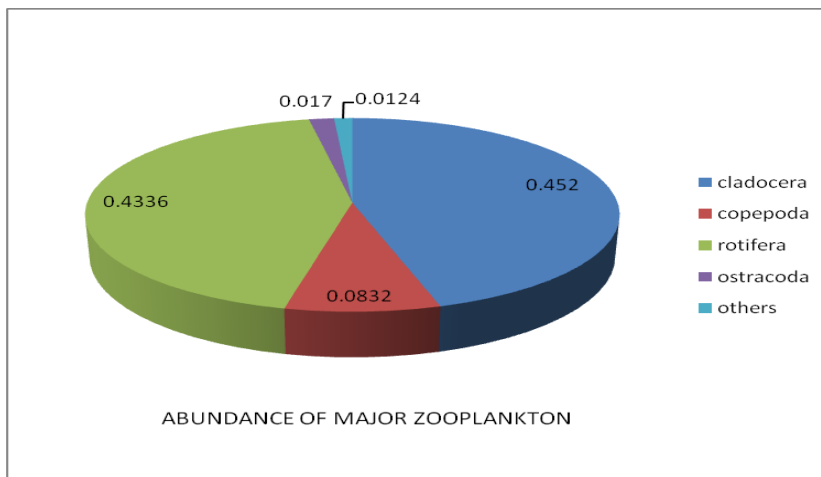
**Figure 2. Percentage abundance of major zooplankton groups**

## V.  CONCLUSION

Zooplankton may exist in a wide range of environmental conditions. But dissolved oxygen, temperature, salinity,pH and other physicochemical parameters are limiting factors . At the same time they are also very good bioindicators to assess the pollution of any freshwater body. The presence of three species of *Brachionus* sp reveals that the the pond is being eutrophicated and is organically polluted . Various anthropogenic activities such as entry of agricultural run offs like pesticides , insecticides from surrounding agricultural fields seems to be the major cause of eutrophication. Further, the water level of this pond must be maintained by desilting . From the above study we can make the overall conclusion that a strict vigilance and general awareness is required so that proper conservation of this old perennial water body can be done, which support a rich biodiversity of flora and fauna.

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# Greedy Algorithm

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*Abstract-* This paper presents a survey on Greedy Algorithm. This discussion is centered on overview of  Activity Selection Problem and Task Scheduling Problem . A greedy algorithm is an algorithm that follows the problem solving heuristic of making the locally optimal choice at each stage with the hope of finding a global optimum. In many problems, a greedy strategy does not in general produce an optimal solution, but nonetheless a greedy heuristic may yield locally optimal solutions that approximate a global optimal solution in a reasonable time.Greedy algorithms determine the minimum number of coins to give while making change. These are the steps a human would take to emulate a greedy algorithm to represent 36 cents using only coins with values {1, 5, 10, 20}. The coin of the highest value, less than the remaining change owed, is the local optimum. (Note that in general the change-making problem requires dynamic programming or integer programming to find an optimal solution; However, most currency systems, including the Euro and US Dollar, are special cases where the greedy strategy does find an optimum solution.)

*Index Terms*- Greedy, scheduling, activity, optimal,  algorithm etc

## I.  INTRODUCTION

Greedy Algorithm solves problem by making the choice that seems best at the particular moment. Many Optimization problems can be solved using a greedy algorithm. Some problems have no efficient solution, but a greedy algorithm may provide an efficient solution that is close to optimal. A greedy algorithm works if a problem exhibit the following two properties:

1) Greedy Choice Property:  A globally optimal solution can be arrived at by making a locally optimal solution. In other words, an optimal solution can be obtained by making "greedy" choices.
2) Optimal Substructure: Optimal solutions contains optimal sub solutions. In other words, solutions to sub problems of an optimal solution are optimal.

## II.  TYPES OF GREEDY ALGORITHM

Greedy algorithms can be characterized as being 'short sighted', and as 'non-recoverable'. They are ideal only for problems which have 'optimal substructure'. Despite this, greedy algorithms are best suited for simple problems (e.g. giving change). It is important, however, to note that the greedy algorithm can be used as a selection algorithm to prioritize options within a search, or branch and bound algorithm. There are a few variations to the greedy algorithm:

- I.  Pure greedy algorithms
- II.  Orthogonal greedy algorithms
- III. Relaxed greedy algorithms

## III.  AN ACTIVITY SELECTION PROBLEM

Our first example is the problem of scheduling a resource among several competing activities. We shall find that the greedy algorithm provides a well-designed and simple method for selecting a maximum-size of mutually compatible activities.

Suppose S={1,2,.....,n} is the set of proposed activities. The activities share a resource, which can be used by only one activity at a time e.g., a Tennis Court, a Lecture Hall etc. Each activity i has a **start time $s_i$** and a **finish time $f_i$,** where $s_i \leq f_i$. If selected, activity i takes place during the half-open time interval[$s_i$, $f_i$). Activities i and j are compatible if the intervals [$s_j$, $f_j$) and [$s_i$, $f_i$) do not overlap (i.e, I and j are compatible if $s_i \geq$ fj or sj $\geq$ fj ).

The activity selection problem selects the maximum-size set of mutually compatible activities.

In this strategy we first select the activity with minimum duration ($f_i$-$s_i$) and schedule it. Then, we skip all activities that are not compatible to this one, which means we have to select compatible activities having minimum duration and then we have to schedule it. This process is repeated until all the activities are considered. It can be observed that the process of selecting the activity becomes faster if we assume that the input activities are in order by increasing finishing time:

$$f_1 \leq f_2 \leq f_3 \leq ..... \leq f_n$$

The running time of an algorithm GREEDY-ACTIVITY-SELECTOR is $\Theta$(nlogn), as sorting can be done in O(nlogn). There are O(1) operations per activity, thus total time is

O(nlogn) + n.O(1) = O(nlogn)

The pseudo code of GREEDY-ACTIVITY-SELECTOR is as follows:

```
GREEDY-ACTIVITY-SELECTOR(s, f)
[1]    n ← length[s]
[2]    A ← {1}
[3]    j ← 1
[4]    for I ← 2 to n
[5]    do if si ≥ fj
[6]    then A ← a Union {1}
[7]    j ← i
```

[8]    return A

The GREEDY-ACTIVITY-SELECTOR algorithm gives an optimal solution to the activity selection problem.

Example. Given 10 activities along with their start and finish time as

$S = (A_1, A_2, A_3, A_4, A_5, A_6, A_7, A_8, A_9, A_{10})$

| Activity | $A_1$ | $A_2$ | $A_3$ | $A_4$ | $A_5$ | $A_6$ | $A_7$ | $A_8$ | $A_9$ | $A_{10}$ |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| Start    | 1     | 3     | 2     | 4     | 8     | 7     | 9     | 11    | 9     | 12       |
| Finish   | 3     | 4     | 5     | 7     | 9     | 10    | 11    | 12    | 13    | 14       |

$S_i = (1, 2, 3, 4, 7, 8, 9, 9, 11, 12)$
$F_i = (3, 5, 4, 7, 10, 9, 11, 13, 12, 14)$

Compute a schedule where the largest number of activities takes place.

Solution. The solution for the above activity scheduling problem using greedy strategy is illustrated below.

Arranging the activities in increasing order of finish time.
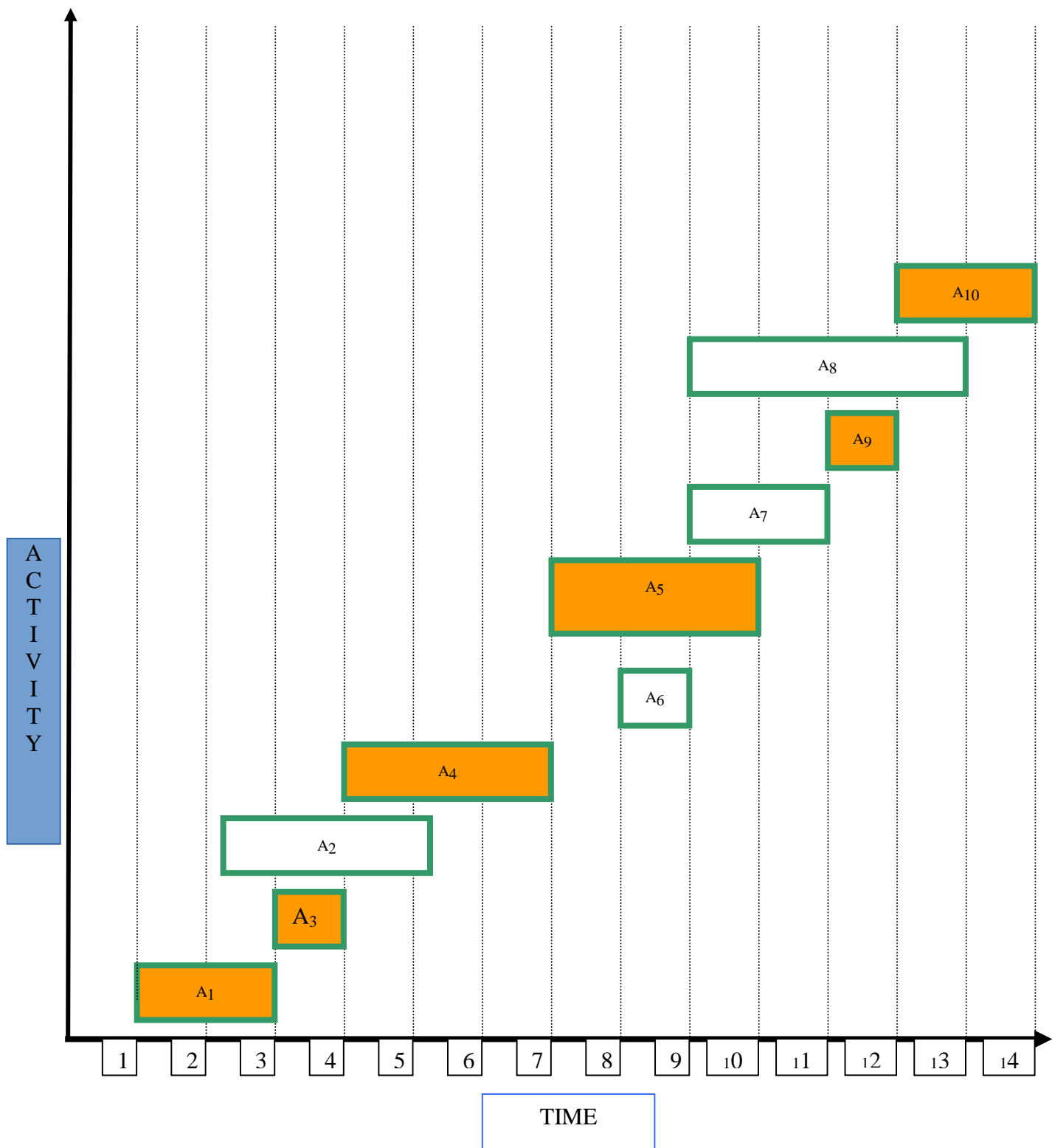
**Next schedule A$_3$ , as A$_1$and A$_3$ are non-interferimg.**Next , schedule A$_4$ as A$_1$, A$_3$ and A$_4$ are non-interfering, then next, schedule A$_6$ as A$_1$, A$_3$, A$_4$ and A$_6$ and are not interfering.
Skip A$_5$ as it is interfering.

Next, schedule A$_7$ as A$_1$, A$_3$, A$_4$ , A$_6$ and A$_7$ are non-interfering.

Next, schedule A$_9$ as A$_1$, A$_3$, A$_4$ , A$_6$, A$_7$ and A$_9$ are non-interfering.
Skip A$_8$, as it is interfering.

Next, schedule A$_{10}$ as A$_1$, A$_3$, A$_4$ , A$_6$, A$_7$, A$_9$ and A$_{10}$ are non-interfering.
Thus, the final activity schedule is
**(A$_1$, A$_3$, A$_4$ , A$_6$, A$_7$, A$_9$, A$_{10}$)**

## IV. ACTIVITY OR TASK SCHEDULING PROBLEM

This is the problem of optimally scheduling unit-time tasks on a single processor, where each task has a dead line and a penalty that must be paid if the dead line is missed.

A unit time task is a job such as a program to be run on a computer that requires exactly one unit of time to complete. Given a finite set S of unit-time tasks, a schedule for S is a permutation of S specifying the order in which these tasks are to be performed. The first task in the schedule begins at time 0 and finishes at time 1, the second task begins at time 1 and finishes at time 2 and so on.

The problem of scheduling unit time tasks with dead lines and penalties for a single processor has the following inputs:

- a set S = {1, 2, 3, …..., n} of n-unit-time tasks.
- A set of n integer dead lines d$_1$, d$_2$, d$_3$, …..d$_n$ such that d$_i$ satisfies $1 \le d_i \le n$ and task I is supposed to finish by time d$_i$ and
- a set of n non-negative weights or penalties w$_1$, w$_2$, w$_3$, ….., w$_n$ such that a penalty w$_i$, is incurred if task I is not finished by time di and no penalty is incurred if a task i is not finished by time d$_i$ and no penalty is incurred if a task finishes by its dead lines.

Here we find a schedule for S that minimizes the total penalty incurred for missed dead lines.

A task is late in this schedule if it is finished after its dead line. Otherwise, the task is early in the schedule. An arbitrary schedule can always be put into early-first form, in which the early tasks precede the late tasks, i.e., if some early task x follows some late task y, then we can switch the positions of x and y without effecting x being early or y being late.

An arbitrary schedule can always be put into canonical form, in which the early tasks precede the late tasks and the early tasks are scheduled in order of non-decreasing dead lines.

The search for an optimal schedule reduces to finding a set A of tasks that are to be early in the optimal schedule. Once A determined, we can create the actual schedule by listing the elements of A in order of non-decreasing dead line, then listing the late tasks(i.e., S-A) in any order, producing a canonical ordering of the optimal schedule.

A set A of the tasks is independent if there exists a schedule for these tasks such that no tasks are late. So, the set of early tasks for a schedule forms an independent set of tasks 'I' denote the set of all independent sets of tasks.

For any set of tasks A, A is independent if for t = 0, 1, 2, …, n we have
N$_t$(A) ≤ t
where N$_t$(A) denote the number of tasks in A whose dead line is t or earlier , i.e., if the tasks in A are scheduled in order of monotonically increasing dead lines, then no task is late.

Example. Let n = 4(P$_1$, P$_2$, P$_3$, P$_4$) = (100, 10, 15, 27) and (d$_1$, d$_2$, d$_3$, d$_4$) = (2, 1, 2, 1)
where P$_i$ are profits on processes or job and d$_i$ are dead line of completion. Find the optimal schedule.

Solution. Max. dead line is 2 so max. number of processes that are scheduled is 2.

| Feasible Solution | Processing Sequence | Value |
|---|---|---|
| (1, 2) | (2, 1) | 10 + 100 = 110 |
| (1, 3) | (1, 3) or (3, 1) | 100 + 15 = 115 |
| (1, 4) | (4, 1) | 27 + 100 = 127 |
| (2, 3) | (2, 3) | 25 |
| (3, 4) | (4, 3) | 42 |
| (1) | 1 | 100 |
| (2) | 2 | 10 |
| (3) | 3 | 15 |
| (4) | 4 | 27 |

**Thus, the optimal schedule is (4, 1) and profit 127.**

## V.    APPLICATIONS

Greedy algorithms mostly (but not always) fail to find the globally optimal solution, because they usually do not operate exhaustively on all the data. They can make commitments to certain choices too early which prevent them from finding the best overall solution later. For example, all known greedy coloring algorithms for the graph coloring problem and all other NP-complete problems do not consistently find optimum solutions. Nevertheless, they are useful because they are quick to think up and often give good approximations to the optimum.

If a greedy algorithm can be proven to yield the global optimum for a given problem class, it typically becomes the method of choice because it is faster than other optimization methods like dynamic programming. Examples of such greedy algorithms are Kruskal's algorithm and Prim's algorithm for finding minimum spanning trees, Dijkstra's algorithm for finding single-source shortest paths, and the algorithm for finding optimum Huffman trees.

## VI.    CONCLUSION

Greedy algorithms are usually easy to think of, easy to implement and run fast. Proving their correctness may require rigorous mathematical proofs and is sometimes insidious hard. In addition, greedy algorithms are infamous for being tricky. Missing even a very small detail can be fatal. But when you have nothing else at your disposal, they may be the only salvation. With backtracking or dynamic programming you are on a relatively safe ground. With greedy instead, it is more like walking on a mined field. Everything looks fine on the surface, but the hidden part may backfire on you when you least expect. While there are some standardized problems, most of the problems solvable by this method call for heuristics. There is no general template on how to apply the greedy method to a given problem, however the problem specification might give you a good insight.  In some cases there are a lot of greedy assumptions one can make, but only few of them are correct. They can provide excellent challenge opportunities.

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# Ayurvedic-Informatics Establishing an In-silico Ayurvedic Medication for Influenza a Virus (Swine Flu)

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*Abstract-* Swine flu disease is an incurable degenerative and terminal disease. It is associated with Neuraminidase (NA), Hemoagglutinin (HA), and Matrix (M2) protein .3D structure of the one protein neuraminidase was generated using Homology modeling. Active compound of medicinal natural compound – EPICATECHIN GALLATE, MARCHANTIN, XYLOPINE were selected as these three natural compound of chemical structure of the active component of these natural compound were drawn docked with Epicatechin gallate, Marchantin , Xylopine Active component combinations. Known inhibitor taken from the literature docked, and docked at the binding site. Obtain molecule Epicatechin gallate, Xylopine, Marchantin have been given score of -174.3 kcal/mol, -148.5 kcal/mol, -131.4 kcal/mol. This is greater than known inhibitor. Zanamivir and Oseltamivir have been given score of -155.9 kcal/mol, and -132.7 kcal/mol molecules were employed for similarity search from zinc database. To the candidate molecules with drug likeness property can be considered for the test in vitro. And finally it can act as lead compound for the future development and optimization.

*Index Terms-* Swine flu disease, Drug designing, Homology modeling, Natural compound.

## I. INTRODUCTION

Influenza A virus has caused seasonal influenza epidemics and influenza pandemics which resulted in serious threat to public health and socioeconomic impact main influenza A virus cause acute respiratory disease in human , birds and other mammal , representing one of the major threats to public's health. Influenza A viruses mutates frequently because of their segmented RNA genome, making it almost impossible to produce a timely and sufficiently effectives [3]. Two neuraminidase inhibitors ZANAMIVIR and OSELTAMIVIR were both approved in 1999 for treatment cause and prevention for acute uncomplicated flu caused by influenza A virus and B. Neuraminidase inhibitors interfere with the enzymatic activity of the NA protein, which is critical for the efficient release of newly synthesized virus from infected cells. However, resistant virus strains are constantly emerging, especially to Oseltamivir. [4]. Different from the oral administration Oseltamivir , Zanamivir can only be inhaled due to its low bioavailability , which makes the limited use of this drug. The currently available drug such as Oseltamivir and Zanamivir was considered as reference drug in this work .one thousand natural compound showing the antiviral, antioxidant, and immunostimulatory properties were selected from various scientific  articles . The initial screenings of the molecule was based on the bases on the lipinski's rule of five and compound having structured similarity to the study drug Oseltamivir and Zanamivir [27]. Molecule which were satisfying this rule were taken docking study using docking software molegro virtual docker . Out of the three natural molecules evaluated Epicatechin gallate was found to have better ligand binding affinity than the commercial drugs. Epicatechin gallate the bioavailability studied of ECG also showed that bioavailability is less than 30%. Also the blood and the cardiovascular toxic health effects of ECG was predicted to be lesser than the study drug Oseltamivir adverse effects than the commercial drugs taken in the study.

The research proposes that intake of Epicatechin gallate which is abundant in green tea can be potent anti-viral therapy against H1N1 swine flu influenza A virus. Drug discovery has evolved through various stages in to more rational and evidence based drug designing has made tremendous contributions in the field of viral chemotherapy, drug resistant infections and viral disease to mention a few new drug discovery method are furthered by development in the technology especially computers, bioassays techniques and calibrated instruments computational structure based drug designing opens the door to novel treatments in modern medicines [3].

## II. METHODOLOGY- SOFTWARES/ WEB SERVER

- PHYRE SERVER
- SWISS PDB VIEWER
- RASMOL
- SAVES SERVER
- Q SITE FINDER
  (http://www.modelling.leeds.ac.uk/qsitefinder/)
- CHEMSKETCH (http://www.acdlabs.com/resources/freeware/chemsketch)

- DISCOVERYSTUDIO
- MOLEGRO VIRTUAL DOCKER

Influenza A virus disease causing protein neuraminidase (NA) were taken for this work. NA protein sequence was taken from NCBI database.Homology modeling was carried out using phyre server, for the predicting 3D structure for the above mentioned proteins. Homology modeling was done using phyre server template pdb id $3CL_2$ A CHAIN protein from RCSB PDB database.

3 models of protein were generated the models, were analyzed by saves server (ramachandran plot) [14] and the best model was selected. Chemical structures of active components of Epicatechin gallate , Marchantin , Xylopine were drawn chemsketch softwares . This combinations structures was saved as *.mol file and was later converted to *.pdb file using online tool chemspider.

## III.   RESULT

3 D Structure of neuraminidase PDB ID $3Cl_2$ A chain protein obtained by homology modeling was analyzed by Saves server. The result obtained for best model are as follows :-
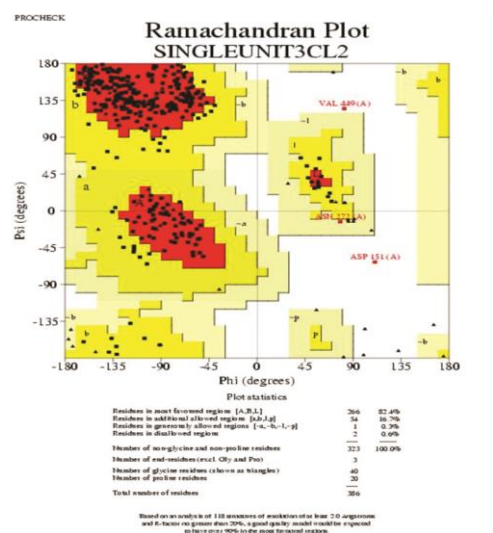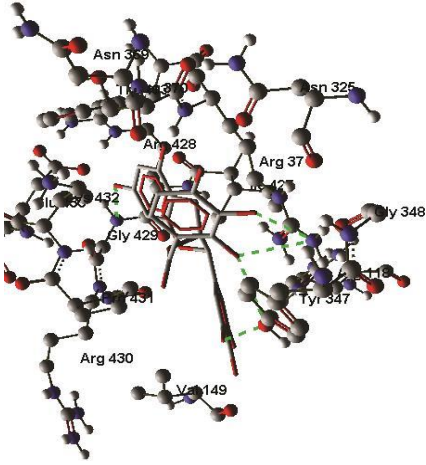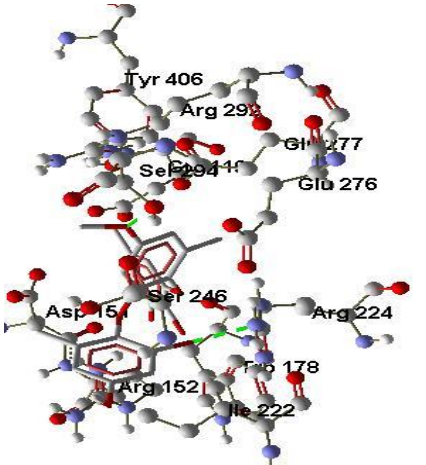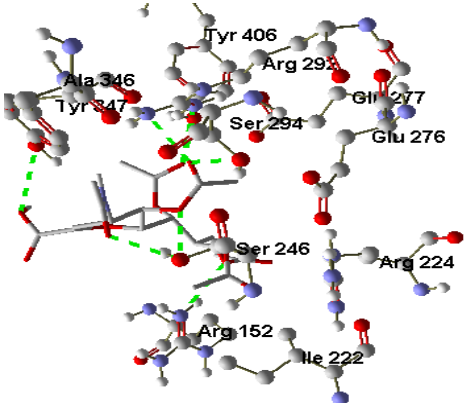


**Fig 1:RAMACHANDRAN PLOT DIAGRAM**

- ❖ Number of residue in favored region (82.4%)
- ❖ Number of residue in additional allowed region (16.7%).
- ❖ Number of residue in generously allowed region (0.3%).
- ❖ Number of residue in disallowed region (0.6%).
- ❖ Very-3D 100.00% of the residue an averaged 3 D score >0.2.

## IV.   DOCKING RESULT

Docking result of the inhibitor molecule. The NA and zanamivir interaction has observed with minimal dock score -155.968 kcal/mol. And oseltamivir has been docked with -132.72 kcal/mol. on the other hand we search the other inhibitor molecules [6] like Marchantin [8], Xylopine , Epicatechin gallate , by the research paper.  The docked energy of NA into each of the inhibitor molecules such as Epicatechin gallate, Xylopine,  Marchantin.  acid have been  -174.3 kcal/mol , -148.5 kcal/mol , -131.4 kcal/mol [11].

| Sr. No. | Docking interaction | Predicted binding site on protein | No of hydrogen bond | Moldock score |
|---|---|---|---|---|
| 1. | **Docking study of Epicatechin gallate**  | gly – (429), pro – (431), cys – (432), arg – (428). | Tyr-(347), gly – (429). | -174.3 kcal/mol |
| 2. | **Docking study of marchantin**  | ser – (294), ser – (246), asp – (151). | arg – (152), ser – (294). | -131.4 kcal/mol |
| 3. | **Docking study of Xylopine**  | Tyr– (406), ser– (294) | ser - ( 246) , arg –( 152) , tyr –( 347). | -148.5 kcal/mol |

| 4. | Docking study of Zanamivir  | ser – (246), gly – (429), Tyr – (406), arg – (292) | Tyr – (347), ser – (294), asp – (151). | -155.9 kcal/mol |
| 5. | Docking study of oseltamivir  | Tyr – (406), ser – (294), arg – (224) | arg – (152), Tyr – (347). | -132.7 kcal/mol |
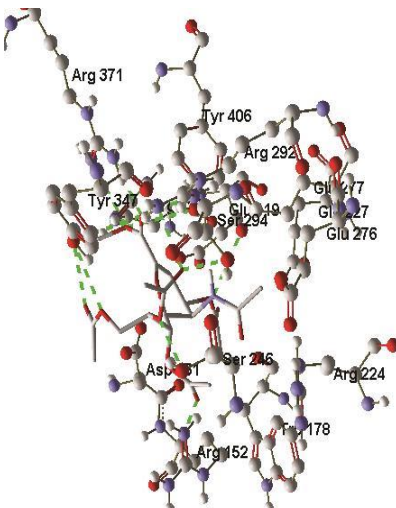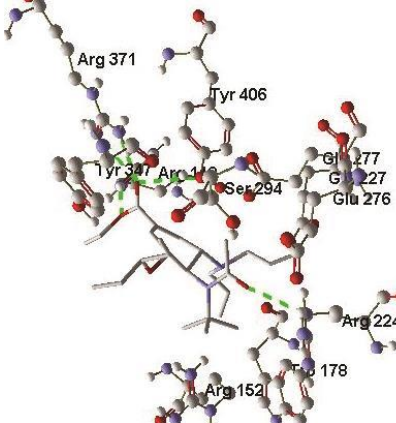
Table 1: List of natural compound which shows docking score .

## V.    CONCLUSION

The successfully docking of Neuraminidase protein with  Epicatechin gallate (ECG) , Marchantin , Xylopine that combination proves that the combination can be effective in the treatments of swine flu influenza A virus diseases. Present drugs are not much more effective to cure this disease and have many side effects also. Present work targets neuraminidase protein of influenza virus. It consists of six, four stranded beta sheets, 3 helix and loops .When the different natural ligands docked with protein. It checks all possible orientations and conformation for all set of ligands. Those docking results are included which showed best interaction with neuraminidase protein. After docking we find the binding energy of main drug zanamivir is -155.9 kcal/mol and the Oseltamivir is -132.7 kcal/mol. We have search many inhibitor molecule of H1N1. After docking we select one inhibitor molecule in the basis of binding energy. The binding energy of Epicatechin gallate is -174.3 kcal/mol.

## VI.    DISCUSSION

This In - silico herbal work makes use of Ayurvedic herbs in computers aided drug   designing. The principles outlined in homology modeling is used to modeled the 3D structure of the protein neuraminidase since suitable template was not found by searching across PDB and BLAST search , so the author have used phyre server to model the proteins. The mentions of natural compound Epicatechin gallate , Marchantin , and Xylopine is found in the work of drug designing. Author utilized the combination of

the active components of the natural compound with protein of influenza A virus. Again, since the work is done in In-silico platform. The combination Epicatechin gallate, Marchantin, Xylopine. Combination needs to go to clinical testing to establish its efficacy.

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# Optimization of Microstrip Ring UWB filter using ANN-PSO

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**Abstract-** Ultra-Wide Band (UWB) is promising technology for many wireless applications due to its large bandwidth, good ratio of transmission data and low power cost. The main goal of this work is to design an UWB filter suitable for that purpose in the frequency band 3.1-10.6 GHz. In order to achieve that goal, one UWB filter configuration is investigated, designed and characterized. Theoretical analysis is done to compute the filter parameters, such as the return loss, insertion loss and attenuation characteristic over the full frequency band. The size of this filter is also studied because of its important aspect on the frequency behavior.

**Index Terms-** UWB, filter, frequency response,   insertion loss, return loss.

## I.   INTRODUCTION

UWB technology is promising and attractive for local area networks, position location, tracking and radar systems. The technology  has  the characteristics of low cost, high data transmission rate and very low power consumption. Many UWB devices and circuits are proposed and investigated widely [1-5].

It is important to reduce their size and weight in order to integrate them with other components as a compact system. Compact and broadband bandpass filter  (BPF) is a key passive component and highly demanded in a UWB system. A planar BPF based on a microstrip structure can provide the advantages of easy design, low cost, compact size.

A  microstrip BPF widely used in a variety of RF/microwave and millimeterwave systems and compact UWB microstrip BPF can be used in a UWB communication system. UWB filters should have a fractional bandwidth of more than 70.0% and it is very difficult to achieve such a wide passband with a traditional parallel-coupled transmission line structures. A practical requirement exists for UWB BPF with a strong coupling structure that can be easily realized and fabricated.

A  ring shaped microstrip resonator circuit with quarter wavelength short circuited stub is analyzed using EM theory and resulting dimensions are utilized to design a single section of an UWB filter in the desired frequency range. Consequently five such circular ring resonators are designed and successive stages are coupled using interconnected lines. Here proper tuning stub is used to implement a strong coupling between the input/output port and the resonator. Thus an UWB microstrip BPF with low  loss is designed and further optimized for best  achievable frequency response.

After the release of UWB bandpass filters with a passband of the same frequency range (3.1 GHz -10.6 GHz, a fractional bandwidth of 110%) were challenges for conventional filter designs. Before mid 2003 the bandwidth of the passband for a bandpass filters was extended from 40% to 70% [2]. These filters are named as broad bandpass filters. They were not covering the whole UWB frequency range. In [3] a bandpass filter covering the whole UWB frequency range with a fractional bandwidth of 110% was realized by fabrication signal lines on a lossy composite substrate. A

successful transmission of the UWB pulse signal was demonstrated using the proposed bandpass filter. This is one of the early reported filters that possess an ultra-wide passband. However, it has a high insertion loss in the passband due to the lossy substrate. Not much research work was reported in 2003 and 2004. In 2004, a ring resonator with a stub was proposed which shows a bandwidth of 86.6% [4]. A bandpass filter covering the whole UWB frequency band was a challenge for microwave filter designers and researchers in that period of time. There are mainly four types of structures that are able to realize an ultra-wide passband.

## II. UWB FILTER CONFIGURATION

UWB was originally developed for military communications and radar. In the field of UWB technology different methods and structures [2- 6] has pushed development of new UWB filters.

Lumped-element filter design is generally unpopular due to the difficulty of its use at microwave frequencies along with the limitations of lumped element values. Hence conventional microstrip filters are often used. The new proposed filter design is based on ring resonators having quarter wavelength short-circuited stub and realized in microstrip configuration. The paper focuses on systematic design and realization of an UWB in printed circuit configuration. The filter design is done with ring shaped resonator and realized in microstrip configuration. The diameter of the ring is designed according to the frequency requirements and stub matching is used to tune the filter to the desired band of operation. Stub width and ring diameter, inter ring separation is taken as design parameter to optimize its frequency response performance. It is designed as per FCC recommended band from 3.1-10.6 GHz.
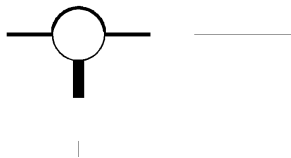


Figure 1. Ring resonator configuration as filter

## III. UWB FILTER DESIGN PROCESS

The UWB is designed using ANN model of ring resonator and PSO optimization techniques. Here Artificial Neural Network (ANN) and Particle Swarm Optimization (PSO) algorithm is used for the synthesis of the UWB filter using ring resonator. The PSO algorithm is used to optimize the filter geometry in order to obtain a wideband performance of the microstrip filter. The configuration of the ring structure acting as resonator is shown in Figure 1. whose resonance frequency is controlled by a tuning stub. The stub dimensions are fed as input to a trained ANN to model the reflectance and transmittance of the single ring resonator. In this work micro strip substrate is used in order to realize the filter using ring structure (substrate thickness 10 mil, dielectric constant 9.8). Analysis using method of moment and further simulation using commercial software tools is performed to investigate and verify the performance of the ring filter.The EM simulation results are in good agreement with those obtained using the ANN algorithm. The objective of this work is to use the ANN model coupled with the particle swarm optimization (PSO) algorithm to synthesize the UWB filter using multiple rings and optimize its performance as UWB filter. In this design, successive stages of coupled circular ring structure with proper tuning stub is used to implement strong coupling between the input/output port and the resonator.

Figure 2. Measured results of reflectance and transmittance of a single ring microstrip filter
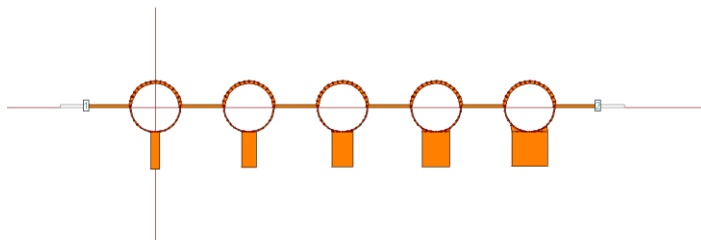


Figure 3. UWB filter configuration using ring  structure

The EM simulation tools are used to optimize the frequency response performance of this UWB filter. Simulated results predict performance of the filter as per FCC Standard. It is observed that the design dimensions are critical in deciding the filter responses. The ring dimension and stub width are required to be precise for the microstrip filter under concern as per optimized results to meet the specification.Final pcb design is generated based on the optimized design for the multiple ring resonator structure with connecting lines. The filter hardware based on the optimized design is fabricated and measured to verify the UWB performance over the FCC band. The filter under concern is designed to provide an Insertion Loss ≤ 1 dB and average roll off  30 dB/decade. The measurement results are quite encouraging.



Figure  4. Layout of the UWB   ring
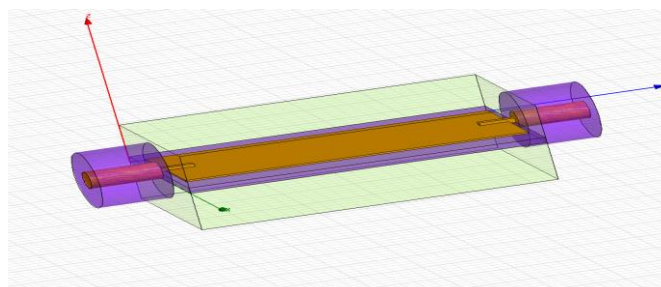
Figure  5.  3D model of UWB filter for simulation

The new proposed design of ring filter is associated with a quarter wavelength short-circuited stub for frequency tuning. Five sections are combined and optimized using PSO for its best achievable filter performance in the UWB frequency range from 3.1-10.6 GHz. A systematic design and realization of an UWB filter in microstrip configuration is done using stub tuned ring shaped resonator having single input and single output. The diameter of the ring is designed according to the resonating frequency requirements and stub matching is used to tune the filter to the desired band of operation. Stub width, ring diameter, inter ring separation is taken as design parameter for ANN model of each section of the ring. Five such sections are modeled using ANN to cover the whole UWB range and combined to form the integrated ring filter whose S parameters are computed using theory and verified by MOM simulation tools (IE3D). The reflectance and transmittance of the whole filter is optimized using PSO for FCC recommended band from 3.1-10.6 GHz.

### III. THEORY OF RING RESONATOR

The theoretical investigation and analysis  is done to relate the geometry parameters of the ring
with its S parameters. Method of moments analysis in the spectral domain in conjunction with the Mixed-Potential Integral Equation (MPIE) approach is used by transforming the expansion and weighting functions [7-8]. Using the decomposition of Green's functions, the method of moment matrix entries can be reduced to a sum of two integrals. The first one is expressed in the spatial field and corresponds to the quasi-static contribution. It is analytically evaluated with   the exponential terms in the function to be integrated. The integrals expressed in the spectral field and corresponding to the dynamic part have the advantage of being calculated on a finite range and this is independent of the choice of the basis and test functions. The integrals expressed in the spectral field are performed by using numerical integration [9-12]. The formulation begins with the development of an integral expression which defines the electric field resulting from an arbitrary current distribution. This integral expression employs a Green's function which relates the electric field at an arbitrary observation point to the current at an arbitrary source point. The MOM applies orthogonal expansions to translate the integral equation into a system of circuit-like simultaneous linear equations. Appropriate basis functions are used to expand the current distribution. Testing functions are used to invoke the electric field boundary conditions. Matrix methods are then used to solve for the expansion coefficients associated with the basis functions. The current distribution solution is then constructed from the expansion coefficients.
The MOM simulation tools (IE3D) are used to verify the performance of this filter in terms of $S_{11}$ and $S_{12}$ of this

optimized wideband ring filter. It is observed that the design dimensions are critical in deciding the filter responses. The

ring dimension and stub width are optimized to meet the specification and accordingly final PCB design is generated. The

UWB filter is designed to provide an insertion loss $\leq 1$ dB and average roll off of 30 dB / decade. Simulated results

predict performances of the filter as per FCC Standards are shown in Figure 2. The filter based on the optimized design is

fabricated and tested. The measurement results are quite encouraging.

### IV. DESIGN OF RING FILTER
An exact analysis of the structure is very tedious. Hence a synthesis procedure is followed which involves a number of simplifying approximations that permit straightforward, easy to-use design calculations [13-16]. However these approximate design equations are found to be sufficiently accurate for most practical applications. The filter design is based on ring structure with quarter wavelength short-circuited stubs [17-22]. Here five short circuited stubs are designed for a distributed microstrip ring band pass filter whose connecting lines are non-redundant. In order to reduce the filter size the length of the connecting line are optimized. The characteristic impedances of these short-circuited stubs and the characteristic impedances of the connecting lines are chosen at 3.1 GHz. The dimension of the individual ring and its stub line impedance is computed using MOM considering fundamental resonance [23-30].

### V. ANN MODEL OF RING FILTER

A training set of 670 randomly distributed points of the parameters in the range given in table I. The back-propagation training algorithm along with the sigmoid function as the activation function is used for the feed-forward network of the ANN in order to train it. Five sections of the ring resonators with controlling stubs are used to develop the

full UWB ring filter. A three layer ANN with a hidden layer having 16 neurons is used to successfully model the geometry parameters of the ring such as diameter of the ring, characteristic impedance of the ring structure, inter ring separation and stub dimensions of individual ring to decide different resonance frequencies covering the UWB band. The training and testing data set is generated from the results of the analysis of the ring structure using method of moments. The accuracy of the trained network with this architecture is given in table II in terms of average error and standard deviation. Therefore, for a given set of input parameters, the geometry parameters of the ring can be accurately computed in the frequency range of interest in negligible time using the developed ANN.

## VI. DEVELOPMENT OF UWB FILTER

The individual ring structure with microstrip line stub having extended ground plane is designed and simulated using IE3D for verification of the frequency response. The single ring filter structure is fabricated and impedance bandwidth is measured as shown in Figure 2(considering fundamental and harmonic frequencies). The measured result shows a frequency bandwidth of 1.3 GHz (8.0 GHz - 9.3GHz) with an insertion loss of 2.7 dB (average). Five such sections covering the whole UWB band is designed and integrated to form the UWB filter as shown in Figure 3 and 4 . It is observed that the integrated five section ring filter can be used for FCC regulated UWB operations where bandwidth enhancement of 150.0% or more is possible. Simulation model of the ring filter is shown in figure 5 and the frequency response of the five section ring filter is verified using MOM simulator for UWB operation as shown in figure 6.
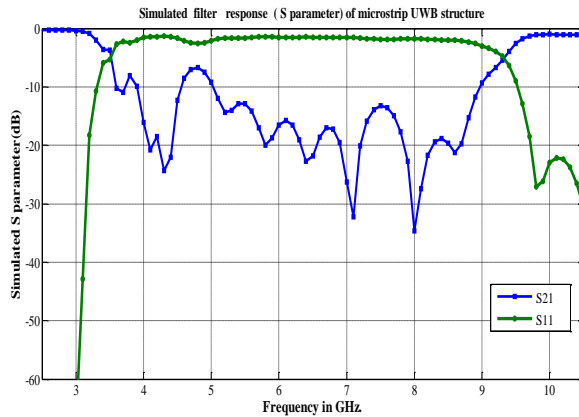


Figure 6. Simulated reflection & transmission characteristics of the UWB filter having five integrated ring in microstrip configuration.

## VII. PSO FITNESS FUNCTION

The reflectance and transmittance of the whole filter is optimized using PSO for FCC recommended UWB band from 3.1-10.6 GHz. The reflectance and transmittance of the integrated ring filter having five sections with different stub width and length are fed to PSO for bandwidth optimization of the same. A suitable fitness function for PSO is used considering maximum bandwidth and minimum return loss of the micro strip ring filter and is shown below.

$$\textbf{Fitness} = \sum_{i=1}^{N} T_i - \sum_{i=1}^{N} R_i$$

$$\textbf{T}_i = \textbf{max}\ (S_{21_i}, S_{21_D})$$

$$\textbf{S}_i = \textbf{min}\ (S_{11_i}, S_{11_D})$$

$$T_i = \ \in S_{21_D} \qquad \forall S_{21_i} \le S_{21_D}\ \&\ \forall S_{21_i} \ge S_{21_D}$$

$$\in \min(S_{21_i}, S_{21_D}) \quad \text{otherwise}$$

$$R_i = \in S_{11_D} \qquad \forall S_{11_i} \leq S_{11_D}$$

$$\in - S_i - \left| - S_{11_D} + S_i \right|^{Ki} \quad \text{otherwise}$$

Where the subscript i indicates different

n frequency points. N indicates the total number of simulated frequency points. $S_{11_D}$ (in dB), $S_{21_D}$ (in dB) are the design requirements for $S_{11}$ and $S_{21}$ respectively. The sign $\forall$ indicates that this operation is taken as soon □ as this condition is satisfied at all frequencies. $K_i$ is set to 1 for all test cases in order to reach an equally weighted sum of reflection coefficient and transmission coefficient. The possible maximum sum of all $R_i$ is $- S_{11_D}$ *N. It can be achieved if all $S_{11}$ i are smaller than $S_{11_D}$. The PSO algorithm is converged within 50 iterations with sufficient accuracy (Figure 7.). The optimized dimensions of the stubs controlling the resonance frequency of individual rings are used to fabricate the UWB filter and the frequency response of the same is also verified from MOM simulator. The optimized dimensions of geometrical parameters of the five section ring filter are tabulated in table III. The fabricated ring filter is shown in Figure 8.

The MOM simulation tools (IE3D) are used to verify the performance of this filter in terms of $S_{11}$ and $S_{21}$ of this

optimized wideband ring filter. It is observed that the design dimensions are critical in deciding the filter responses. The

ring dimension and stub width are optimized to meet the specification and accordingly final PCB design is generated.

## VIII. MEASUREMENT

The final filter layout is generated and fabricated using CER-10 using optimized dimension of the geometry parameters with best possible fabrication precession available. The final circuit after integration and packaging undergone for testing. The fabricated filter is measured for transmission and reflection performance with the help of Network Analyzer (E8363B). The measured attenuation and VSWR plot of the filter is shown in Figure (9.a-b). Measurement results shows good filter characteristic over the whole UWB band. The measured insertion loss over the band is 3.0 dB (average) and a 7.3 GHz filter passband from 4.41-10.29 GHz. with -10 dB return loss, and VSWR band width of 6.5 GHz is obtained. Measured results are compared with that of the simulated performance as shown in table IV. These results have indicated a very good agreement between simulation and measurements. This insertion loss can be further reduced using low loss substrate and SMA connectors. The fabrication process is required to be precise to improve this loss figure and to realize the full bandwidth for UWB operations. The mounting of the filters is required be rigid and full flatness of the substrate should be ensured to avoid surface wave loss. The other performance is seen to be satisfactory.
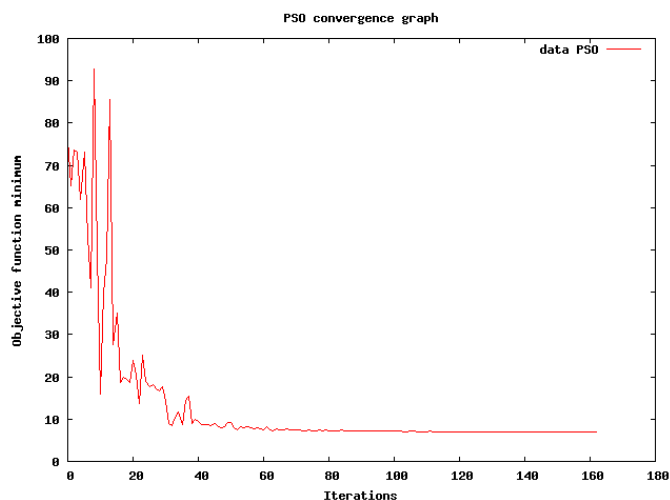


Figure 7. PSO convergence plot
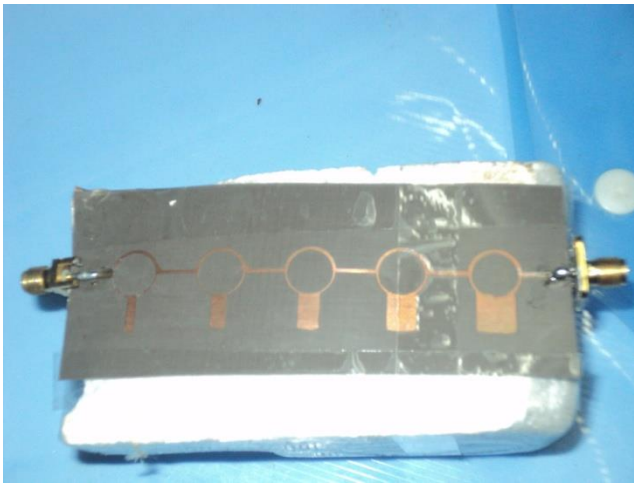
Figure 8. Fabricated ring filter in microstrip configuration.



**(a) Reflection measurement**



**(b) Transmission measurement**

Figure 9. Measured results of reflection and transmission characteristics of the UWB ring filter (a) Reflection measurement (b) Transmission measurement.

Table I Selection of Range of Input Parameters of Ring filter for ANN model

| Ring diameter | Characteristic impedan | Inter. ring | stub length mm. | stub width mm. |
|---|---|---|---|---|

| mm. | ce of ring ohm | separation) mm. | | |
|---|---|---|---|---|
| 0-7.0 | 5-150 | 0-14.0 | 8.0-25.0 | 0.5-4.0 |

Table II The accuracy of developed ANN model

| ANN Input/output parameters | Ring dia (mm) | Characteristic impedance of ring (mm.) | Inter ring separation (mm) | Stub length (mm) | Stub width (mm) |
|---|---|---|---|---|---|
| Training Average error | 0.01 0.05 | 0.5 0.5 | 0.1 0.3 | 0.05 0.5 | 0.003 0.03 |
| Testing Average error | 0.02 0.04 | 0.7 0.6 | 0.2 0.4 | 0.06 0.4 | 0.004 0.04 |

Table III Optimized dimensions of the ring filter (ANN-PSO model)

| Ring diameter) mm. | Characteristic impedance of ring in ohm | Inter ring separation in mm. | stub length mm. | stub width mm. |
|---|---|---|---|---|
| 5.6 | 50.0 | 10.0 | S1  8.5<br>S2  8.1<br>S3  8.0<br>S4  7.95 | S1 2.0<br>S2 3.03<br>S3 5.73<br>S4 |

| | | | S5  7.8 | 6.23 |
| | | | | |
| | | | | S5  8.2 |

Table IV Comparison table of the simulated and measured performance of the UWB ring filter

| Filter Parameter | Simulated | Measured |
|---|---|---|
| VSWR Bandwidth | 5..8  GHz | 5.88 GHz |
| Insertion loss | 4 dB | 3.0 dB(avg.) |

CONCLUSIONS

In this chapter an UWB microstrip BPF with low insertion loss is designed and optimized for its frequency response performance using PSO. Each individual ring resonator is associated with a quarter wavelength short-circuited stub for frequency tuning. A systematic design and realization of an UWB filter in printed circuit configuration is done using stub tuned ring shaped microstrip structure having single input and single output. The diameter of the ring is chosen according to the resonating frequency requirements and stub matching is used to tune the filter to the desired band of operation. Stub width, ring diameter, inter ring separation is taken as input design parameter for the ANN model. Five different ring resonators are integrated to form UWB filter where the geometrical parameters of the individual ring resonators are obtained from output of respective ANN model. Five sections are combined and optimized using PSO where reflectance and transmittance of the integrated microstrip ring filter is optimized for UWB frequency range from 3.1-10.6 GHz. In this process of optimization the physical dimensions of individual rings are altered and the filter as a whole becomes capable of efficient transmission for UWB band. Finally the final filter layout is generated and fabricated using optimized dimensions of the ring structure with best possible fabrication precession available. The S parameters of the fabricated filter is measured to verify the transmission and reflection performance of the same with the help of VNA and compared with that of the simulated performance as shown in table IV. These results have indicated a very good agreement between simulation and measurements.

So it can be concluded that ANN-PSO technique is efficiently utilized for design and development of one UWB filter having optimum frequency response. The insertion loss and measured bandwidth are near to that of the desired value and can be improved further with some precautions.

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# Handcrafted Shawls of Nagaland

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***Abstract-*** One of India's smallest states is also among its biggest conundrums. With a history as chequered and intriguing as its topography, Nagaland is yet to be explored. The state, with its diverse tribal culture, is a land of festivals and very rich textile tradition. In the textile history of India, the warrior shawls of Nagaland have a unique place and just like the way its counterpart the Scottish kilt has been preserved, there is immediate need and urgency to take care of the Nagaland shawls. We have sixteen major tribes in Nagaland and the warrior shawls of these entities vary a lot.

## I.    INTRODUCTION

**N**aga Shawl
One of the common features of the Naga shawl is that three pieces are woven separately and stitched together. In fact, the central stripe is more decorated than the other two, which generally have more or less the same pattern. The designs vary from a formal arrangement of lines to elaborate patterns of diamonds and lozenge shapes. Simple straight lines, stripes, squares and bands, varying in width colour and arrangement are the most traditional design and motifs. Each tribe has its own patterns with simple, clean lines, stripes, squares and bands being the most traditional design motifs.

**Naga Shawls and its Symbolism –**

The decorative warrior shawl "Tsungkotepsu", is one of the most characteristic cloths of the Aos. On a general dark base, the cloth has a median white band and on either side of it are horizontal bands of contrasting black, red and white. There are five or more broad red bands close together at the top and bottom, six narrow red bands close to the broad white median band. The median band is painted with a pattern in black which includes figures of mithuns, symbolizing wealth of the owner, elephant and tiger to symbolize valour of the man, human head representing the success in head hunting and a few other things like spear, dao and cock. This is an exclusive male shawl, which could be worn only by one who has taken heads in war or offered mithuns sacrifice. Men of Mulir and Mongsentsunger clans are forbidden to wear this cloth.



**Fig. 1 An Ao 'Tsungkotepsu' Shawl**

The "Chuchusubangsu" shawl can be worn by men of Mulir clan as of right. The cloth itself is red with very narrow dark blue bands and a broad white median band embroidered with large red lozenge. The blue bands indicate that the wearer has not only taken heads in war, but performed feast of merit.

Another shawl worn on festive occasions by men of wealth or the sons and daughters of wealthy men is "Aomelep su", in which dog's hair dyed red is woven in stripes of red, yellow and black alternating.

"Rongsu" shawl is one of the most decorative Ao cloths and the most difficult to earn the right of wearing it, for it can be worn only by a man whose grandfather and father or himself have done the mithuns sacrifice. The pattern consists of alternate narrow band of dark blue and red with an occasional light blue line. All over it are thick long bunches of red hair and it is edged at the end with black and red goat's hair tassels, each tassel being ornamented with cowries. Other shawls consist of "Tiongkong su" having each side of the centre a red band with black streaks but the central narrow breadth is woven of dogs hair dyed red and uncolored thread; "Tabensa su" having red and black stripes, but black predominant; "Lungkhum subang" with red edge on two sides, a white stripe in the centre, but main part black; "Bangmerem su" having red and white bands at the two sides and central part white; "Keyi su" with red and white stripes alternating.

Some of the important and popular Ao skirts include: "Azu jangnup su" mostly of red and black stripes with a little yellow in the black stripes. The poor may have only one design woven into each of the two breadths. The wife and daughters of a rich man may wear skirts having three or four designs woven into each of the two breadths. "Ngami su" or fish tail skirt is one in which certain dark colored threads are broken off at a certain place and short pieces of red thread are substituted, to give a fish tail look. "Yongzujangau" or cucumber seed skirt is woven in red on a

black background. The shawl is called so, as the designs on it resemble the seeds of cucumber.

Chakhesang shawls are very similar to the Angami tribe shawls, as Chakhesangs are actually the Eastern Angamis. "Khonoma Shawl", the most common warrior shawl of the Chakhesang tribe. The shawl has spear motif which signifies bravery in the war and hence is used in men's shawl only.

The "Mozaluo shawl" too is a warrior shawl and has spear motif woven on it. Also there is woven a motif similar to piece of flesh.

"Loramhoushu" is a cloth with white red and black bands and the one with black with red and yellow bands is called "Lohe". Chakhesangs has more number of bands in this shawl, when compared to the Angamis. Green stripes may now a day be often seen in these clothes, though no green dye is known to them, and fancy cloths are beginning to supplant the traditional patterns.

"Loramhoushu" is generally of one meter and 85cm long and one meter and 8cm wide with four black marginal bands close together on both the edges, each band about 2.5cm wide. On each of the black bands, there are narrow red lines.

The size of "Lohe" is also same as Loramhoushu and the breadth of the marginal red band is 2.5cms. Close to these red bands, there are narrow green bands and two narrow red or pink bands alternating one another at an interval of 2.5cms. This is also worn as skirt by women.

There is another white cloth with black and red border which may only be worn by men who have a high social standing owing to the number of gennas of a semi-public nature performed by them.

Lotha shawls are also of several patterns and indicate the number of social gennas performed by the wearer. The ordinary shawl of the Lotha is known as "Sutam", a white cloth with broad dark blue horizontal stripes worn by boys and men who have performed no social gennas. The "Phangrup shawl", a dark blue cloth, edged with broad bands of red with a broad stripe running across the middle of the cloth parallel with the red stripes. This shawl can be worn by a man who has performed the first social genna. The pattern of shawl used by the northern Lothas is slightly different from the one used in the south.



**Fig. 2 A Shawl of Lotha tribe**

A northern Lotha, who has performed both the first social genna and the head taking ceremony wears a cloth namely "Chamthe", which is exactly like the "Phangrhup", except that the median band is pale blue instead of white. There is no

particular cloth awarded for the performance of the second social genna, but the southern Lothas wear a cloth called "Ethasu" after performing the third social genna and is a dark blue cloth with four red bands at each of the two edges.

A man who has completed the series of social genna by dragging a stone wears a handsome cloth called "Lungpensu", which is a dark blue with five bands of light blue about one inch broad, and three pairs of narrow lines of light blue at two edges. A man who has dragged a stone more than once has four or even five narrow lines in his cloth which is called "Eshamsu".

The skirt of an unmarried girl is a plain dark blue one. On marriage, she wears a pretty skirt called "Loroesu", dark blue with big squares of narrow white and red lines giving a sort of tartan effect.

## II. CONCLUSION

Of late the Naga elders no longer insist on strict observations of the code for wearing particular shawls, as the era of head hunting and tribal fights to show their valour is no longer in vogue. There is such a great demand from tourists for the Naga Shawls, but unfortunately so far none of the designs have been certified and retained as an exclusive possession of the tribe and which is their collective intellectual property. Hence there is a need to preserve and patent the shawls of Nagaland and bring its richness to the outside world.

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# Constraints and Stress level of Farmers

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**Abstract-** The studies were conducted in Akola district of Maharashtra state to assess the constraints and stress level of the farmers. The survey was based on the 171 farmers from 96 villages. The operational area of the research activity covered the Akola district of Vidharbha region of Maharashtra state. The present study was conducted in 96 villages of Akola district. The villages as well as the farmers were selected randomly. On having completed data sheets through one to on einterviews of the respondent farmers, it was subjected to processing to get categorical details on number of farmers under various categorical constraints involving of personal, natural technological and economic constraints.

The results revealed that almost all the farmers were exposed to the varying degrees of the constraints as well as stress levels. Among the various constraints Natural and Economic Constraints were of major concern.

*Index Terms*- Farmers, constrains, stress

## I. INTRODUCTION

Agriculture has always been celebrated as the primary sector in India. India is an agrarian economy, which means, agriculture is the pre-dominant sector of the Indian economy. True to this, even to this day, in spite of the Indian economy opening out to the world and globalization, close to 70% of the population still depends on agriculture for its livelihood. Despite a steady decline in its share to the Gross Domestic Product (GDP) agriculture remains the largest economic sector in the country. The very nature of farming itself is the cause of many strains for farming families. Farming can be an isolating profession, as farmers traditionally work long hours, outside, often in bad weather and alone. An individual whose primary job functions involves livestock and agriculture. A farmer takes all the necessary steps to insure proper nourishment of the attempts that he raises and then sells the items to purchasers. Some farmers have been able to capitalize on the need for high demand products that they produce such as organic vegetable and livestock. An NFU survey in 1999 showed that 62% of farmers were working for more than 61 hours a week. A spokesperson for the Samaritans, which handles many calls from stressed farmers, says: 'There is the fortress farming mentality – work is home and home is work. There is nowhere to get away from it all – nowhere to escape from the same mindset.'

An additional stress for many farmers is the speed of change within the industry over the last 10 years. Now government and EEC regulations have brought with them mountains of paperwork which many farmers find stressful. At the same time, farming families have faced critical public opinion and press coverage in recent years. Caroline Davies, director of the Rural Stress Information Network (RSIN), says: 'Farmers are at a very vulnerable stage, they are exposed to a lot of criticism, and they do feel that society is against them.'

James Morrish, development officer for the RSIN in the south west, says calls for help have fallen since foot and mouth disappeared. But he still receives between 50 and 60 calls a day from farm workers seeking advice. Isolation is the biggest problem, with economic difficulties and animal health regulations are also causing pressures. A state of stress exists when unusual or excessive demands threaten a person well being or integrity. Extraordinary efforts are needed to master the situation and there is the danger that coping capacities will be overwhelmed with the consequence of disturbed functioning ,pain or anxiety , illness or even death. Stress defined neither by the person (coping resources ego strength etc.)Nor by his reactions (stress responses, but rather by the inter play of the three.)

Stress can originate in physiological, psychological and social condition and threaten the integrity of in its body the personality or the social system. Threat can disturb psychological well being and psychological functioning. Social institutions produce psychological stress.

## II. COPING WITH STRESS IN FARMING

No matter how stressed farmers feel, they can't just call in sick. 'Practically, even if you are in the worst state of stress and shock, you still have to go outside every day, feed the sheep, milk the cows and tend to the animals,' says Brian Warren, a dairy farmer in Devon and a representative of the Farm Crisis Network which helps farming families who are experiencing problems. This culture of just getting on with things can mean that stress goes ignored. And it is not just the farmers themselves who take the brunt of the strain, but also wives and families.

Often, says Caroline Davies of the RSIN, it is the women who make the first move to deal with the situation. 'With the men, the initial problem is getting them to speak. It is women who will pick up the phone and talk when they are under stress,' she says. Many calls to the RSIN come from women worried about their husbands or partners, who just won't talk about things, she adds.

Talking to someone is always the first important move towards coping, The Samaritans advice. 'The burden of uncertainty and distress caused by another setback can be overwhelming. Talking to someone can be the first step forward,' says a spokesperson. There are several organisations dedicated to helping farmers cope with stress and providing stress counselling. Two of those organisations, the Farm Crisis Network and the Royal Agricultural Benevolent Institution, suggest the tips to help farmers cope.

"Often, when we talk about sustainable agriculture, it is sustainable in terms of products and economics not in terms of people". We would like to see attention given to the sustainability of the people in the agricultural community. The large number of the population of the developing countries comprises small farmers and landless labours. For these farmers who are tied to subsistence levels of living considering their small size of the holding, monoculture cannot increase their income through crop development alone. Many small farmers are faced lots of constrains. The stress level depends upon the constraints of farming.

Some constraints are as follows.

1) Lack of electricity and irrigation water.
2) Lack of knowledge about improved farm techniques.
3) Lack of labour for performing farm operations.
4) Uncertainty in farm income due to weather hazards.
5) Low price returns from farm produce.
6) Inadequate and untimely availability of crop loans.
7) Insufficient capital availability.

The most important but not least is debts. In which the farmer takes the birth in debts and die in the same condition. The economic condition in the agricultural industry are a major source of stress for Canadian farmer and their families and affects almost every face/ off farm lives. The stress resulting from adverse economic condition has been ongoing for some time and continues to exist with pervasive effects on farm health and safety. This culture of just getting on with things can mean that stress level goes ignored and it is not just the farmers themselves who take brunt of the strain, but also wives and families.

Unstable and adverse economic conditions with the agricultural industry are not new. For a number of years, Canadian and vidarbha region small farmers have experienced high level of stress arising from a number of sources, including high input cost, low market return, uncertain markets and unfavorable weather conditions. These factors have had an impact on income, debt and asset values in the industry. Farmers perceived debt, addiction, environmental problems, poor prices for farm produce, stress and family responsibilities, government apathy, and increased cost of cultivations. Private money lenders, use of chemical fertilizers and crop failure as the reasons for farmers suicides.

The literature reveals the worldwide condition of farmers. In India, the constraints factors of farmer might be different as they are in more vulnerable situation. Hence, this study deals with following objectives.

**Objectives:-**
1) To find out the constraints of farmers.
2) To find out the stress level of farmers.
**3)** To compare constraints and stress level of farmers.

**Methodology:-**
- Locale of the study-The study was conducted in the Akola District.

96 villages were selected for data collection in Akola District..

- Research design: An Exploratory Research methods and survey method was used.
- Sample and sampling: Representative samples of 171 farmers from many villages in Akola district were selected.
- Sampling Procedure: Quiestionarries and interview methods were used to collect samples.

**Variables:** (A) Independents variables
1) Age.
2) Gender.
3) Education.
4) Family members.
5) Family economic condition.
6) Type of land and area of land.
(B) Dependent variables:
1) Constraints of farmers.
2) Stress level of farmers.

**Tool for data collection**
1) Preliminary information was taken with the help of Questionnaires.
2) Stress level in farmers was measured with "stress scale tests" by
Dr. M Singh.

III. RESULTS AND DISCUSSION

**1) Constraints:** Data on constraints faced by respondent farmers are presented in the following table.

**Table No. 1: Constraints**

| Sr. No. | Total constraints | Distribution of Respondent Farmers | |
|---|---|---|---|
| | | No of Respondents | Percentage |
| 1 | High-level (57-above) | 25 | 14.61% |
| 2 | Medium level (29-56) | 146 | 85.39% |
| 3 | Low level (0-28) | 0 | 0% |
| | | 171 | 100% |

The Data presented in Table no.1indicated the number of the respondent Farmers under different level of constraints. As regards the total constraints, it was further noticed that the highest number of respondent farmers (85.39%) had a medium level of constraints followed by (14.6%) of the farmers having high level of constraints. No farmer was with a low level of constraints.
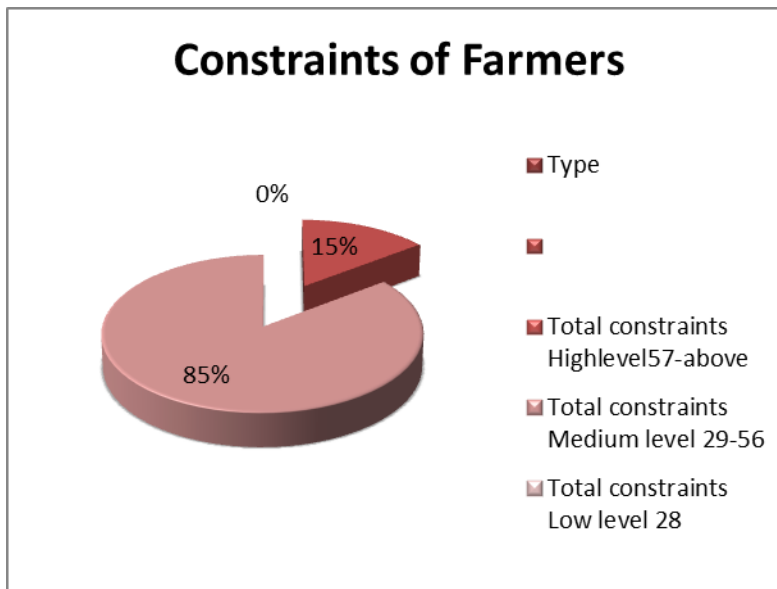


**1.2)**

**1.1) Types of Constraints:** The data on number of respondent farmers on the basis of Types of constraints are presented in the following table.

**Table no. 1.1: Types of Constraints**

| Sr.No.1 | Personal constraints | | |
|---|---|---|---|
| 1.1 | Less education | 18 | 10.54% |
| 1.2 | Bad habits | 23 | 13.45% |
| 1.3 | Big family | 38 | 22.22% |
| 1.4 | Less land | 77 | 45.02% |
| 1.5 | Sawkar\Private money lenders | 15 | 8.77% |
| | Total | 171 | 100% |
| Sr.No.2 | Natural constraints | | |
| 2.1 | Adverse weather condition | 33 | 19.24% |
| 2.2 | Saline water belt | 78 | 45.61% |
| 2.3 | Non irrigation | 55 | 32.16% |
| 2.4 | Labour problem | 5 | 2.94% |
| | Total | 171 | 100% |
| Sr. No.3 | Technical constraints | | |
| 3.1 | Non availability of seeds | 45 | 26.35% |
| 3.2 | No. availability of fertilizer and pesticides etc | 40 | 26.35% |
| 3.3 | No transfer facility | 10 | 5.84% |
| 3.4 | No storage &market facility | 20 | 11.69% |
| 3.5 | Lack of aware Ness of modern  Technology | 56 | 32.78% |
| | Total | 171 | 100% |

| Sr.No.4 | Economic Constraints | | |
|---------|----------------------|-----|--------|
| 4.1 | Low annual income | 35 | 20.49% |
| 4.2 | Low quality of farm | 20 | 11.69% |
| 4.3 | Low price at harvesting time | 75 | 43.85% |
| 4.4 | Down market | 41 | 23.97% |
| | Total | 171 | 100% |

The farmers are exposed to different types of constraints such as personal, natural, technical and the economical. The data presented in table no. 1 revealed that the low farm holding and the bad habits were major personal constraints. They contributed to the personal constraints to the extent of 45 and 22 percent, respectively. The natural constraints like salinity 45 %, non availability of quality irrigation water 32 % and aberrant weather conditions were of major concern. The technical constraints comprised of the lack of awareness of modern technology and different schemes 32 % followed by the non availability of inputs like quality seeds 26 % and fertilizers, insecticides, pesticides etc by 23 %. The economic constraints constituted the low prices for farm produce 43 % and the market availability 23 %. As regards the total constraints, it was further noticed that the highest number of respondent farmers (85.39%) had a medium level of constraints followed by (14.6%) of the farmers having high level of constraints. No farmer was with a low level of constraints.

**2) Stress:**

The respondent farmers were grouped in to different levels of stress conditions. The relevant data are presented in the following table.

**Table No. 2: Stress**

The perusal of the data presented in table 2 indicated that 21.o6 % of the respondent farmers were under severe stress while 17.53 % faced the high level of stress. The moderate and low stress levels were observed in 21.06 and 20% farmers,

| Sr. No. | Level of stress | Distribution of Respondent Farmers | |
|---------|-----------------|----------------------|------------|
| | | No. of Respondents | Percentage |
| 1 | 57above (Severe state) | 36 | 21.06% |
| 2 | 47-56 ( High state ) | 30 | 17.53% |
| 3 | 37-46 (Moderate state) | 36 | 21.06% |
| 4 | 27-36 (Low state) | 33 | 19.29% |
| 5 | 0-26 (Very low state) | 36 | 21.06% |
| | Total | 171 | 100% |

respectively. A few number of farmers >20% exhibited a very low level stress. It is observed from the finding that the level is found in most of the farmers may be in varied severity.
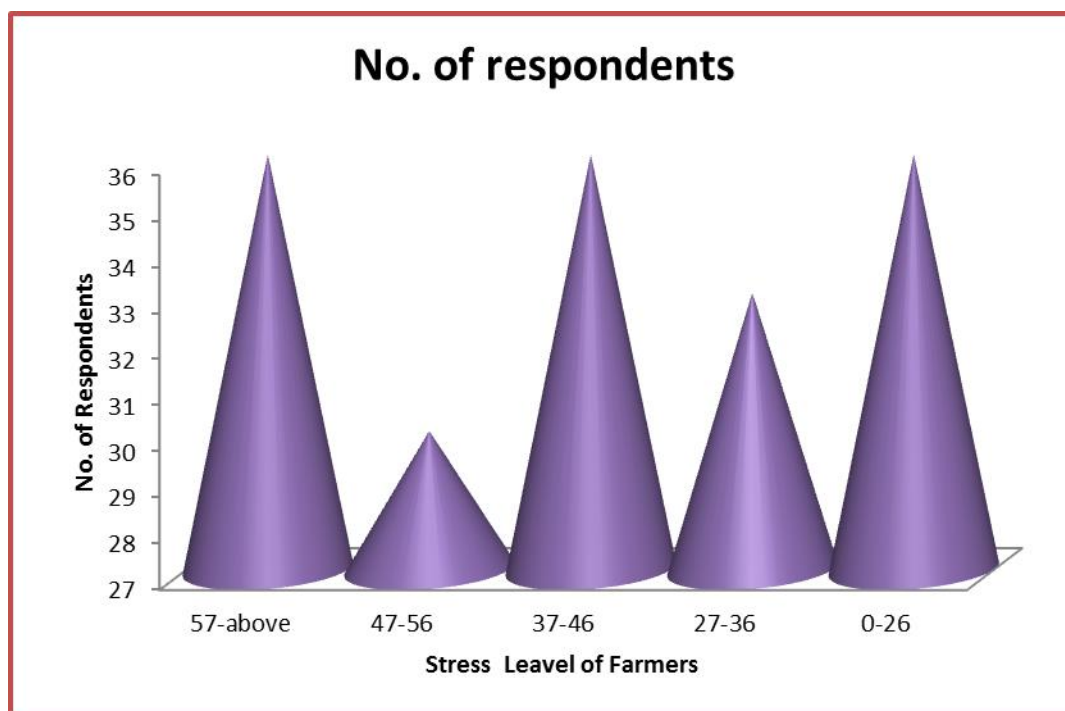


The studies made by Dongare and Deshmukh 2008 also revealed that the farmers suicides ib Vidharbha are caused by the complex interplay of personal political natural economic and technical constraints leading to indebtedness of farmers.

## IV. CONCLUSION

- Almost all the farmers are put under constraints. However, the majority of them (85 .39 %) were found to have a moderate level of constraints while > 14 % exhibited a high level of constraints.

- The personal constraints like low land holdings and the big family size were found to be the major. The lack of irrigation and aberrant weather conditions were the most important natural constraints.

- The low market prices for the farm produce during harvest period appeared to be the most important constraint for the farmers.

- The technical constraints comprised of the non availability of the major inputs like seeds, fertilizers, insecticides and pesticides on time. The lack of awareness of modern technology also appeared to be equally important technical constraint.

- The high level and a very severe stress levels were noted in case of 13.45 and 2.92 per cent farm families, respectively

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# "Free hand Image Control System"

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**Abstract-** As the personal computing industry pursues more user friendly, inexpensive user interfaces the concept of a touch less interface is worthy of inspection. Touch less is an SDK (software development kit) that allows users to create and experience multi-touch applications. The main idea is to offer users a new and cheap way of experiencing multi-touch capabilities, without the need of expensive hardware or software. All the user needs is a camera, which will track colored markers defined by the user.

This next generation input technology allows the user to navigate without touching the surface. Computers are no longer relegated to use in the home study or on an office desk. These days people travel everywhere with their smart handsets, personal media players, e-books and tablet PCs. Coffee shops, restaurants, gyms, bus stops, plane terminals and even lavatories are fair usage environments for this new generation of touchless interface. If a customer is reading an e-book at the gym while on a treadmill and wants to turn a page, it would be a much easier to swipe across the device with a touchless gesture. A touch less interface can allow an automobile driver to safely adjust volume with the touch less swipe of hand without having to navigate through a complicated instrument cluster to find control buttons. The day will soon come when even the most commonplace home appliance, handheld devices, computing platform and industrial interface can be activated and controlled with the wave of a hand.

*Index Terms*- marker, touch less interface, HSV colorspace

## I. Introduction

As the personal computing industry pursues more user friendly, inexpensive user interfaces the concept of a touch less interface is worthy of inspection. Touch less is an SDK (software development kit) that allows users to create and experience multi-touch applications. The main idea is to offer users a new and cheap way of experiencing multi-touch capabilities, without the need of expensive hardware or software. All the user needs is a camera, which will track colored markers defined by the user. This next generation input technology allows the user to navigate without touching the surface.

Human-machine interaction has evolved significantly over the past decade through enhancements in user interfaces and smart design. Many of these changes have focused around touchscreen interfaces with high-precision, low-power capacitive touchscreens at the forefront particularly in the handset market. Now, through advancements in human interface (HI) technology and design, touch less gesturing is poised to usher in the next user interface innovations. Not all devices have or need complex graphical displays with touchscreen either, and for such devices a touch less interface can provide an innovative and differential approach for operation.

Small scale video advertising billboards within public spaces can change the context of their messages based on whether someone is near or far away and then use touch less gesture input to interact with the potential customer. Such "environment aware" electronics can enable smarter end-products that are simultaneously more energy-efficient.

## II. ANALYSIS AND DESIGN

We designed our project and made a descriptive class diagram showing all the classes with its properties and methods.
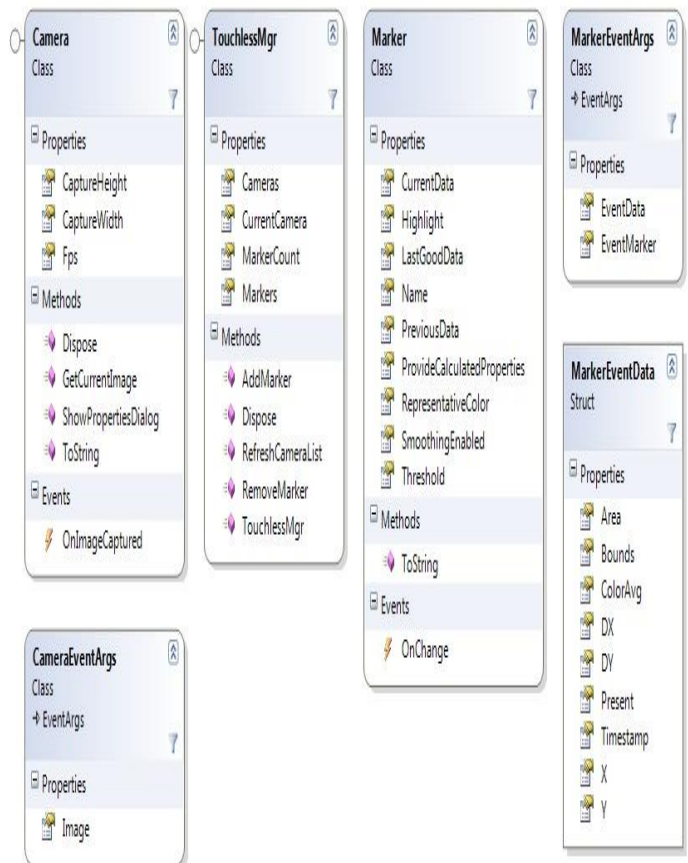


Fig. 1. Class diagram

MODULE 1: CAMERA

Improve HSV colorspace partitioning model. We could group perceived similar colors better. Potentially replace with a group clustering algorithm. Perhaps just refine the per-dimension bin counts, or replace the hash function. Use a lookup table instead of transforming RGB to HSV. We can just terminate early if it's not in the lookup table. Reduce loop overhead of converting ARGB values into RGB values, then into HSV values, then into Binned HSV values, then finally into a hash # for color lookup during marker update. Potentially use a lookup table for a subset of colors to avoid the math altogether. Improve HSV color grouping , consider refining the per-dimension bin counts or using a different HSV color-space partitioning model that better suits human perception of similar colors.

## MODULE 2: TOUCH LESS MGR

Add functionality to save and load marker configuration files (reduce repeat training of the same marker, possibly provide auto configured files for standard markers will variant lighting allow for this).Implement additional marker data such as ColorAverage, ColorSpace, Axis and Roundness. Add flood fill algorithm so we can add a marker with a few points in the Bitmap. Refine the marker tracked colors as we find colors around the marker. The representative color doesn't always match the perceived color of the marker. Provide subsequent examples of a marker appearance. Let Touch less Mgr actually expose a way to get a list of the current markers. Make a better exception for camera start failure. Validate the Pixel format of incoming images. Create a utility function to retrieve image data in a consistent manner, we have a bit of code duplication right now. Make a public interface for demo classes to implement and then allow the user to just invoke start and stop of a demo class on the library. Standardize error handling and exception generation across the project.

## MODULE 3: MARKER

Implement a way of getting higher degree moments of inertia. Mostly, we are interested in the axis of least rotational momentum and the roundness factor. Allow the user to send a mask image with the add marker bitmap for arbitrary marker region selections. Extend or replace alpha smoothing with exponential decay to provide smoothed marker data and reduce the marker jumpiness. Optimize threshold, or replace threshold concept with a partial matching. Also, step threshold by numbers that actually make a difference, or just have sensitivity +/- buttons and increment functions. Expose smoothing factor as a public marker property. Fix and improve the automated marker tests. Standardize some marker colors, create an "auto-find

makers". Also improve the meta-tracking (cases where small numbers of pixels are missing from the middle of a marker, or are outliers of the concentration of pixels). Periodically/continuously adopt surrounding pixels of confirmed marker pixels. Coloravg is currently just marker representative color. Implement a way of actually getting a color average from the set of colors found. Improve Marker highlighting. Improve upon the raster scan algorithm used for marker updating. Optimize the method for getting the marker appearance from a circular area of a bitmap, we could use hierarchical bounds intersection or something smarter than the current scan algorithm. Optimize the values used to increment/decrement color frequencies for marker appearance detection. This should be somehow based on signal/noise ratios. Improve the expected marker regions used for scanning on update. We could consider the marker's acceleration, rather than just the velocity. Perhaps try using regions that aren't axis-aligned rectangles.

## SUB-MODULES:

## SCROLL

In computer graphics applications such as filmmaking, television production, and other kinetic displays, **scrolling** is sliding text, images or video across a monitor or display. "Scrolling", as such, does not change the layout of the text or pictures, but incrementally moves (pans or tilts) the user's view across what is apparently a larger image that is not wholly seen. A common special effect is to scroll credits, while leaving the background stationary. **Smooth scrolling** is a feature to reduce what the viewer would perceive as "jumps" (discontinuous movement) in the display. The computational effort of moving images and video smoothly is high , therefore successful smooth scrolling in text is most common. Frame rate is speed at which an entire image is redisplayed. It is related to scrolling, in those changes to text and image position can only happen as often as the image can be redisplayed. When frame rate is a limiting factor, one smooth scrolling technique is to blur images during movement that would otherwise appear to "jump".

## RESIZE

In computer graphics, **image scaling** is the process of resizing a digital image. Scaling is a non-trivial process that involves a trade-off between efficiency, smoothness and sharpness. As the size of an image is increased, so the pixels which comprise the image become increasingly visible, making the image appears "soft". Conversely, reducing an image will tend to enhance its smoothness and apparent sharpness.

Apart from fitting a smaller display area, image size is most commonly decreased (or sub sampled or down sampled) in order to produce thumbnails. Enlarging an image (up sampling or interpolating) is generally common for making smaller imagery fit a bigger screen in full screen mode, for example. In "zooming" an image, it is not possible to discover any more

information in the image than already exists, and image quality inevitably suffers. However, there are several methods of increasing the number of pixels that an image contains, which evens out the appearance of the original pixels. zoom is a method of decreasing (narrowing) the apparent angle of view of a digital photographic or video image. Digital zoom is accomplished by cropping an image down to a centred area with the same aspect ratio as the original, and usually also interpolating the result back up to the pixel dimensions of the original. It is accomplished electronically, with no adjustment of the camera's optics, and no optical resolution is gained in the process.

When comparing the image quality achieved by digital zoom with image quality achieved by resizing the image in post-processing, there's a difference between cameras that perform potentially lossy image compression like JPEG, and those that save images in an always lossless Raw image format. In the former case, digital zoom tends to be superior to enlargement in post-processing, because the camera may apply its interpolation before detail is lost to compression. In the latter case, resizing in post production yields results equal to or superior to digital zoom. Some digital cameras rely entirely on digital zoom, lacking a real zoom lens, as on most camera phones. Other cameras do have a real zoom lens, but apply digital zoom automatically once its longest focal length has been reached. Professional cameras generally do not feature digital zoom.

## ROTATE

The rotation operator performs a geometric transform which maps the position $(x_1, y_1)$ of a picture element in an input image onto a position $(x_2, y_2)$ in an output image by rotating it through a user-specified angle $\theta$ about an origin $O$. In most implementations, output locations $(x_2, y_2)$ which are outside the boundary of the image are ignored. Rotation is most commonly used to improve the visual appearance of an image, although it can be useful as a preprocessor in applications where directional operators are involved. Rotation is a special case of affine transformation.

The rotation operator performs a transformation of the form:

$$x_2 = cos(\theta) * (x_1 - x_0) - sin(\theta) * (y_1 - y_0) + x_0$$
$$y_2 = sin(\theta) * (x_1 - x_0) + cos(\theta) * (y_1 - y_0) + y_0$$

where $(x_0, y_0)$ are the coordinates of the center of rotation (in the input image) and $\theta$ is the angle of rotation with clockwise rotations having positive angles. (Note here that we are working in image coordinates, so the y axis goes downward. Similar rotation formula can be defined for when the y axis goes upward.) Even more than the translate operator, the rotation operation produces output locations $(x_2, y_2)$ which do not fit

within the boundaries of the image (as defined by the dimensions of the original input image). In such cases, destination elements which have been mapped outside the image are ignored by most implementations. Pixel locations out of which an image has been rotated are usually filled in with black pixels.

### III.APPLICATIONS

A valid challenge to touch less interfaces is why they should be implemented at all. Why do away with tactile buttons and touchscreens if they work? Infrared systems are not going to replace existing systems, but instead they are going to augment the user experience. Increased integration and miniaturization are changing the way customers use electronics products. No longer are "computers" relegated to use in the home study or on an office desk. These days people travel everywhere with their smart handsets, personal media players, e-books and tablet PCs. Coffee shops, restaurants, gyms, bus stops, plane terminals and even lavatories are fair usage environments for this new generation of embedded electronics. In such diverse operating environments, users' hands are sometimes occupied, dirty, sweaty or covered in food -- all conditions not conducive to touchscreen operation. If a customer is reading an e-book at the gym while on a treadmill and wants to turn a page, it would be a much easier to swipe across the device with a touch less gesture to turn the page rather than physically contacting a touchscreen or hunting down a small button For example, a touch less interface can allow an automobile driver to safely start/end a call or adjust volume with the touch less swipe of a hand without having to navigate through a complicated instrument cluster to find control buttons. Not all devices have or need complex graphical displays with touchscreens either, and for such devices a touch less interface can provide an innovative and differentiated approach for operation.

### IV.FUTURE SCOPE

No longer are "computers" relegated to use in the home study or on an office desk. These days people travel everywhere with their smart handsets, personal media players, e-books and tablet PCs. The Touch less SDK is a set of .Net components that can be used to simulate the gestural interfaces of many devices using nothing fancier than an ordinary USB Webcam. Mouse movements and mouse click movements can be developed and these can be implemented for various gaming application. If the sensor could be made small enough, it may even find its way into cell phones and mobiles. The technology requires no special hardware and uses the standard camera that is already built into the advanced models to control functions and applications such as calls, music and video players, games, web browsing and other usability options.

### V.CONCLUSION

Human-machine interaction has evolved significantly over the past decade through enhancements in user interfaces and smart design. Many of these changes have focused around touchscreen interfaces with high-precision, low-power capacitive touchscreens at the forefront particularly in the handset market.

Now, through advancements in human interface (HI) technology and design, touch less  gesturing is poised to usher in the next user interface innovations. And the day will soon come when even the most commonplace home appliance, handheld devices, computing platform and industrial interface can be activated and controlled with the movement of a hand.

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# Incidence of Viral Hepatitis in Thalassemic Patients As A Consequence Of Multiple Blood Transfusions

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ABSTRACT: There are many blood borne transfusion transmitted diseases. The most common among them is undoubtedly viral hepatitis B and hepatitis C. Patients with the history of multiple blood transfusions are at much greater risk of infection by contaminated blood products. Thalassemia major is one such condition where repeated blood transfusions are required. In our study a total of 218 patients were screened for Hepatitis B surface antigen and HCV antigen in their serum. 08 (3.66%) were found to be HBsAg positive and 18(8.25%) patients were found to be HCV positive by third generation ELISA technique. This was compared to the data of donor population which were considered healthy at the time of blood donation. HBsAg seropositivity was 1.98% and HCV seropositivity was 1.09% in this population. This result clearly indicates high incidence of transfusion transmitted hepatitis in thalassemic patients and much higher incidence of HCV infection compare to donor population is a matter of concern and research.

## I. INTRODUCTION

Thalassemia describes a group of inherited disorders characterized by reduced or absent amounts of hemoglobin, the oxygen-carrying protein inside the red blood cells. Thalassemias are classified according to the globin that is affected, hence the names *alpha* and *beta* thalassemia. Beta thalassemia may be the most well-known type of thalassemia and is also called Cooley's anemia. Beta thalassemia major usually causes severe anemia that can occur within months after birth. If left untreated, severe anemia can result in insufficient growth and development, as well as other common physical complications that can lead to a dramatically decreased life-expectancy. Fortunately, in developed countries beta thalassemia is usually identified by screening in the newborn period, before symptoms have developed. Children who are identified early can be started on ongoing blood transfusion therapy as needed. Individuals with beta thalassemia major receive regular blood transfusions, usually on a monthly basis. This helps prevent severe anemia and allows for more normal growth and development. Transfusion therapy does have limitations. Although blood supplies in most part of the world are very safe, particularly relative to the past there remains an increased risk of exposure to such blood-borne infections as hepatitis. Most deaths caused by blood transfusion worldwide are due to the transmission of infectious agents: viruses, bacteria or protozoa.

Evolving suburban wilderness and global travel ensure the emergence and spread of 'new' blood borne pathogens .Microbial adaptation, climate and weather changes, war and famine and the specter of bio-terrorism all raise the concern of emerging infection threats to the blood supply. The agents responsible share the following characteristics: persistence in donor's bloodstream, giving rise to carrier or latent states, a susceptible recipient population, the ability to cause asymptomatic infections, stability in stored blood and in many cases in plasma fractions .Ideally, blood for transfusion should either be tested for all pathogens that are prevalent in a given population and cause serious disease or treated to inactivate all such pathogens. In practice neither is possible. (Mollison et al 1997) Hepatitis B (HBV) and hepatitis C virus (HCV) are transmissible by the parenteral route and may be found in blood and other body fluids. From the bloodstream, the viruses travel to the liver where they replicate in hepatocytes, resulting in an acute or chronic liver infection. (Dodd RY. 2007)

## II.   MATERIALS AND METHODS

A group of 121 patients suffering from beta thelessemia at K.T. Children Hospital, Rajkot initially included   in the study. At the end of the study we have registered 218 patients.

These patients had been receiving blood transfusions regularly at K.T. Children Hospital

from 2005 till the end of the study period. Patients who had received at least 2 previous blood transfusions were included for serological follow up for 5 successive years. Transfusion and clinical records of all patients were maintained. About 3 ml serum sample was collected before transfusion during a specific period (March-April-May) of each year and samples were preserved.

**Serological study**: Frozen samples were tested after the study period for various viral markers in the same laboratory by one person using the same batches of reagents and kits. Tests were carried out by commercially available, third generation, enzyme linked immunosorbent assay (ELISA) for the following TTD markers: (i) HBsAg (Microscreen HbsAg ELISA Test Kit by Span Diagnostics) (ii) antibodies to HCV (SP- NANBASE C-96 3.0 test kit by General Biological Corp.)

## III.   RESULTS AND DISCUSSION

Present study was conducted to observe incidence of viral infection in thalassemic patients who received multiple blood transfusion in and around Rajkot city. Rate of viral infections among thalassemic patients were compared with incidence of these infections in donor population. Table 1 shows prevalence of viral infections in thalassemic patients at the beginning of the study in 2005 the rate of infection was out of 121 only 04 were HBsAg Positive and 07 were HCV Positive while in 2010 out of 218 patients 8 were HBsAg positive and 18 were HCV Positive. Rate of HBsAg positivity among donor population is 1.71% in 2005 and 1.98% in 2010 while HCV seropositivity was 0.87% at the beginning of the study and 1.09% at the end the study (Figure 1).Rate of HBsAg seropositivity in thalassemic patients was 3.3% initially and 3.66% at the end of the study while it was 5.78% in 2005 and 8.25% in 2010 for HCV marker. (Figure2).

Rate of HBsAg seropositivity among blood donors vary from 0.40% (Graves and Biswas, 1973) to 17.70% (Talib, 1983). It was found to be varying from 2.0% (Chakravarti, 2005) to 13.8% (Mollah A.H., 2003) in patients suffering from thalassemia.

Rate of Hepatitis C infection was found to be varying from 0.74% (DeSilva, 1998) to 2.4% (Khan M., 1993) in blood donors while it was between 5.1% (Samimi-Rad K. 2007) to 19.3% (Mirmomen S., 2006) in thalassemic patients which is comparable to our data.

Hepatitis B virus infection is a major cause of morbidity and mortality in humans and it is endemic all over the world. (Blumberg, 1965) About 350 million people of the world are infected with this virus (Lee, 1997). Hepatitis B virus is major cause of chronic hepatitis, cirrhosis and hepatocellular carcinoma especially in Asian countries. (Tabore et al 1980)

Hepatitis C virus first identified in 1989, was major cause of non-A, non-B hepatitis. Hepatitis C Virus has been identified as an important etiological agent responsible for transfusion associated hepatitis and accounts for about fifty percent of the sporadic cases of non-A, non-B hepatitis (CDC, 1991).

Around 100 million people worldwide are estimated to be infected with HCV. Chronicity occurs in about 80% of infected patients. The health burden of chronic hepatitis C infection in the western world is gradually being realized. In most Asian countries, Hepatitis B virus is still the major cause of chronic liver disease and hepatocellular carcinoma. In Japan, the pattern is changing in the past decades and now HCV is the predominant cause of HCC. A comprehensive assessment of HCV infection in Asia is important. Any

factor or activity that increases the risk of transmission must be identified and built into strategy for infection control. This is particularly vital when effective HCV vaccine is not available. ( Serin and Kunio 2002).

Risk of infectious complications due to blood transfusion is a major concern. Number and types of microbial infections depend on variety of factors as discussed. In developing countries like India where medical facilities are sporadic and not up to the best of the standards such incidences are obviously high. The risk is increased manifold if a person receives multiple blood transfusions.

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*Graph 1*
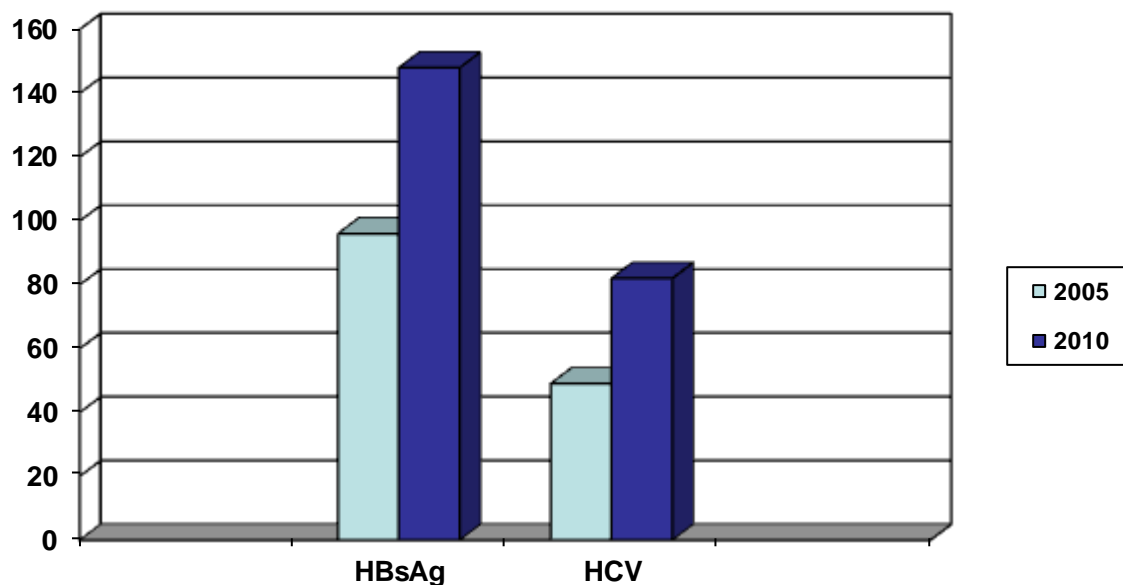
*Donor's Status*

**Table 1**

| Year | Total | HBsAg +Ve | % | HCV +Ve | % |
|------|-------|-----------|---|---------|---|
| 2005 ( at the beginning of Study | 5586 | 96 | 1.71% | 49 | 0.87% |
| 2010 ( at the end of Study) | 7458 | 148 | 1.98% | 82 | 1.09% |

<u>**Graph 2**</u>

**Prevalence of viral infections in Thalassemic patients**
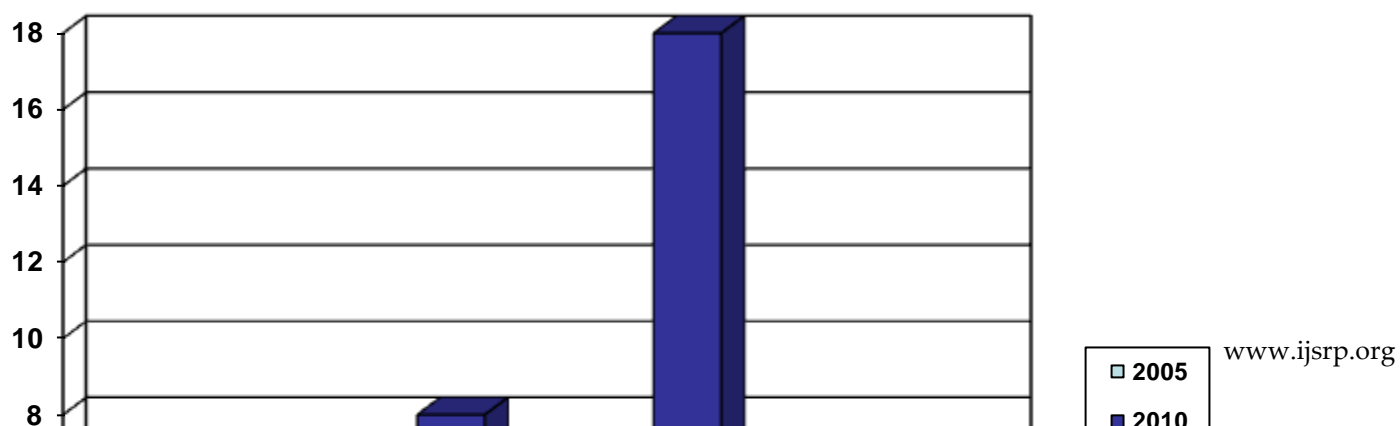
**Table 2**

| Year | Total | HBsAg +Ve | % | HCV +Ve | % |
|---|---|---|---|---|---|
| 2005 ( at the beginning of Study | 121 | 04 | 3.3% | 07 | 5.78% |
| 2010 ( at the end of Study) | 218 | 08 | 3.66% | 18 | 8.25% |

# Studies on the Quality of Grapevine Berries Sprayed With Copper Fungicide

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   **Abstract:** Studies were carried out by the grapevine berries sprayed with copper hydroxide (Kocide 3000) to assess its quality in terms of reducing sugars, non reducing sugars, total sugars and acidity. The total, reducing and non reducing sugars were higher in the grapevine berries sprayed with Copper hydroxide comparing with that of control plots. Fruit quality was improved in Copper hydroxide (Kocide 3000) treated plots when compared to control. The plots receiving 450 g a.i ha$^{-1}$ recorded 25.43 per cent increase in total sugar over control. It attributes that copper hydroxide apart from managing downy mildew pathogen, it improves quality of grapevine berries fetching higher market rate.

   **Index Terms:** Acidity- Copper hydroxide- Grapevine- Quality – Sugars

## I. INTRODUCTION

Downy mildew (*Plasmopara viticola*) a fungal disease native to North America attacks most species of wild and cultivated grape. Today, the disease can be found on grapevines in most regions of the world that are wet during the growing season, which results in great failure of fruits yield and hence a major loss of economy to wine industries. The solution to control the devastating pathogen, *Plasmopara viticola* was found by Alexis Millardet who discovered in 1882 the prophylactic effect of lime and copper and developed the 'Bordeaux mixture', which became the first successful fungicide to be used in vineyards

   Copper sprays applied to leaves exist predominantly as insoluble deposits of copper salts (Menkissoglu and Lindow, 1991). Copper is an essential cofactor of a number of enzymes involved in respiration such as oxygenases and electron transport proteins (Garcia *et al*., 1994). Copper has the ability to generate free radicals able to damage DNA and lipid membranes (Hoshino *et al*., 1999 and Muller *et al*., 2000). For years, copper containing compounds have been sprayed on vegetable and fruit crops to limit the spread of plant pathogenic bacteria and fungi. Copper sprays are protectant fungicides that must be applied evenly to the plant or fruit surface before the disease develops to prevent infection. Copper is not systemic chemical and cannot be carried internally through the plant to kill the pathogen. The solubility of these copper products increases as the pH drops, slowly dissolving to release a small and constant supply of cupric ions ($Cu^{+2}$) as long as the water remains. (Sandra Hardy., 2004).

Control of the pathogen is generally achieved with chemical fungicide and copper salt applications (Aziz *et al*., 2006). Currently the only fungicides approved as an organic option are those containing copper hydroxide and copper sulphate. These sprays only protect vines from new infections; they do not eliminate existing infections and are not systemic (Wilcox, W., 2007). Kocide 3000 manufactured by DuPont, a copper based fungicide/bactericide was reported to inhibit wide range of fungal and bacterial pathogens. The active ingredient is copper hydroxide (35 per cent) with 30 per cent metallic copper equivalent. In the present study, the quality of berries was studied by the sprayings of copper hydroxide (Kocide 3000) along with the standard fungicide Ridomil used for control of downy mildew disease.

## II.  MATERIALS AND METHODS

**Quality of berries**

In order to determine the quality of berries due to the fungicide sprayed (Copper hydroxide-Kocide 3000) the chemical analysis of the berries under each treatment was carried out for acidity and reducing sugars. The total sugar content was determined by hand refractometer and expressed as percentage.

**Total sugars**

To estimate total sugars in the fruits from the field trial, method given by Dubois, *et al.* (1956) was followed. Fruit sample (100 mg) was homogenized and extracted with 5 ml 80 per cent warm ethanol twice. The extracts were centrifuged at 2000 rpm for 10 minutes. Then 0.2 ml of the supernatant was taken in a test tube and 1 ml of 5 per cent redistilled reagent grade phenol solution and 5 ml of 96 per cent sulphuric acid were added and shaken well. After 10 minutes, it was reshaken and placed in a water bath at 25-30°C for 20 minutes. Simultaneously, glucose standard was prepared. Absorbance was measured at 490 $\eta$m in a spectrophotometer. The OD value wee compared with the glucose standard graph and the amount of total sugars was calculated in per cent of fresh weight basis.

**Reducing sugars**

A known quantity of the pulped material was taken, clarified with neutral lead acetate, deleaded with sodium oxalate and made upto a desired volume. The clarified and deleaded solution was run down from a burette to Fehling's solution A and B till a brick red colour was reached. Then a few drops of methylene blue was added and titration continued till the end point (brick red colour) was reached. The quantity of reducing sugars was estimated from the titer value and expressed as the percentage of the material taken originally. Non reducing sugars were found out by substracting the reducing sugars from the total sugars.

**Acidity**

The berries were pulped in a blender and 50 g of the pulped material was taken which was digested with 200 ml of water for half an hour, the volume was made up to 500 ml, cooled and filtered. Twenty five milliliters of the filtrate was taken for the estimation of acidity and titrated against normal potassium hydroxide using phenolphthalein as indicator. The results are expressed as grams of acid per hundred millilitres of juice, which was approximately percentage of acid. The quality of the grapes was judged in terms of the sugars acid ratio (Krishnamurthi *et al*., 1959).

**Statistical analysis**

The data generated from various experiments of this study were statistically analyzed by DMRT with IRRISTAT software. The data with per cent values were subjected to arc sine transformation.

III.   RESULTS

**Effect of fruit quality**

Since the application of Copper hydroxide (Kocide 3000) has reduced disease severity in fruits, the effect of different doses of Copper hydroxide (Kocide 3000) on fruit quality was investigated. For this purpose, total sugar, acidity, sugar acid ratio, reducing sugar and non reducing sugars were estimated. The results are presented in Tables 1 to 5

Total sugar content was higher in fruits obtained from 450 g a.i ha$^{-1}$ of Copper hydroxide (Kocide 3000) sprayed plots by 25.43 per cent increase over control. Sugar content was found to be lower in fruits obtained from control plots (12.67) due to infection of fruits by the downy mildew pathogen (Table 1). The acidity content recorded from the fruits obtained in Copper hydroxide (Kocide 3000) treated plot (450 g a.i ha$^{-1}$) was 7.14 per cent increase over control plots (Table 2).

Sugar acid ratio was observed lower (16.75 per cent increase over control) in fruits taken from Copper hydroxide (Kocide 3000) treated plot (150 g a.i ha$^{-1}$). The ratio was higher (23.01 per cent increase over control) in fruits obtained from Copper hydroxide (Kocide 3000) treated plot (450 g a.i ha$^{-1}$) (Table 3). Highest reducing sugar content was recorded (9.95 per cent) in fruits obtained from Copper hydroxide (Kocide 3000 @ 450 g ai ha$^{-1}$) treated plots followed by 375 g ai  ha$^{-1}$ treated plot (9.92 per cent) (Table 4). Non reducing sugar content was recorded (7.25 per cent) in fruits obtained from Copper hydroxide (Kocide 3000- 450 g ai ha$^{-1}$) treated plots followed by 375 g ai  ha$^{-1}$ treated plot (6.94 per cent). There was no marked difference in non reducing sugar content in  fungicide treated plots (Table 5).

**Discussion:**

The fruit quality was improved in sprayed plots when compared to control. The dosage of Copper hydroxide (Kocide 3000 at 450 g ai ha$^{-1}$) recorded 25.43 per cent increase in total sugar

over control. This can be attributed to the reduction in disease incidence in leaves which makes more photosynthates available for fruit development and reduced disease severity in fruits leading to their normal development.

The downy mildew infects leaf and fruit and also affects the quality of developing berries. Srinivasan and Jeyarajan (1977) reported that total, reducing sugars content of the *P. viticola* infected grapevine was significantly less than that of healthy fruits. Ghure and Shinde (1987) reported that there was 3.5, 1.6 and 21.7 per cent reduction in total soluble solids, total sugars and ascorbic acid respectively when powdery mildew intensity exceeded 75 per cent. There was also increase in per cent of non reducing sugars (69.7) and acidity (24.3). As a result, fruit taste and market value was reduced.

Cupric hydroxide sprays reduces the quality, flavour and colour of grapes (Haeseler and Petersen, 1974). But the present findings showed that the fruit quality of grapevine was improved due to spraying of Copper hydroxide (Kocide 3000). This can be attributed that the Copper hydroxide effectively controls downy mildew infection in grapevine fruits and thus increases the quality of berries to fetch higher market prices.

**Table 1. Influence of total sugar in grapes by Copper hydroxide (Kocide 3000)**

| Treatments | Total soluble solids $^0$brix / Days after harvesting* | | | | | | Per cent increase over control |
|---|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **Mean** | |
| Kocide 3000@ 150 g a.i. ha$^{-1}$ | 18.16 $^a$ (25.22) | 14.90 $^d$ (22.70) | 15.53 $^b$ (23.21) | 16.00 $^a$ (23.57) | 16.56 $^a$ (24.01) | 16.23 (23.74) | 21.93 |
| Kocide 3000@ 225 g a.i. ha$^{-1}$ | 17.33 $^{ab}$ (24.60) | 16.80 $^{bc}$ (24.18) | 16.40 $^{ab}$ (23.89) | 16.63 $^a$ (24.07) | 15.96$^a$ (23.54) | 16.27 (24.05) | 22.13 |
| Kocide 3000@ 300 g a.i. ha$^{-1}$ | 17.93 $^{ab}$ (25.05) | 15.93 $^{cd}$ (23.52) | 15.86 $^{ab}$ (23.47) | 16.30 $^a$ (23.81) | 16.46 $^a$ (23.93) | 16.50 (23.96) | 23.21 |
| Kocide 3000@ 375 g a.i. ha$^{-1}$ | 17.60 $^{ab}$ (24.80) | 17.73 $^{ab}$ (24.90) | 15.86 $^{ab}$ (23.47) | 15.73 $^a$ (23.36) | 16.40 $^a$ (23.88) | 16.67 (24.08) | 23.99 |
| Kocide 3000@ 450 g a.i. ha$^{-1}$ | 17.53 $^{ab}$ (24.74) | 17.46 $^{ab}$ (24.69) | 16.53 $^{ab}$ (23.99) | 16.80 $^a$ (24.20) | 16.63 $^a$ (24.06) | 16.99 (24.33) | 25.43 |
| Kocide 3000@ 900 g a.i. ha$^{-1}$ | 16.40 $^b$ (23.88) | 16.63 $^{bc}$ (24.06) | 16.13 $^{ab}$ (23.68) | 16.43 $^a$ (23.91) | 15.77 $^a$ (23.39) | 16.27 (23.78) | 22.13 |
| Ridomil 2.5 kg ha$^{-1}$ | 17.00 $^{ab}$ (24.32) | 17.86 $^{ab}$ (24.99) | 15.66 $^{ab}$ (23.03) | 15.73 $^a$ (23.36) | 16.67 $^a$ (24.09) | 16.59 (24.02) | 24.11 |
| Market fruit | 16.93 $^{ab}$ (24.28) | 17.57 $^{ab}$ (24.77) | 17.16 $^a$ (24.47) | 17.23 $^a$ (24.52) | 16.77 $^a$ (24.17) | 17.13 (24.44) | 26.04 |
| Control | 12.90 $^c$ (21.04) | 13.16 $^e$ (21.30) | 12.90 $^c$ (21.03) | 12.23 $^b$ (20.47) | 12.13 $^b$ (20.38) | 12.67 (20.84) | - |

*Values are mean of three replications

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT
Values in parentheses are arcsine transformed values

**Table 2: Influence of acidity in grape fruits by Copper hydroxide (Kocide 3000)**

| Treatments | Acidity (%) / Days after harvesting* | | | | | | Per cent increase over control |
|---|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **Mean** | |
| Kocide 3000@ 150 g a.i. ha$^{-1}$ | 0.44 [b] (3.82) | 0.44 [a] (3.80) | 0.43 [bc] (3.75) | 0.42 [a] (3.71) | 0.42 [ab] (3.71) | 0.43 (3.75) | 9.30 |
| Kocide 3000@ 225 g a.i. ha$^{-1}$ | 0.44 [b] (3.80) | 0.41 [cd] (3.67) | 0.43 [bc] (3.75) | 0.42 [a] (3.71) | 0.41 [b] (3.67) | 0.42 (3.72) | 7.14 |
| Kocide 3000@ 300 g a.i. ha$^{-1}$ | 0.42 [c] (3.71) | 0.42 [bc] (3.71) | 0.44 [ab] (3.80) | 0.42 [a] (3.71) | 0.43 [a] (3.75) | 0.42 (3.74) | 7.14 |
| Kocide 3000@ 375 g a.i. ha$^{-1}$ | 0.36 [e] (3.43) | 0.39 [e] (3.58) | 0.41 [de] (3.67) | 0.41 [ab] (3.67) | 0.43 [a] (3.75) | 0.40 (3.62) | 2.50 |
| Kocide 3000@ 450 g a.i. ha$^{-1}$ | 0.40 [d] (3.62) | 0.43 [ab] (3.75) | 0.45 [a] (3.84) | 0.40 [bc] (3.62) | 0.42 [ab] (3.71) | 0.42 (3.71) | 7.14 |
| Kocide 3000@ 900 g a.i. ha$^{-1}$ | 0.43 [bc] (3.75) | 0.40 [de] (3.62) | 0.40 [ef] (3.62) | 0.40 [bc] (3.62) | 0.42 [ab] (3.71) | 0.41 (3.67) | 4.88 |
| Ridomil 2.5 kg ha$^{-1}$ | 0.44 [b] (3.83) | 0.44 (3.80)a | 0.45 [a] (3.87) | 0.39 [c] (3.58) | 0.43 [a] (3.75) | 0.43 (3.77) | 9.30 |
| Market fruit | 0.43 [bc] (3.75) | 0.40 [de] (3.62) | 0.40 [ef] (3.62) | 0.40 [bc] (3.62) | 0.42 [ab] (3.71) | 0.41 (3.67) | 4.88 |
| Control | 0.40 [d] (3.62) | 0.39 [e] (3.58) | 0.39 [f] (3.58) | 0.40 [bc] (3.62) | 0.37 [d] (3.50) | 0.39 (3.58) | - |

*Values are mean of three replications
In a column, means followed by a common letter are not significantly different at the 5% level by DMRT
Values in parentheses are arcsine-transformed values

**Table 3: Influence of Sugar acid ratio of grapes by Copper hydroxide (Kocide 3000)**

| Treatments | Sugar acid ratio / Days after harvesting* | | | | | | Per cent increase over control |
|---|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **Mean** | |
| Kocide 3000@ 150 g a.i. ha$^{-1}$ | 39.33[cd] | 40.62[bc] | 34.53[d] | 38.37[b] | 38.74[ab] | 38.32 | 16.75 |
| Kocide 3000@ | 41.31[bcd] | 36.43[de] | 36.13[cd] | 38.12[b] | 40.33[ab] | 38.46 | 17.06 |

| 225 g a.i. ha | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kocide 3000@ 300  g a.i. ha⁻¹ | 39.41$^{cd}$ | 38.22$^{bcd}$ | 37.84$^{ad}$ | 39.86$^{ab}$ | 38.05$^{ab}$ | 38.67 | 17.51 |
| Kocide 3000@ 375 g a.i. ha⁻¹ | 42.70$^{bc}$ | 37.96$^{cd}$ | 36.36$^{bcd}$ | 38.82$^{b}$ | 38.31$^{ab}$ | 38.83 | 17.85 |
| Kocide 3000@ 450 g a.i. ha⁻¹ | 45.08$^{a}$ | 45.50$^{a}$ | 38.73$^{abc}$ | 38.38$^{b}$ | 38.14$^{ab}$ | 41.76 | 23.61 |
| Kocide 3000@ 900  g a.i. ha⁻¹ | 35.30$^{ef}$ | 40.86$^{bc}$ | 40.92$^{a}$ | 43.11$^{a}$ | 41.98$^{a}$ | 40.43 | 20.84 |
| Ridomil 2.5 kg ha⁻¹ | 43.85$^{b}$ | 39.67$^{bcd}$ | 36.75$^{bcd}$ | 42.00$^{ab}$ | 39.61$^{ab}$ | 40.37 | 20.98 |
| Market fruit | 38.16$^{de}$ | 41.61$^{bc}$ | 40.34$^{ab}$ | 41.09$^{ab}$ | 37.51$^{b}$ | 39.74 | 19.73 |
| Control | 32.79$^{f}$ | 33.88$^{e}$ | 30.31$^{e}$ | 30.58$^{c}$ | 31.96$^{c}$ | 31.90 | - |

*Values are mean of three replications

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

Values in parentheses are arcsine-transformed values

**Table 4. Influence of reducing sugar in grapes by Copper hydroxide (Kocide 3000)**

| Treatments | Reducing Sugar (%) / Days after harvesting* | | | | | | Per cent increase over control |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | Mean | |
| Kocide 3000@ 150 g a.i. ha⁻¹ | 9.68 $^{ab}$ (18.12) | 10.21 $^{ab}$ (18.63) | 10.07 (18.49)a | 9.85 $^{ab}$ (18.29) | 9.51 $^{b}$ (17.96) | 9.86 (18.30) | 28.80 |
| Kocide 3000@ 225  g a.i. ha⁻¹ | 9.33 $^{b}$ (17.78) | 10.33 $^{a}$ (18.73) | 10.14 $^{a}$ (18.57) | 9.57$^{b}$ (18.01) | 9.36 $^{b}$ (17.81) | 9.74 (18.18) | 27.93 |
| Kocide 3000@ 300  g a.i. ha⁻¹ | 10.05 $^{ab}$ (18.47) | 10.18 $^{ab}$ (18.60) | 9.36 $^{b}$ (17.81) | 10.53 $^{a}$ (18.93) | 9.32 $^{b}$ (17.77) | 9.88 (18.32 ) | 28.95 |
| Kocide 3000@ 375  g a.i. ha⁻¹ | 10.07 $^{ab}$ (18.50) | 10.04 $^{ab}$ (18.47) | 10.09 $^{a}$ (18.52) | 9.93 $^{ab}$ (18.37) | 9.48 $^{b}$ (17.92) | 9.92 (18.360 | 29.23 |
| Kocide 3000@ 450  g a.i. ha⁻¹ | 9.63 $^{ab}$ (18.07) | 10.47 $^{a}$ (18.87) | 10.20 $^{a}$ (18.62) | 9.25 $^{b}$ (17.70) | 10.23 $^{a}$ (18.65) | 9.95 (18.38) | 29.45 |
| Kocide 3000@ 900  g a.i. ha⁻¹ | 9.64 $^{ab}$ (18.08) | 9.50 $^{b}$ (17.95) | 10.09 $^{a}$ (18.51) | 9.69 $^{b}$ (18.13) | 9.57 $^{ab}$ (18.01) | 9.69 (18.140 | 27.55 |
| Ridomil 2.5 kg ha⁻¹ | 9.82 $^{ab}$ (18.26) | 9.55 $^{b}$ (17.99) | 9.87 $^{ab}$ (18.30) | 9.49 $^{b}$ (17.94 ) | 9.53. $^{b}$ (17.98) | 9.65 (18.09) | 27.25 |
| Market fruit | 9.64 $^{ab}$ (18.08) | 9.50 $^{b}$ (17.95) | 10.09 $^{a}$ (18.51) | 9.69 $^{b}$ (18.13) | 9.57 $^{ab}$ (18.01) | 9.69 (18.140 | 27.55 |
| Control | 7.5 $^{c}$ (15.89) | 7.10 $^{c}$ (15.44) | 6.70 $^{c}$ (14.99) | 6.93 $^{c}$ (15.26) | 6.90 $^{c}$ (15.20) | 7.02 (15.36) | - |

*Values are mean of three replications

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

Values in parentheses are arcsine-transformed values

**Table 5: Influence of non reducing sugar in grape fruits by Copper hydroxide (Kocide 3000)**

| Treatments | Non reducing sugar (%) / Days after harvesting* | | | | | Mean | Per cent increase over control |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | | |
| Kocide 3000@ 150 g a.i. ha^{-1} | 8.48 [a] (16.92) | 4.79 [d] (12.63) | 6.36 [ab] (14.53) | 6.14 [abc] (14.34) | 7.05 [a] (15.38) | 6.56 (14.76) | 17.38 |
| Kocide 3000@ 225 g a.i. ha^{-1} | 7.70 [a] (16.11) | 6.32 [bcd] (14.40) | 6.20 [ab] (14.40) | 7.48 [ab] (15.87) | 5.73 [ab] (13.83) | 6.68 (14.92) | 18.86 |
| Kocide 3000@ 300 g a.i. ha^{-1} | 7.88[a] (16.29) | 5.75[cd] (13.86) | 6.51[ab] (14.77) | 5.76[bc] (13.88) | 7.14 [a] (15.49) | 6.61 (14.86) | 18.00 |
| Kocide 3000@ 375 g a.i. ha^{-1} | 7.53 [a] (15.90) | 7.69 [ab] (16.06) | 5.77 [ab] (13.87) | 6.80 [abc] (15.05) | 6.92 [a] (15.24) | 6.94 (15.23) | 21.90 |
| Kocide 3000@ 450 g a.i. ha^{-1} | 8.22[a] (16.64) | 7.14[abc] (15.43) | 6.38[ab] (14.62) | 7.23[ab] (15.59) | 7.27 [a] (15.64) | 7.25 (15.58) | 25.24 |
| Kocide 3000@ 900 g a.i. ha^{-1} | 6.76 [ab] (15.06) | 7.12 [abc] (15.47) | 6.04 [ab] (14.22) | 6.74 [abc] (15.04) | 6.19 [ab] (14.41) | 6.57 (14.84) | 17.50 |
| Ridomil 2.5 kg ha^{-1} | 7.18[a] (15.52) | 8.32[a] (16.74) | 5.80[ab] (13.90) | 6.26[abc] (14.44) | 7.13 [a] (15.47) | 6.93 (15.21) | 21.79 |
| Market fruit | 6.73 [ab] (14.98) | 7.67 [ab] (16.05) | 7.13 [a] (15.48) | 7.77 [a] (16.18) | 7.40 [a] (15.78) | 7.34 (15.69) | 26.16 |
| Control | 5.40 [b] (13.43) | 6.06 [bcd] (14.25) | 5.10 [b] (13.03) | 5.30 [c] (13.30) | 5.23 [b] (13.22) | 5.42 (13.45) | - |

*Values are mean of three replications

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

Values in parentheses are arcsine-transformed values

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# Time Series, Factors and Impacts Analysis of Rainfall in North-Eastern Part in Bangladesh

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***Abstract-*** The amount of rainfall received over an area is an important factor in assessing availability of water to meet various demands for agriculture, industry, irrigation, generation of hydroelectricity and other human activities. Over the study period of recent 30 years, trend values of monsoon average rainfall in Sylhet have decreased. This paper has measured the correlation coefficients between rainfall and time for Sylhet, where correlation coefficient for Sylhet is negative. In order to check the strength of linear relationship between rainfall and time, P-value has been measured. Due to various factors of Sylhet region of Bangladesh, there is a growing need to study the rainfall pattern, and also frequency of the heavy rainfall events. This study was checked annual average rainfall of 30 years for this region. It is hoped that this research may be of help to the concerned organizations and experts working on increasing rainfall problem in Chittagong.

***Index Terms***- rainfall variation, trend, correlation coefficient, t-test, P-value

## I. INTRODUCTION

B angladesh, is primarily a low-lying plain of about 144,000 km2, situated on deltas of large rivers flowing from the Himalayas, has a sub-tropical humid climate characterized by wide seasonal variations. Four distinct seasons can be recognized in Bangladesh from the climatic point of view: (1) dry winter season from December to February, (2) pre-monsoon hot summer season from March to May, (3) rainy monsoon season from June to September and (4) post-monsoon autumn season which lasts from October to November [1] Rainfall in Bangladesh mostly occurs in monsoon period, caused by the weak tropical depressions that are brought from the Bay of Bengal into Bangladesh by the wet monsoon winds. More than 75% rainfall occurs in the monsoon period. Average temperature of the country ranges from 17 to 20.6°C during winter and 26.9 to 31.1°C during summer. Average relative humidity for the whole year ranges from 70.5% to 78.1% in Bangladesh [2].

## II. NORTH-EASTERN PART OF BANGLADESH

Sylhet, the north-eastern administrative division of Bangladesh, located at 24°53′ latitude and 91°52′ E longitudes, has a number of topographical features like rivers, hills and hillocks (tilas), haors (wetland) and high flood plain; which made it quite different from the rest of the parts of Bangladesh. Hilly Sylhet region not only plays an important role in the socio-economic development of Bangladesh but also important for ecological balance of the country. Beautiful panorama of the region with vast reserve forest, intense tea gardens and growing rubber gardens in the hillocks, lakes and wetlands as well as sands and stones of the border areas made it attractive for tourists from both home and abroad. Among the topographical features of the region, hills are the most dominating one, which is determining its climatic and morphological features. Heavy rainfall, tea garden, dense bamboo and cane bushes, high flood plain and the flashy rivers; all the features are very related and contributed by the hills of this region, e.g., [3]. Haor basin extends from two rivers to the high plain of central Sylhet. The basin generally goes under water for several months during monsoon. The flood plain is higher at this region than the rest of the part of the country.

Northern branch of river Barak (comes from India) renamed as 'Surma' which is one of the main river of Bangladesh passed through Sylhet city. Southern branch of Barak gets the name Kushiara in Bangladesh, which is another major river of Sylhet. Surma and Kushiara make unification as Kalani, which is renamed as Meghna and passes through the central portion of the country and finally merges with the Bay of Bengal. Other important rivers are: Mogra, Dhanu, Boulai and Ghorautra. Main characteristic of rivers in this region is flashy and flash flood occurs frequently during May to the middle of October [3]. The networks of the rivers, streams and channels overflow in the monsoon and fill the haors. Any change of the hydro-climatic pattern in this region will significantly affect the balance among these natural features and also other parts of the country. Hence, a comprehensive understanding of the rainfall pattern in this region is greatly needed.
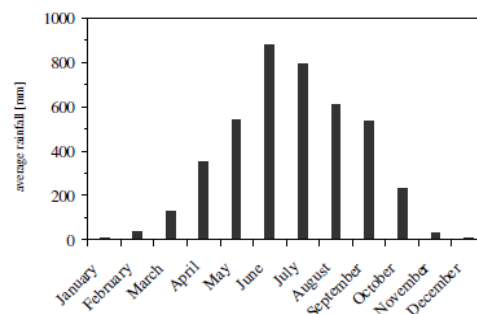


**Figure 2.1: Average monthly rainfall in Sylhet region (1957-2006)**
**Source: Bangladesh Water Development Board (BWDB)**

## III. OBJECTIVE OF THE STUDY

The main objectives of the study are:
- ➢ Regression analysis of rainfall data
- ➢ Determine the correlation coefficient for Chittagong station
- ➢ Testing the significance of correlation coefficient
- ➢ Determine the strength of linear relationship between rainfall and time
- ➢ Focus the impacts of rainfall variation

## IV. LITERATURE REVIEW

Both home and abroad, a number of studies have been conducted to examine the patterns and trend of rainfall based on daily, monthly, seasonal and yearly rainfall data. In this section, only those studies that have dealt with the patterns trend of rainfall are reviewed briefly. However, other relevant studies are referred to at appropriate places in this dissertation.

**Gregory (1956)** has examined the Regional variations in the trend of annual rainfall over the British Isles for the period 1881-1950 and he has found that annual rainfall values have fluctuated considerably over the years and also that these fluctuations varied from one part of Britain to another. He has noted the major implications of the regional variations in annual rainfall trends.

**Panabokke and Walgame (1974)** have studied the application of rainfall confidence limits to crop water requirements in dry zone agriculture in Srilanka". They have observed that in many areas of the seasonally arid tropics, crops must be planted early and the date of the start of growing season should coincide with the first heavy rainfall.

**Parthasarathy and Dhar (1974)** have studied the secular variations of regional rainfall over India for the period 1901-1960. They have shown that the yearly rainfall data for western part in Indian Peninsula to central parts of the country follow a positive trend. The yearly rainfall data for some sub-divisions, namely Punjab, Himachal Pradesh and Assam follow and increasing trend. However, south Assam is the only sub-division where rainfall data show a negative trend.

**Benoit (1977)** has studied the start of growing season rainfall in northern Nigeria for the years 1951-1975. He has found that the date of start of the growing season is occurred when the accumulated rainfall exceeds one half of potential evapotranspiration for the remainder of growing season, provided that no dry spell longer than five days occur immediately after this date .The mean start of the growing season of locations in northern Nigeria is related to latitude, where the growing season starts later than that at southern locations.

**Stern et al. (1981)** have examined the start of the rains in West Africa for the period 1934-1965. In this study of the rains is defined as the first occurrence of a specified amount of rain within two successive days. They have found that the probability of rains depends only upon whether the previous day was wet or not. The earliest possible start of rains is defined by the probability of dry spells, when the relationship between start and latitude is not linear. This definition is used to indicate the showing periods, when safe planting is required.

**Stern et al. (1982)** have analyzed the daily rainfall data for Kano, Sholapur and Hydrabad, India for the period 1916-1975 with a view to provide agronomically useful results by a direct method and a modeling approach. Through the direct method, they have obtained the probability of an event like start, end of the rains etc. directly from the relative frequency of rainfall occurrences.

**Roy et al. (1987)** have studied the trends of regional variations and periodicities of annual rainfall in Bangladesh for 32 years between 1947 and 1979 at 30 meteorological stations and they have shown the yearly rainfall amounts for most of the stations follow a normal distribution .Annual rainfall data for Rajshahi, Ishwardi, Pabna and Khulna stations have shown positives trends while for comilla stations a negative trend has been found.

**Nguyen and Pandey (1994)** proposed a mathematical model to describe the probabi1ity distributions of temporal rainfall using data from seven rain gauge stations. The study considers multifractal multiplicative cascade model. The model provides adequate estimates of the hourly rainfall distribution and hence can be used in locations where these short-duration Rainfall data are not available.

A number of studies have been carried out on rainfall patterns (Ahmed and Karmakar, 1993; Hussain and Sultana, 1996; Kripalini et al., 1996; Rahman et al.,1997; Ahmed and Kim, 2003; Shahid et al., 2005; Islam and Uyeda, 2008; Shahid, 2008), only very few works have been found on rainfall trends and extremes in Bangladesh.

**Rahman et al. (1997)** used trend analysis to study the changes in monsoon rainfall of Bangladesh and found no significant change.

**Ahmed (1989)** estimated the probabilistic rainfall extremes in Bangladesh during the pre-monsoon season.

**Karmakar and Khatun (1995)** repeated a similar study on rainfall extremes during the southwest monsoon season. However, both the studies were focused only on the maximum rainfall events for a limited period.

**Suhaila Jamaludin and Abdul Aziz Jemain (2007)** have studied the fitting the statistical distributions to the daily rainfall amount in Peninsular Malaysia. Daily rainfall data have been classified according to four rain type's sequence of wet days.

**Shamsuddin Shahid (2009)** has analyzed Rainfall variability and the trends of wet and dry periods in Bangladesh over the time period 1958–2007 has been assessed using rainfall data recorded at 17 stations distributed over the country. The result shows a significant increase in the average annual and pre-monsoon rainfall of Bangladesh. The number of wet months is found to increase and the dry months to decrease in most parts of the country. Seasonal analysis of wet and dry months shows a significant decrease of dry months in monsoon and pre-monsoon.

## V. MATERIALS AND METHODOLOGY

### 5.1 Data collection and data range:

The daily rainfall data for the period 1979-2008 collected by the Department of Meteorology, Government of People's Republic of Bangladesh have been employed in this study.In this study, the period between the months of May to October has been considered as the rainy season or monsoon period.

The whole Bangladesh has been divided into four zones named Chittagong, Dhaka, Rajshahi and Sylhet according to the amount of annual rainfall. Thus one important meteorological station, Sylhet has been selected from the four zones to analysis the rainfall data.

**5.2 Linear Regression Model:**

The linear regression line was fitted using the most common method of least squares. This method calculates the best fitting line for the observed data by minimizing the sum of the squares of the vertical deviations from each data point to the line. If a point lies exactly on the straight line then the algebraic sum of the residuals is zero. Residuals are defined as the difference between an observation at a point in time and the value read from the trend line at that point in time. A point that lies far from the line has a large residual value and is known as an outlier or, an extreme value.

The equation of a linear regression line is given as

$$y = a + bx$$

Where, y is the observation on the dependent variable
x is the observation on the independent variable

'a' is the intercept of the line on the vertical axis and 'b' is the slope of the line.

The estimate of intercept 'a' and the regression coefficient 'b' by the least square method

i.e.
$$\hat{a} = \bar{y} - \hat{b}\bar{x}$$

$$\hat{b} = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

and

Coefficient of determination, $R^2$ = (SS due to Regression)/ (Total SS)

$$= \frac{\sum (\hat{Y}_i - \bar{Y})^2}{\sum (Y_i - \bar{Y})^2}$$

In order to fit regression lines of the in rainy season monthly average Rainfall (dependent variables) against time (independent variable) in years were plotted. Linear regression lines were then fitted to determine the trends of rainfall. The drawing of the diagrams and the fitting of the regression lines were done in Microsoft Excel.

**5.3 Trend**

By secular trend or simply trend we mean the general tendency of the data to increase or decrease during a long period of time. Temperature, rainfall and agriculture production data are made over time and therefore are referred to as time series data, which is defined as a sequence of observations that varies over

time. The time series is made up of four components known as seasonal, trend, cyclical and irregular (Patterson, 1987). Trend is defined as the general movement of a series over an extended period of time or it is the long-term change in the dependent variable over a long period of time (Webber and Hawkins, 1980). Since the trend variation occurs over a substantial extended period of time, the stations 30 years of available data were considered suitable for the trend analysis. Therefore Tokua, Hoskins and Kiunga stations were excluded from this analysis. Trend is determined by the relationship between the two variables (temperature and time or rainfall and time or agriculture production and time).

To observe that the trend of monsoon average Rainfall for the selected stations and trend values have been calculated by using least square method, the findings are presented in Table 6.1. Also trend values are plotted accordingly in Figure 6.1.

The estimated trend in Table-6.1 and graphical representation in Fig-6.1 of this study reflects that the monsoon average rainfall in Sylhet decreasing over the time period. The simple regression coefficient indicates that on an average the rainfall in Sylhet is decreasing 0.439 (b=0.439) per year.

**5.4 Correlation Coefficient:**

The correlation coefficient determines the strength of linear relationship between two variables. It always takes a value between –1 and +1, with 1 or –1 indicating a perfect correlation (all points would lie along a straight line in this case and having a residual of zero). A correlation coefficient close to or equal to zero indicates no relationship between the variables. A positive correlation coefficient indicates a positive (upward) relationship and a negative correlation coefficient indicates a negative (downward) relationship between the variables. The correlation coefficients between rainfall and time were calculated as follows.

Given the pairs of values (x1, y1), (x2, y2), ……….(xn, yn), the formula for computing the correlation coefficient is given by

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

The correlation coefficients for Sylhet station was calculated using the above formula.
The results are shown in Table 6.2

**5.5 Testing Significance of the Correlation Coefficient**

In testing the significance of the correlation coefficient, the following null ($H_0$) and alternative ($H1$) hypothesis were considered.

Hypothesis:
$H_0$: $\rho = 0$
$H1$: $\rho \neq 0$
Where, $\rho$ is the population correlation coefficient.

The appropriate test statistics for testing the above hypothesis is

$$t = \frac{r\sqrt{(n-2)}}{\sqrt{(1-r^2)}}, \quad d.f = n-2$$

The P-values were then calculated in the following manner.

P -value = 2P {t > Observed value of the test statistic}

The P-values for four station of Bangladesh which were used to determine the strength of linear relationship between the rainfall and time and thus establishing trend. The significance of the trend was tested at 5% level of significance. A trend exists if the P value is less than 0.05. P-values greater than 0.05 shows that trend is not significant.

## VI.   RESULTS AND DISCUSSION

Table 6.1:  Computation of trend values of monsoon average rainfall of Sylhet.

| Year (x) | Y=Average Rainfall(mm) | $t = \dfrac{x - \frac{1}{2}(1993+1994)}{\frac{1}{2}(Interval)}$ | Trend values $\hat{Y} = \hat{a} + \hat{b}t$ |
|---|---|---|---|
| 1979 | 621.83 | -29 | 697.92 |
| 1980 | 435.67 | -27 | 692.87 |
| 1981 | 619.67 | -25 | 687.83 |
| 1982 | 564.83 | -23 | 682.78 |
| 1983 | 645.17 | -21 | 677.73 |
| 1984 | 625.50 | -19 | 672.68 |
| 1985 | 535.50 | -17 | 667.63 |
| 1986 | 475.67 | -15 | 662.58 |
| 1987 | 686.17 | -13 | 657.53 |
| 1988 | 820.67 | -11 | 652.48 |
| 1989 | 837.50 | -9 | 647.43 |
| 1990 | 585.67 | -7 | 642.38 |
| 1991 | 668.00 | -5 | 637.33 |
| 1992 | 524.50 | -3 | 632.28 |
| 1993 | 697.67 | -1 | 627.23 |
| 1994 | 438.00 | 1 | 622.19 |
| 1995 | 579.33 | 3 | 617.14 |
| 1996 | 571.17 | 5 | 612.09 |
| 1997 | 547.83 | 7 | 607.04 |
| 1998 | 589.50 | 9 | 601.99 |
| 1999 | 513.00 | 11 | 596.94 |
| 2000 | 670.33 | 13 | 591.89 |
| 2001 | 509.83 | 15 | 586.84 |
| 2002 | 510.50 | 17 | 581.79 |
| 2003 | 511.33 | 19 | 576.74 |
| 2004 | 596.00 | 21 | 571.69 |
| 2005 | 571.83 | 23 | 566.64 |
| 2006 | 513.33 | 25 | 561.60 |
| 2007 | 606.33 | 27 | 556.55 |
| 2008 | 495.00 | 29 | 551.50 |
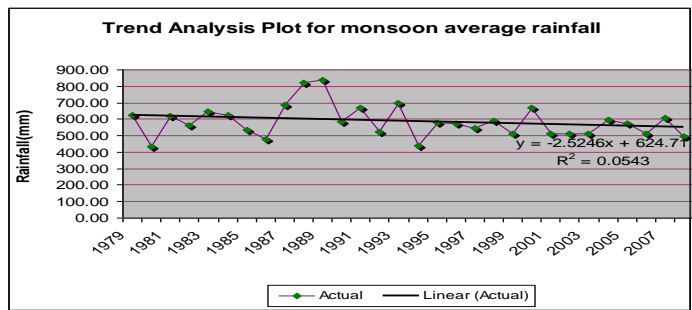


**Figure 6.1: Trend Analysis Plot for monsoon average rainfall of Sylhet during period last 30 years (1979-2008)**

Figure-6.1 shows that the trend of rainfall for Sylhet is decreasing which indicates there is a negative linear relationship between rainfall and time.

The $R^2$ value 0.0543 means that only 5.43 percent variation in rainfall is explained by time.

The strength of the linear relationship between the variable and time was then calculated to determine the trend of rainfall. These relationships are measured by the correlation coefficient.

**Table 6.2 Correlation coefficients for rainfall and time.**

| Station | Correlation Coefficients(r) |
|---|---|
| Sylhet | -0.110 |

Table-6.2 shows that the negative relationship between rainfall and time at Sylhet station

**Table 6.3 Test statistic and P-value of the selected station**

| Test statistic and P-value | Sylhet station |
|---|---|
| Observed values of t | -0.586 |
| Degrees of Freedom | 28 |
| P-value | 0.563 |

Table-6.3 shows that the P-values are large for the selected station and therefore the null hypothesis is not rejected. This implies that the correlation coefficient for rainfall is statistically insignificant though it is slightly decreasing in Sylhet station.

## VII.   FACTORS BEHIND DECREASING RAINFALL

### 7.1  Destruction of hills:

Rainfall is decreasing at Sylhet region. The reason behind this is destruction of hills. Major effects of hill cutting hills are: i) Deforestation and desertification ii) Ecological imbalance and climate change. Growth of plants and trees from the cut portion of the hill, takes long time or almost absent in many cases. Such deforestation can decrease rainfall.  'United Nations Convention to Combat Desertification' (UNCCD) defined desertification. In the definition desertification is understood as 'land degradation in dry lands', and one of the main indicators of land degradation is change in the productivity of the vegetation cover. Desertification is occurred due to climate change. It is liable for decreasing rate of rainfall in Sylhet region. For rainfall, lifting of

moist air mass is necessary for condensation into droplet and air formation. In this case, hills act as a barrier, where the moist air, after being obstructed, lift upward and gradually loose it's temperature to condense enough to form cloud. This is the main reason of the high intensity of rainfall at the Sylhet region. Due to destruction of hills, now moist airs are not being obstructed such a way and the amount of rainfall in Sylhet region is decreasing. This will result in a massive change in the eco-system of tea plantation which requires heavy rainfall (Md. Sirajul Islam,G M Jahid Hasan, Md. Aktarul Islam Chowdhury,2005)

### 7.2  Global warming:

Studies in different parts of the world indicate that global warming has altered the precipitation patterns and resulted in frequent extreme weather events, such as rainfall variation, floods, droughts and rainstorms, etc. [18-20] Due to the global warming, in South Asia, most of the climate models project a decrease in precipitation during the dry season and increase during the monsoon season (Christensen et al. 2007)

### VIII.   IMPACTS OF DECREASING RAINFALL

Sylhet, as a north-eastern district of the country experiences flash flood, as it is close to Meghalaya of India which is mainly hilly area.

### 8.1 Flash flood:

River cross-section builds up based on the catchments pattern and the amount of rainfall over it. If rainfall in Sylhet region decreases and Meghalaya region increases, for the upstream cross sections of the rivers in the Sylhet region, this excess flow will appear as unusual over the capacity of the river cross sections, causing flash flood. It has been reported by Bangladesh Water Development Board (BWDB) that the number of flood increases nowadays in this region. [4]

Heavy rains in south-eastern and north-eastern Bangladesh, starting on June 25, 2012 and lasting over five days have caused floods and catastrophic landslides, leaving at least 118 dead (as of June 29, 2012) and over 300,000 people without secure accommodation. Flash Floods set off by heavy rains and upstream torrents from Meghalaya in India have swamped vast stretches of land in Sylhet and other nearby districts of the country, leaving thousands of people marooned. In addition, there is a high potential to deteriorate the flood condition in Sylhet as the onrush of water from upstream is very likely to inundate most of the sub-districts located near to Indian border. As the river beds of surma and kushiara and their tributaries are silted up, so the prolonged water beyond danger limit might cause huge affect to Sylhet District.[22]
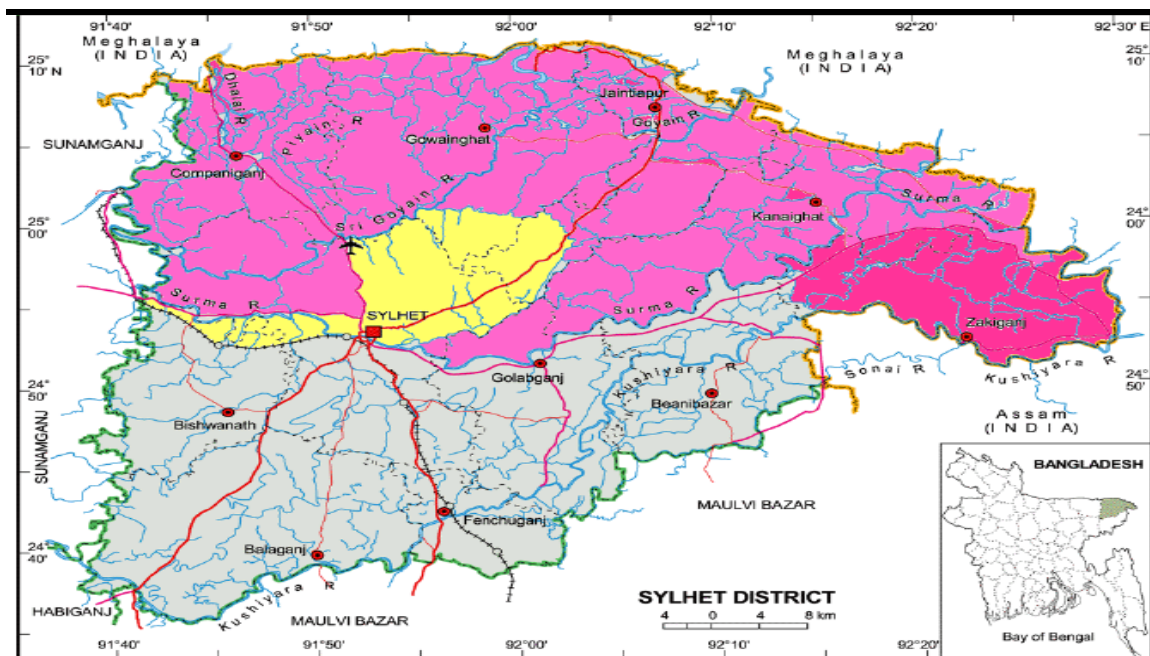


**Figure 8.1: Flood Affected Area Profile, 2012**

**8.2  Imbalance in Ecosystem:** Decreasing rate of rainfall will result in a massive change in the ecosystem of tea plantation, which requires heavy rainfall. Significant decreasing trends in annual and pre-monsoon consecutive dry days may help to increase the crop productivity and reduce the pressure on groundwater for irrigation in Bangladesh.    [4]

Part of the old Meghna esturine, old Bramhaputra, and eastern Surma- Kushiyara flood plains and Sylhet basin may also

be affected. Large volume of sediments gets settled in the paddy lands and in the river channels. Flash floods normally damages Boro paddy in the depression sites and also seedlings of aman crop and vegetables. [24]

**8.3 Soil erosion and landslides:** Changes in distribution and intensity of rainfall pattern observed over years in hilly regions might be attributed to global climate change. This has accelerated soil erosion and land slides. [23]

**8.4 Unemployment:** Majority of the people living in vulnerable areas are engaged either in crop production and/or fishing. They frequently remain unemployed due to tidal flooding and other natural hazards resulting in food insecurity.[23]

## IX. CONCLUDING SUSTAINABLE MANAGEMENT OPTIONS

1. Landslide vulnerability assessment and zoning is a prerequisite for sustainable management.

2. City planning, land use and utilization must adhere to the recommended land zoning and relevant policy and legal provisions.

3. Most of the landslides in Sylhet hilly areas happen during the rainy season when rainfall intensity is very high. Therefore rainy seasons need to be monitored closely to assess the situation, especially in the landslide prone areas. In case of any potential landslide, people of the concerned localities need to be informed through early warning system.

4. Awareness program should also contain the significance of proper land-use as well as sustainable land management.

5. A recognized important element in adaptation to increased floods caused by climate change is and adequate flood forecasting system able to provide reliable forecasts during floods with sufficient lead time.

6. Modification of buildings and structures and their immediate surroundings to reduce damage in flooding.

7. Actions undertaken during floods to prevent damage to and failure of flood control structures are known flood fighting. Flood fighting is an emergency measure of mitigating flood impacts on society and environment, particularly when flood control structures have proved ineffective or failed.

8. Evacuation is essential where the buildings or other features do not provide a safe place of refuge during a flood.

9. In the contest of climate change government should preserve a good volume of money to assistant and flood relief as an adaptive measure.

10. Flood insurance can be implemented to manage the flood damage costs. It is presently available in many countries with well-developed insurance markets.

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# Comparative Study on Sustainable Bioelectricity Generation from Microbial Fuel Cell Using Bio-waste as Fuel

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*Abstract*- Electricity generation from microbial fuel cell (MFC) using cow dung and cow urine as fuel was investigated in this study. The electrodes used in MFC were combinations of copper, brass and magnesium sheets of 0.2 mm thickness and having 6"X 6" dimension. Comparative studies resulted from using cow dung as fuel in two chamber design of MFC under aerobic and anaerobic conditions. Studies were carried out using cow urine as fuel in six chamber design of MFC under anaerobic condition. Dual chamber design and six chamber design gave an average output of 1.1 volt and 4.2 volt respectively.

*Index Terms*- Bioelectricity, MFC, electrode, design

## I. INTRODUCTION

Technology using microbial fuel cell (MFC) that convert the energy stored in chemical bonds in organic compounds to electrical energy achieved through the catalytic reactions by microorganisms has generated considerable interests among academic researchers in recent years[1,6,16]. Microbial fuel cells (MFCs) are a promising technology for electricity production from a variety of materials.

India is blessed with plenty of energy sources such as solar, wind, hydro and biomass. Biomass alone has got energy potential of about 66000 MW, out of which, about 900 MW energy had been achieved till 2006.So there is a lot of biomass which can be used efficiently and sustainably. Recent studies have shown that oil and other fossil fuels will not be available in next 100 years and it is expected that the demand for oil will exceed the production [1]. One estimate of population growth, coupled economy growth at current levels puts a global demand of 41TW in 2050 at current energy growth rates. However, considering anticipated energy trends, a more reasonable projection is 27 TW by 2050 and 43TW by 2100 [11]. Major concern is the fact that release of stored carbon in fossil fuels is increasing the concentration of carbon dioxide in the atmosphere, with increases from 316ppmv in 1959 to 377 ppm in 2004[11]. By 2100 it is estimated that $CO_2$ concentration will reach anywhere from 560 ppm to 970 ppm [1]. Today greatest environmental challenge is to simultaneously solve energy production and $CO_2$ release. There is strong need to develop a whole new energy platform that produces sufficient energy while at the same time reduces $CO_2$ emissions. The use of fossil fuels, especially oil and gas, in recent years has accelerated and this triggers a global energy crisis. One of the ways to alleviate the current global warming crisis is renewable energy resources. Developing alternative electricity production methods are given prime importance. New electricity production from renewable resources without a net carbon dioxide emission is much desired [5, 12]. Bacteria can be used in MFCs to generate electricity while accomplishing the biodegradation of organic matters or wastes [17, 20]. Figure.1 shows a schematic diagram of a typical MFC for producing electricity. It consists of anode and cathode chambers partitioned by a proton exchange membrane (PEM) [6, 28].
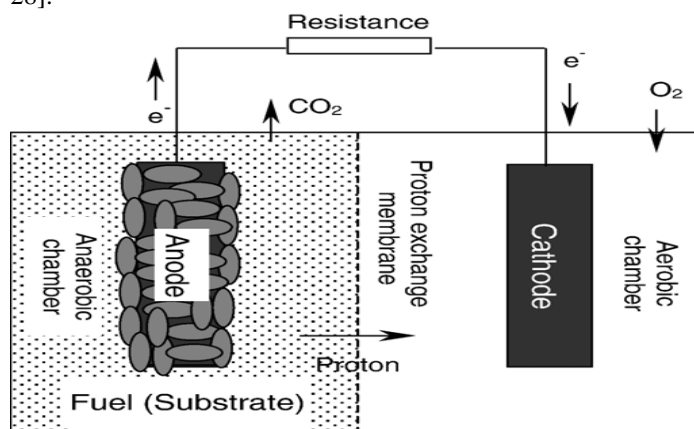


Figure: 1. Schematic diagram of a typical two-chamber microbial fuel cell.

Microbes in the anodic chamber of an MFC oxidize added substrates and generate electrons and protons in the process. Carbon dioxide is produced as an oxidation product. However, there is no net carbon emission because the carbon dioxide in the renewable biomass originally comes from the atmosphere in the photosynthesis process. Unlike in a direct combustion process, the electrons are absorbed by the anode and are transported to the cathode through an external circuit. After crossing a PEM or a salt bridge, the protons enter the cathode chamber where they combine with oxygen to form water. Microbes in the anodic chamber extract electrons and protons in the dissimilative process of oxidizing organic substrates [24]. Electric current generation is made possible by keeping microbes separated from oxygen or any other end terminal acceptor other than the anode and this requires an anaerobic anodic chamber. The overall

reaction is the breakdown of the substrate to carbon dioxide and water with a concomitant production of electricity as a by-product. Based on the electrode reaction pair above, an MFC bioreactor can generate electricity from the electron flow from the anode to cathode in the external circuit. In recent years, rapid advances have been made in MFC research and the number of journal publications has increased sharply in the past three years with more researchers joining the research field. Several reviews on MFC are available, each with a different flavour or emphasis. Logan et al. (2006) reviewed MFC designs, characterizations and performances. The microbial metabolism in MFCs was reviewed by Rabaey and Verstraete (2005). Lovley (2006) mainly focused his review on the promising MFC systems known as Benthic Unattended Generators (BUGs) for powering remote-sensing or monitoring devices from the angle of microbial physiologies. Pham et al. (2006) summarized the advantages and disadvantages of MFCs compared to the conventional anaerobic digestion technology for the production of biogas as renewable energy. Chang et al. (2006) discussed both the properties of electrochemically active bacteria used in mediator less MFC and the rate limiting steps in electron transport. Bullen et al. (2006) compiled many experimental results on MFCs reported recently in their review on bio-fuel cells. This work here presents a state of the art review on MFC with emphases on the recent advances in MFC reactor designs, MFC performances and optimization of important operating parameters. A brief MFC history is also presented.

Theoretically, most microbes can potentially be used as a biocatalyst in MFC. The earliest MFC concept was demonstrated by Potter in 1910 [8]. Electrical energy was produced from living cultures of *Escherichia coli* and *Saccharomyces* by using platinum electrodes [22]. This didn't generate much interest until 1980s when it was discovered that current density and the power output could be greatly enhanced by the addition of electron mediators. Unless the species in the anodic chamber are anodophiles, the microbes are incapable of transferring electrons directly to the anode. The outer layers of the majority of microbial species are composed of non-conductive lipid membrane, peptidoglycans and lipopolysaccharides that hinder the direct electron transfer to the anode. Electron mediators accelerate the transfer [5]. Mediators in an oxidized state can easily be reduced by capturing the electrons from within the membrane. The mediators then move across the membrane and release the electrons to the anode and become oxidized again in the bulk solution in the anodic chamber. This cyclic process accelerates the electron transfer rate and thus increases the power output. Good mediators should possess the following features [8]: (1) able to cross the cell membrane easily; (2) able to grab electrons from the electron carries of the electron transport chains; (3) possessing a high electrode reaction rate; (4) having a good solubility in the anolyte; (5) non-biodegradable and non-toxic to microbes; (6) low cost. And how efficient the oxidized mediator gets reduced by the cells reducing power is more important compared with other features. Although a mediator with the lowest redox would in theory give the lowest anodic redox and thus maximize the redox difference between anode and cathode (i.e. give biggest voltage difference) it would not necessarily be the most efficient at pulling electrons way from the reduced intracellular systems (NADH, NADPH or reduced

cytochromes) within the microbes. A mediator with a higher Eo redox would give a higher overall power than a mediator with the lowest redox [8]. Typical synthetic exogenous mediators include dyes and metallo-organics such as neutral red (NR), methylene blue (MB), thionine, meldola's blue (MelB), 2-hydroxy-1,4-naphthoquinone (HNQ), and Fe(III)EDTA[1,8,19,25,27]. Unfortunately, the toxicity and instability of synthetic mediators limit their applications in MFCs. Some microbes can use naturally occurring compounds including microbial metabolites (Endogenous mediators) as mediators. Humic acids, anthraquinone, the oxyanions of sulphur (sulphate and thiosulphate) all have the ability to transfer electrons from inside the cell membrane to the anode [15]. A real breakthrough was made when some microbes were found to transfer electrons directly to the anode [4, 9]. These microbes are operationally stable and yield a high Coulombic efficiency [4, 24]. *Shewanella putrefaciens* [10], *Geobacteraceae sulferreducens* [3], *Geobacter metallireducens* [16] and *Rhodoferax ferrireducens* [4] are all bioelectrochemically active and can form a biofilm on the anode surface and transfer electrons directly by conductance through the membrane. When they are used, the anode acts as the final electron acceptor in the dissimilatory respiratory chain of the microbes in the biofilm. Biofilms forming on a cathode surface may also play an important role in electron transfer between the microbes and the electrodes. Cathodes can serve as electron donors for *Thiobacillus ferrooxidans* suspended in a catholyte [23] for an MFC system that contained microbes in both anodic and cathodic chambers. *G. metallireducens* and *G. sulfurreducens* [7] or other seawater biofilms [2] may all act as final electron acceptors by grabbing the electrons from cathode as electron donors. Mediator-less MFCs are advantageous due to reduction in cost of mediators [8].

## II. MATERIALS AND METHODS

### A. Microbes Used in MFC

Many microorganisms possess the ability to transfer the electrons derived from the metabolism of organic matters to the anode. Marine sediment, soil, wastewater, fresh water sediment cow dung and activated sludge are all rich sources for these microorganisms [17, 29]. The anodic electron transfer mechanism in MFC is a key issue in understanding the theory of how MFCs work. As mentioned above, microbes transfer electrons to the electrode through an electron transport system that either consists of a series of components in the bacterial extracellular matrix or together with electron shuttles dissolved in the bulk solution. *Geobacter* belongs to dissimilatory metal reducing microorganisms, which produce biologically useful energy in the form of ATP during the dissimilatory reduction of metal oxides under anaerobic conditions in soils and sediments. The electrons are transferred to the final electron acceptor such as $Fe_2O_3$ mainly by a direct contact of mineral oxides and the metal reducing microorganisms [14, 26]. The anodic reaction in mediator-less MFCs constructed with metal reducing bacteria belonging primarily to the families of *Shewanella, Rhodoferax,* and *Geobacter* is similar to that in this process because the anode acts as the final electron acceptor just like the solid mineral oxides. *S. putrefaciens*, *G. sulferreducens*, *G. metallireducens* and *R. ferrireducens* transfer electrons to the solid electrode (anode) using this system. Though most of the real mediator-less

MFCs are operated with dissimilatory metal reducing microorganisms, an exception was reported with *Clostridium butyricum* [18, 21] . Mediators such as dye molecules and humic substances also have some effects on the mediator-less MFCs even though the anodophiles can transfer the electrons to the anode directly especially in the early stage of bio-film formation. Electron mediators like $Mn^{4+}$ or neutral red (NR) incorporated into the anode noticeably enhance the performance of MFCs using anodophile *S. putrefaciens* [20]. Mediators play an important role in electron transport for those microbes that are unable to transfer the electrons to the anode. Basic processes are shown as follows [8, 13]. Mediators shuttle between the anode and the bacteria transferring the electrons. They take up the electrons from microbes and discharge them at the surface of the anode. *Actinobacillus succinogenes*, *Desulfovibrio desulfuricans*, *E. coli*, *Proteus mirabilis*, *Proteus vulgaris*, and *Pseudomonas fluorescens* need extraneous mediators while some microbes can provide their own. For example, *Pseudomonas aeruginosa* produces pyocyanin molecules as electron shuttles.

## B. Mechanism

The bacteria live on the surface of anode and convert a substrate such as glucose, acetate but also waste water into $CO_2$, protons and electrons. Under aerobic conditions, bacteria use oxygen or nitrate as a final electron acceptor to produce water. However, on the anode of a MFC, no oxygen is present and bacteria transfer electrons from their natural electron acceptor to an insoluble acceptor, such as the MFC anode. Due to the ability of bacteria to transfer electrons to an insoluble electron acceptor, we can use a MFC to collect the electrons originating from the microbial metabolism. The electron transfer can occur either via membrane-associated components, soluble electron shuttles or nano-wires. The electrons then flow through an electrical circuit with a load or a resistor to the cathode. The potential difference (Volt) between the anode and the cathode, together with the flow of electrons (Ampere) results in the generation of electrical power (Watt). The protons flow through the proton or cation exchange membrane (Selective permeable membrane) to the cathode (Oh and Logan 2004). At the cathode, an electron acceptor is chemically reduced. Ideally, oxygen is reduced to water.

## C. Construction and Operation

Canister drums of 2 liters capacity were used to mix the slurry and place the electrodes for dual chamber MFC design. Canister drums of 500ml capacity were used for six chamber MFC design. Multimeter was used to detect and measure electricity generated from MFC. Copper, brass and magnesium sheets of 0.2mm thickness and 6"X6"dimensions were used as electrodes. Insulated copper wires were used to connect the electrodes to external circuit. Solder iron and solder wire were used to connect the copper wire to electrodes. Cow dung and urine were used as fuel and as source of microbes. Cow dung slurry was prepared by mixing with water in 2:3 proportions and stirred well till uniform slurry is formed. The surface of the metal sheets used as electrodes were rubbed with sand paper to make them rough. Figure.2 shows the dual chamber and six chamber MFC design used on lab scale.
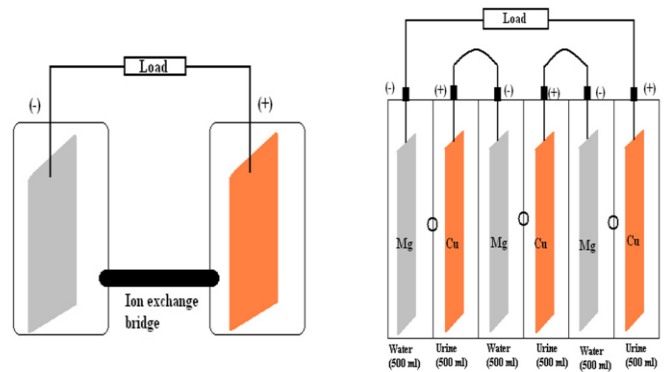


Figure: 2. Dual and six chamber MFC designs

Following table shows the design in terms of operating condition, combination of electrodes and type of fuel used.

Table: 1. Magnesium electrodes are inserted in container containing cow dung under aerobic condition slurry and other electrodes in container containing water.

| Dual chamber design | Anode | Cathode |
|---|---|---|
| Design 1 | Brass | Magnesium |
| Design 2 | Copper | Magnesium |

Table: 2. Magnesium electrodes are inserted in container containing water and other electrodes in container containing cow dung slurry under aerobic condition.

| Dual chamber design | Anode | Cathode |
|---|---|---|
| Design 3 | Brass | Magnesium |
| Design 4 | Copper | Magnesium |

Table: 3. Magnesium electrodes are inserted in container containing water and other electrodes in container containing cow dung slurry under anaerobic condition.

| Dual chamber design | Anode | Cathode |
|---|---|---|
| Design 5 | Brass | Magnesium |
| Design 6 | Copper | Magnesium |

Table: 4. Magnesium electrodes are inserted in container containing water and other electrodes in container containing cow urine under anaerobic condition.

| Six chamber design | Anode | Cathode |
|---|---|---|
| Design 7 | Magnesium | Brass |
| Design 8 | Copper | Magnesium |

## III. RESULTS AND DISCUSSION

Generation of electricity was detected and measured for 15 days. Graphical representation of the results, taking number of days of observation on X-axis and voltage measured in volt on Y-axis is given below:
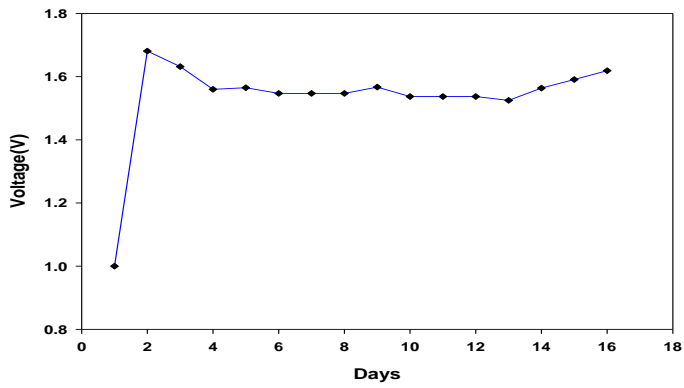
Figure: 3.1. Results of design 1
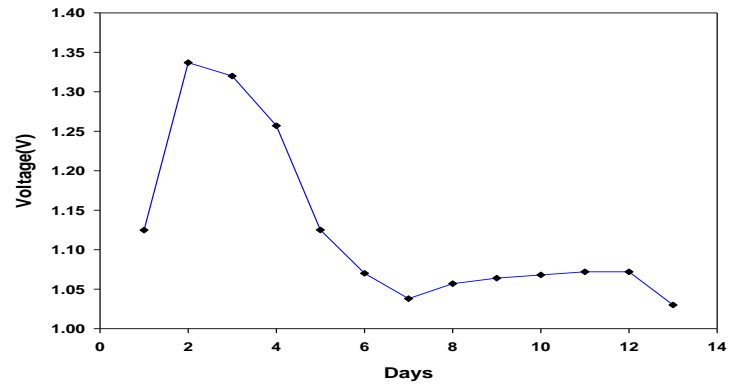


Figure: 3.4. Results of design 4
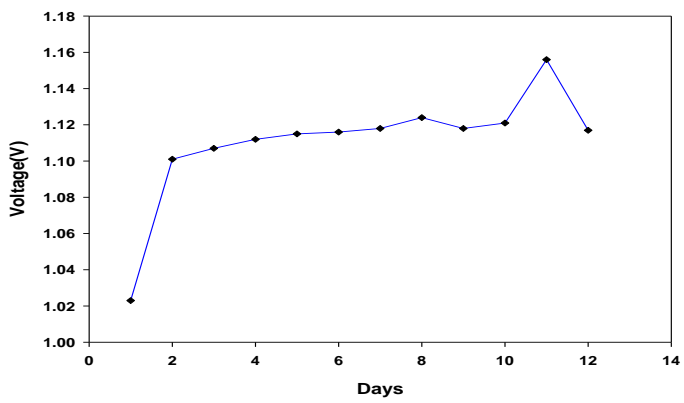


Figure: 3.2. Results of design 2
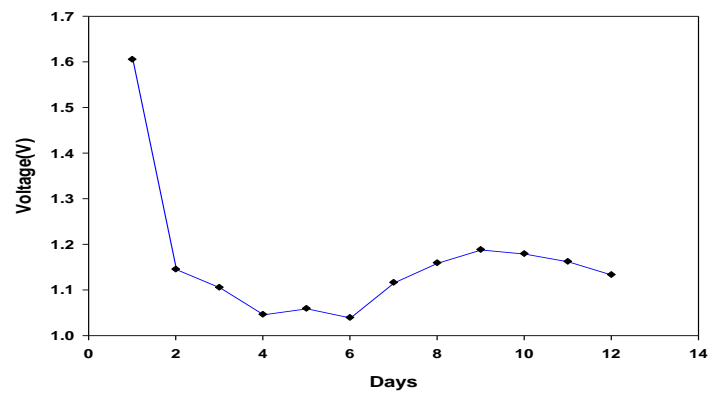


Figure: 3.5. Results of design 5
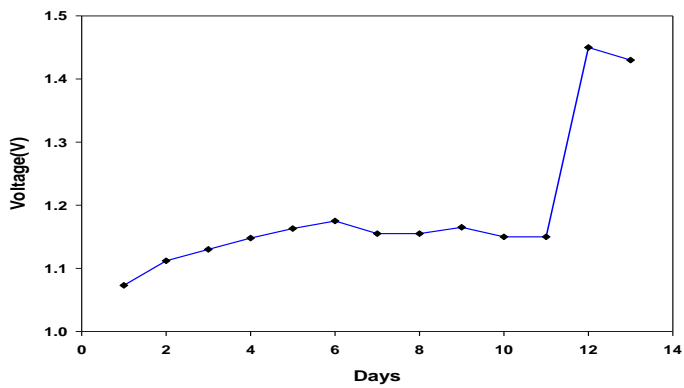


Figure: 3.3. Results of design 3
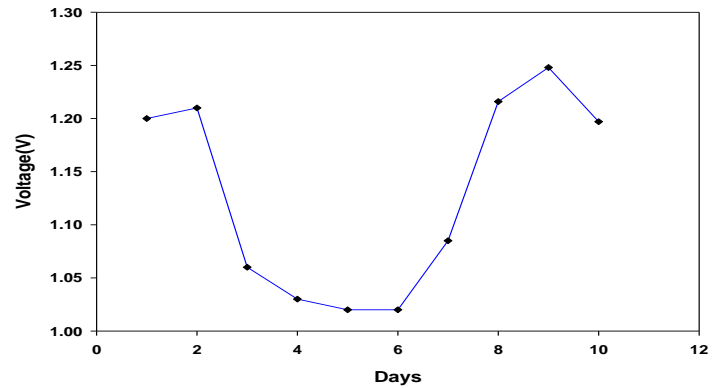


Figure: 3.6. Results of design 6
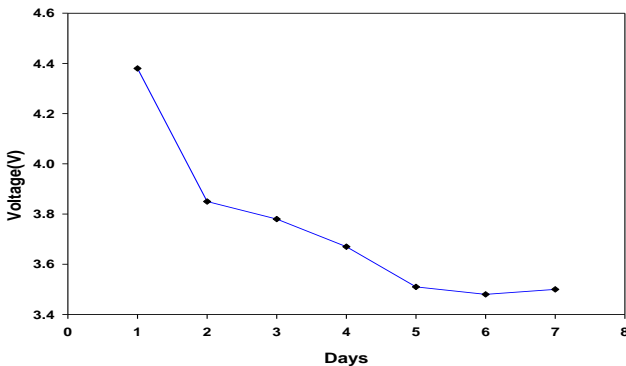
Figure: 3.7. Results of design 7
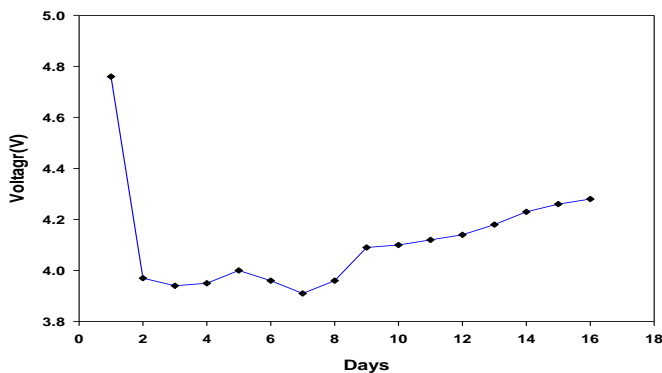


Figure: 3.8. Results of design 8

Cow dung slurry was used as fuel in design 1, 2, 3, 4, 5 and 6. Design 1 showed a steady output of 1.6 volt from day 2 till day 15, whereas design 2 gave an output of 1.12 volt up to day 11. Design 3 showed an output of 1.1 volt from day 2 till day 11 which later showed a peak of 1.4 volt on day 12. Design 4 initially showed a better result with 1.35 volt but showed a negative slope from day 3 till day 7, giving steady state value of 1.05 volt. All above designs were operated with electrode inserted in cow dung slurry under aerobic conditions and hence design with magnesium electrode inserted in chamber containing water were selected for further testing under anaerobic conditions as they gave better results compared to the one with magnesium electrode inserted in chamber with cow dung slurry. Design 5 showed a more steady output compared to the output from design 6 with. Design 5 gave a steady output of 1.1 volt whereas design 6 initially showed a peak of 1.2 volt on day 2 then output as low as 1 volt till day 6 and sudden increase in output till day 9 of 1.23 volt.

Cow urine was used as fuel in design 7 and 8 which was a six chamber design MFC with each chamber connected in series. Design 7 showed a gradual decrease in output from 4.4 volt to 3.5 volt till day 7 and the trend continued like this. Design 8 showed a peak of 4.8 volt on day 2 then decrease to 4 volt till day 8 and then a gradual increase till day 15 to 4.2 volt. The result shows that design 8 is a better choice with steady output of 4.2 volt. The output of design 8 was used to illuminate LED of 1.35 volt which showed a positive result.

## IV. CONCLUSION

It can be concluded that from the biogas plant of higher capacity, sufficient amount of electricity can be generated which can be used for various small domestic needs. With modification in the electrode design and the biogas plant design, there is a good prospect of tapping unconventional energy source from biogas plant. By including certain natural organic waste in the slurry of biogas plant, there is possibility of enhancing the voltage output, which would add to the economy of biogas plant and increase the fertilizer property of exhaust slurry.

Studies of the anode bio-film community composition of MFC from cow dung slurry would throw the door open for exploration of efficient way of harvesting electrical energy from the biogas plant as a new method for renewable and sustainable energy production. The waste generated from MFC can further be processed to produce manure and white coal.

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# Root Canal Morphology of Mandibular second Premolars in North Indian SubPopulation

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*Abstract*- **Introduction:** The main goal of root canal treatment is to prevent or heal formation of apical periodontitis. Complexity of root canal anatomy presents clinical challenges related to treatment outcome. The aim of this study was to investigate the morphology of the root canal system of mandibular $2^{nd}$ premolar in north Indian subpopulation using periapical radiographs and CT Dentascan. No such study on Indian subpopulation is present till date. **Methods:** A total of 310 mandibular second premolar teeth were examined with the help of periapical radiographs and CT Dentascan in 158 patients, aged between 15 to 60. Number of roots and root canals were evaluated. **Results:** Among the teeth examined 6.4% (n=20) had more than one root. Regarding canal morphology, 3.8% (n=12) of the teeth had two canals, whereas 1.9 % (n= 6) had three canals and 1% had more than 3 canals. **Conclusion:** Most of the mandibular $2^{nd}$ premolar had 1 root and 1 root canal. Less than 1 of 10 mandibular $2^{nd}$ premolar had complex root canal system(2 or more canals).This study provides supplemental information about root canals of mandibular $2^{nd}$ premolar in north Indian subpopulation.

*Index Terms*- dentascan, mandibular 2nd premolar, root canal

## I. INTRODUCTION

The main objectives of endodontic therapy are proper cleaning and shaping of all pulp spaces and complete obturation of these spaces with an inert filling material. Slowey (1) stated that the root canal anatomy of each tooth has certain commonly occurring characteristics as well as numerous atypical ones that can be roadmaps to successful endodontics. So the clinician must have an understanding of the complexity of the root canal system and its possible variations in order to achieve a successful outcome.

As a group, the mandibular premolars are among the most difficult teeth to treat endodontically. A possible explanation for this difficulty may be the extreme variations in root canal morphology that occur in these teeth. Furthermore, the incidence, location, and morphology of root canal systems may vary in different ethnic or regional populations. The mandibular second premolar is typically described in textbooks as a single rooted tooth with a single root canal system (2, 3). But, there are numerous case reports and anatomic studies that have reported variations in this tooth (5-10).

Traditional radiograph is limited in its ability to give reliable information on the number and morphology of root canals (12). The application of further analytic diagnostic tools such as dental CT for the assessment of unusual root canal

morphology has been highlighted, aiding the correct endodontic management of complicated and challenging cases (13).

There are no published reports on the root canal anatomy of mandibular $2^{nd}$ premolars in Indian population. Therefore, the purpose of this study was to evaluate root and canal morphology in mandibular second premolars in north Indian subpopulation.

## II. MATERIAL AND METHODS

**Case selection:**

Patients having fully erupted permanent mandibular second premolars with completely developed apices lacking root canal fillings and coronal restorations were selected. Most of these patients required pre-operative CT Dentascan assessment for implant placement, orthodontic treatment and other treatment needs. A total of 310 mandibular second premolar form 158 patients were evaluated. Informed consent was obtained from the patient.

**Image acquisition:**

A minimum of two radiographs were taken for each tooth-first was taken at an angle of 90 degrees in the horizontal plane and second was taken at 30 – 40 degrees mesial to the horizontal plane as suggested by Martinez-Lozano et al(13).CT Dentascan images were obtained for all the patients. Two independent Endodontists assessed the number of roots and canals, the position where canal bifurcation occurred and the canal configuration to reach consensus on the interpretation of radiographic findings. The types of canal configuration was categorised based on Vertucci's classification (14).

## III. RESULTS

Among the 310 mandibular second premolars studied, 19 teeth exhibited 2 roots and 1 tooth had 3 roots. No significant difference was found between the number of root / root canals and tooth position.

**Number of roots:**

The majority of the teeth 93.5% had a single root. Two roots were found in 6.1% of the cases whereas three-rooted (0.3%) teeth were extremely rare. Two rooted premolar were bilaterally present in 5 patients. Results were tabulated (table 1) along with major anatomical studies on mandibular second premolar.

| Reference (Country) | No. of teeth studied | Type of study | 1 Root% | 2 Roots% | 3Roots% | |
|---|---|---|---|---|---|---|
| Visser (1948) (16) | 2,089 (Germany) | Analysis of extracted teeth | 99.85% (2,086) | 0.05% (1) | 0.1% (2) | |
| Vertucci (1978) (17) | 400 (USA) | Clearing | 100 %( 400) | — | | — |
| Geider et al. (1989) (18) | 328 (France) | In vitro radiography & sectioning | 97.6% (320) | 0.4% (8) | — | |
| Zaatar et al. (1997) (19) | 64 (Kuwait) | Radiographs of RCT teeth | 95.6% (61) | 4.7% (3) | | — |
| Present study | 310(India) | Radiographic and CT analysis in vivo | 93.5 %( 290) | 6.1 %( 19) | 0.3 %( 1) | |

Number of canals:

Of all the teeth studied, single canal was present in 93.2% of the cases. Two separate canals were present in 3.8% of cases whereas three canals were found in 1.9% of the cases. CT images confirmed the presence of 4 canals in 0.6%.

| Reference studied | No. of teeth (Country) | Type of study | 1 canal% | 2 or more canals% |
|---|---|---|---|---|
| Barrett (1925) (20) | 32 (USA) | Sectioning | 65.6% (21) | 34.4% (11) |
| Pineda and Kuttler (1972) (21) | 250 (Mexico) | Radiographic In vitro | 98.8% (247) | 1.2% (3) |
| Zillich and Dowson (1973) (22) | 906 (USA) | Radiographic in vitro and Probing | 87.5% (793) | 12.5% (113) |
| Vertucci (1978) (17) | 400 (USA) | Clearing | 97.5% (390) | 2.5% (10) |
| Geider et al. (1989) (18) | 328 (France) | In vitro radiography and sectioning | 86.6% (284) | 13.4% (44) |
| Zaatar et al. (1997) (19) | 64 (Kuwait) | Radiographs of RCT teeth | 95.3% (61) | 4.7% (3) |
| Hasheminia and Hashemi (2005) (25) | 80 (Iran) | Clearing and sectioning | 88.8% (71) | 11.2% (9) |
| Present study | 310 (India) | Radiographic and CT analysis in vivo | 93.2 % (289) | 6.8 % ( 21) |

**Table – 1**

| Reference (Country) | No. of teeth studied | Type of study | 1 Root% | 2 Roots% | 3Roots% | |
|---|---|---|---|---|---|---|
| Visser (1948) (16) | 2,089 (Germany) | Analysis of extracted teeth | 99.85% (2,086) | 0.05% (1) | 0.1% (2) | |
| Vertucci (1978) (17) | 400 (USA) | Clearing | 100 %( 400) | — | | — |
| Geider et al. (1989) (18) | 328 (France) | In vitro radiography | 97.6% (320) | 0.4% (8) | — | |

& sectioning

| | | | | | |
|---|---|---|---|---|---|
| Zaatar et al. (1997) (19) | 64 (Kuwait) | Radiographs of RCT teeth | 95.6% (61) | 4.7% (3) | — |
| Present study | 310(India) | Radiographic and CT analysis in vivo | 93.5 %( 290) | 6.1 %( 19) | 0.3 %( 1) |

## IV. DISCUSSION

Anatomical studies render invaluable knowledge about the normal and unusual canal morphology. Various techniques have been used in studies evaluating canal morphology.The aim of this study was to investigate the morphology of the root canal system of mandibular 2nd premolar in north Indian subpopulation using periapical radiographs and CT Dentascan. Compared to other technique, Dentascan and periapical radiographs are non-invasive method and can be used directly to evaluate living samples. Matherne et al (15) suggested that computed tomography imaging has been successfully used in endodontics for better understanding of the root canal anatomy.Yoshioka et al (16) have indicated that sudden narrowing of the canal system on a periapical radiograph suggests canal system multiplicity. However, it has its inherent limitation to assess the root canal system completely.

Our study shows that the incidence of more than one root in mandibular 2nd premolar is about 6.4 % which is very much higher than the previous anatomical studies (7-11). Only one study by Serman and Hasselgren(17) got results similar to the present study. With respect to the number of canals, the findings were quite similar to the findings of Hasheminia and Hashemi(18).One of the possible reasons could be the different ethnic population(19) in our study and secondly 2 rooted mandibular 2nd premolar may occur bilaterally. In our study, almost 5 patients had two rooted mandibular 2nd premolar bilaterally. In addition, mandibular 2nd premolar with 3 or more root canals were reported occasionally and their incidence in this study was also minor(19).

Matherne et al (20) reported the superiority of computed tomography over other diagnostic methods in locating the additional canals. In the present study, axial images of CT were used to confirm the additional roots or canals. Thus CT imaging is not only non-invasive but also highly sensitive method for morphological studies in living samples(21). In clinical practice,2 or more root canals may be overlapped in perapical radiographs and the information provided by dentascan in this study was useful to probe root canal orifices(21).

The human mandibular 1st premolar tooth,in comparison had a higher incidence of more than 1 canal system(24.2%) and more than 1 apical foramina(21.1%) in weighted studies(22). No literature is available on incidence of multiple canals in mandibular 2nd premolar using dentascan and periapical radiographs in Indian subpopulation. This study provides supplemental information about mandibular 2nd premolar in north Indian subpopulation.

## V. CONCLUSION

The present in vivo study has revealed that the mandibular 2nd premolar can have an extremely complex root and root canal morphology.

(i) Most of the mandibular 2nd premolars have a single root i.e 93.5 % and 6.4% had more than one root, which is much higher in north Indian subpopulation than other ethinic group studies.

(ii) In 5 patients, two rooted mandibular 2nd premolar is bilaterally present, increasing the overall percentage.

(iii) The incidence of single canal in mandibular second premolars is 93.2%, two canals is 3.8%, 3 canals is 1.9%, 4 canals is 0.6%.

(iv) While doing root canal therapy of mandibular 2nd premolar, one should be cautious and find extra canals, which otherwise may lead to higher failure rate.

(v) The use of 3-dimensional imaging methods in future large anatomic studies would be of value in assessing the occurrence and the frequency of anomalous canal morphology.

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# Development of resistance in *Tribolium castaneum*, Herbst (Coleoptera: Tenebrionidae) towards deltamethrin in laboratory

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*Abstract* - A strain of Tribolium castaneum (Herbst) was developed for resistance against deltamethrin, after six generation of selection from a laboratory susceptible strain, through topical application method. The selection was initiated at the dose 0.0004, which was increased during successive generations' upto 0.026 in sixth generation. The resistance ratio of selected strain was determined, and it was found to be 370.5 fold in sixth generation as compared to susceptible strain.

*Index Terms*: Selection, resistance, deltamethrin, Tribolium castaneum

## I. INTRODUCTION

T*ribolium castaneum* Herbst (Coleoptera: Tenebrionidae) also known as the red flour beetle is a common, worldwide pest of stored product infesting many commodities. The pest contributes to the maximum spoilage of the stored grains at larval as well as the adult stages. Besides being abundant in the granaries they are also familiar sights in the households. The fact that flour beetle had been found well preserved in the Pharaonic tombs of the sixth dynasty, 2500 B.C., suggest that these beetles probably become pest as man learned to store seeds. In Hindu literature they have been referred as"Ghun". Infestation by these beetles results in an unappealing smell due to the secretion of benzoquinones from abdominal glands. This widely distributed pest species is extremely facile and tactable genetic model.

As a consequence of repeated chemical treatments, many cases of insecticide resistance have been detected in the genus Tribolium around the world. The first record date back to the end of 1959s and the first half of 1960s (Anonymous, 1958; Kumar and Morrison, 1965). In India the first report of pesticide resistance from a storage insect pest came in 1971, when T. castaneum was found to have developed resistance against malathion (Bhatia et al., 1971) and p, p' DDT (Bhatia, 1971).

The red flour beetle has developed resistance against almost all the insecticides commonly used against it such as phosphine, methyl bromide, organophosphates, pyrethroids and insect growth regulators (Anisur-Rahman and Shahjahan, 2000; Champ and Dyte, 1976; Collins, 1998; Dhaliwal and Chawla, 1995; El-Lakwah et al., 1996; Horowitz et al., 1998; Pacheco et al., 1994; Pimental et al., 2007; Werner, 1997; Zettler and Arthur, 1997)

Synthetic pyrethroid are being extensively used in controlling insect pests because of their characteristics like quick knock down, broad spectrum activity and low mammalian toxicity. In India pyrethroids were introduced in 1980 for the control of number of field pests (Bengston et al., 1983, Ramzan and Chahal, 1987). Resistance towards some commonly used synthetic pyrethroids, viz., permethrin, cypermethrin, deltamethrin and fenvalerate has already been reported (Dhingra et al., 1988; Mc Caffery et al., 1989, Saxena et al., 1989, 1992; Armes et al., 1992; ; Sinha, S. R. and Saxena, J. D. 1999; Padhee et al., 2002). The purpose of this study was to investigate the development of resistance in Tribolium castaneum towards a synthetic pyrethroid deltamethrin through bioassay method in laboratory.

## II. MATERIAL & METHOD

### A. Rearing of the test insects

The selection of deltamethrin resistant strain of T. castaneum was initiated with a population of composite nature, collected from two different regions of Agra (Cant and Dayalbagh). These field populations were mixed together in a common jar for rearing. Insects were reared on wheat flour containing 5% brewer's yeast at 30±2° C and 70% Rh as per the WHO standard method. The progeny of this culture was designated as parental strain.On emergence of appreciable number of adults, insects were sieved out and used for bioassay tests.

### B. Selection Procedure

The selection of resistance was done by topical application method. The base line susceptibility to deltamethrin of the parental strain was evaluated by bioassay. On the basis of bioassay tests of the parental strain, the dose which killed 60-70 percent population was chosen for applying selection pressure. For obtaining the first generation the adults (300-400) of the parental strain were treated with this dose of insecticide. Then after 48 hrs live insects transferred to fresh medium for rearing. The concentration of insecticide was increased in the subsequent generations for rearing second, third, fourth, fifth and sixth generation respectively. Bioassay tests were

conducted in each successive generation in order to monitor the increase in resistance level. Thus, the selection for the deltamethrin - resistant strain was carried out for six generations. The susceptible strain (parental strain) was simultaneously maintained without any insecticidal exposure, for comparison.

C. Insecticide and Method of Bioassay

Technical grade deltamethrin (98.10%), obtained from Tagros Chemicals India Ltd., was used for the experiments. Bioassay of both susceptible and selected strains of T. castaneum was done by topical application method. Six to eight graded concentrations of the insecticide were prepared in acetone and applied at the rate of 0.5µl to each adult insect on the ventral surface of the mid thorax with the help of a micropipette (0.5-10µl). Each concentration replicated three times with 10 insects in each replicate. In control insects were treated with acetone only. The insects after the treatment with different concentrations of insecticide along with the control were kept at $30 \pm 2^{0}$C and 70% Rh.. Mortality counts were taken after 48 hr of treatment and the data were subjected to probit analysis (Finney, 1972).

D. Statistical Analysis

Mortality data from insecticide treated strains were corrected for control mortality by Abbott's formula (Abbott's, 1925) transformed in logits and analysed by INDOSTAT (Software). Relative susceptibility of population to chemical was estimated by resistance ratio (RR = LC50 of Resistant strain/ LC50 Susceptible strain)

## III. RESULTS AND DISCUSSION

The selection of deltamethrin-resistant strain of T. castaneum was initiated with the parental population. The susceptibility of parental population was determined through bioassay tests. The LC50 to deltamethrin of parental population was 0.00019%. Bioassay was carried out in order to ascertain the base-line toxicity of parental strains to deltamethrin.

The selection of insects for resistance was initiated by ascertaining the dose which gave 70% mortality of susceptible individuals in each generation. The survivors of each selection pressure were reared in fresh wheat flour medium .The details of dosages on insecticidal pressure used in different generations have been given in Table 1

Table 1: Doses of deltamethrin used in successive generations of selection of T. castaneum

| Generation | LC$_{70}$ |
|---|---|
| Parental | 0.0004 |
| First | 0.0005 |
| Second | 0.003 |
| Third | 0.007 |
| Fourth | 0.014 |
| Fifth | 0.026 |

The increased resistant level in the selected strain was measured in each successive generation through bioassay tests. The results of the bioassay tests performed after successive generations showed that the LC50 value increased from 0.0002 % in the parental generation to 0.0006, 0.001, 0.003, 0.003, 0.0068, and 0.074 % in the first, second, third, fourth, fifth, and sixth generation respectively (Table 2, fig-1). The data showed that there was a progressive increase in the level of resistance to deltamethrin as was evident from the fact that the concentration of insecticide given as selection dose, increased from 0.0004 % for first generation to 0.026 % for sixth generation. The results showed that resistance at LC50 and its concurrent ratio increased in the order of > 6 in second >17 in third and fourth >34 in fifth >370.5 folds in sixth generation.

Table 2 -Toxicity of deltamethrin to the adults of *Tribolium castaneum* in the successive generations

| Generation | Degrees of freedom | Heterogeneity $\chi^2$ | S. E. of b | Regression equation | LC$_{50}$ (%) | Fiducial limits | Resistance ratio |
|---|---|---|---|---|---|---|---|
| P1 | 5 | 4.1356 | 0.1167 | Y=10.1764+ 1.3959072x | 0.0002 | 0.0002-0.0002 | - |

| F1 | 6 | 8.4844 | 0.1285 | Y=7.7646 + 0.8635396x | **0.0006** | 0.0004-0.0009 | 3 |
| F2 | 6 | 7.0091 | 0.1014 | Y=8.1795+ 1.0928895x | **0.0012** | 0.001 - 0.0015 | 6 |
| F3 | 6 | 4.7559 | 0.1293 | Y=8.1157+ 1.2600802x | **0.0034** | 0.0027-0.0042 | 17 |
| F4 | 7 | 12.1093 | 0.0866 | Y=6.8378 + 0.7431464x | **0.0034** | 0.0025-0.0045 | 17 |
| F5 | 7 | 9.1103 | 0.0833 | Y=6.9874 + 0.9163402x | **0.0068** | 0.0053-0.0086 | 34 |
| F6 | 7 | 4.4980 | 0.0699 | Y=5.7296 + 0.6454653x | **0.0741** | 0.0524-0.1047 | 370.5 |
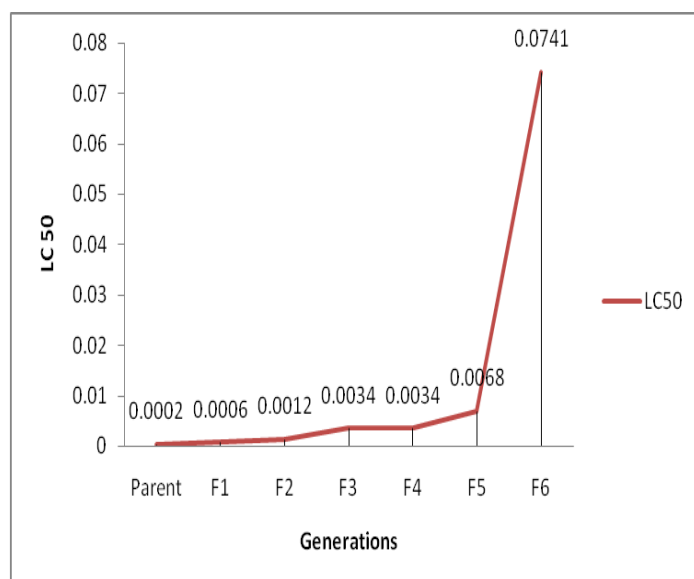


Fig 1: Showing increase in LC50 value in successive generations.

Thus the present investigation showed that topical method was appropriate to assess the high degree of resistance to deltamethrin in T .castaneum.

There are very few reports on laboratory selection for resistance to deltamethrin and other synthetic pyrethroids in the stored grain pests. Selection of S. oryzae in the laboratory over 25 generations using permethrin and deltamethrin resulted in resistance levels of x256 and x98, respectively (Heather, 1986). Misra (1995) selected a fenvalerate-resistant strain of T. castaneum in the laboratory having >210 fold resistance through seven generations of selection. It appeared from the above reports that in S. oryzae, a 98 – fold resistance to deltamethrin was acquired after 25 generations. Saxena and Sinha (1999) reported a high degree of resistance 891.94 fold to deltamethrin in Tribolium castaneum through treated flour method in six generations of selection. while in the present investigation with T. castaneum, 370.5 fold resistance was attained in six generations by topical application method for selection.

## ACKNOWLEDGEMENT

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# Fabrication of Porous Clay Ceramics Using Kenaf Powder Waste

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*Abstract-* Porous clay ceramics were fabricated by using kenaf powder waste (KP as a pore-forming agent PFA). The raw clay powder was characterized using XRF, XRD and TGA. Samples were prepared with different kenaf powder wastes (up to 30wt.%) using granulated powder mixtures and followed by hydraulic pressing. After drying, the ceramic green bodies were fired with different temperatures ranging from 1100 to 1175$^o$C for 3 h with a heating rate of 5$^o$C/min. The pore formation and microstructure in the samples were characterized using FE-SEM, while bulk densities, porosities and water absorption were determined using the Archimedes method. Their mechanical properties were also investigated in order to optimize the fabrication process itself. The results obtained showed shrinkages between 11.72-15.90% for the samples. The density values decreased from 1.30 -1.75g/cm$^3$, while porosity was determined to be between 11.86 to 45.64 %. The tensile strength was in the range of 9.06 to 24.05MPa. These results prove that kenaf powder wastes (KP) are potentially capable to produce porous ceramic materials.

*Index Terms*- Laotian clay; Sintering temperatures; Shrinkage; Porosity; Kenaf powder waste

## I.  INTRODUCTION

Porous clay ceramic materials are used for a wide range of applications such as insulators, catalyst, supports, filters, etc. It can be produced using various techniques for example by addition of chemicals, polymers and organics pore forming agent [1]. Environmentally friendly materials which can be recycled and conserve energy are very important in many research fields today. On the other hand, as a result of environmental regulations the demand for clay with higher insulation capability has increased [2-4].  It is well known that to increase the insulation capacity of the porous clay, it is important to generate porosity in the body. Typically, organic pore-forming agent additives are used. Sawdust, polystyrene, paper, sludge, coal and coke are some examples of organics which are used as pore forming agent materials. Recently, Perlite, diatomite, calcite, pumice and vermiculite which are examples of inorganic minerals have also been used as pore-forming agents [2; 3]. Organic pore formers are generally cheaper than inorganic ones and also have advantage of ensuring a heat contribution to the firing furnace. However, $CO_2$ emission is the main drawback of organic pore formers. Inorganic pore former have less environmental problems but they may change the plasticity of the clay system negatively and increase the amount of water needed to maintain acceptable plasticity. Organic product residues are extensively used as a pore former in the clay industry [5; 6]. Kenaf powder waste on the other hand can be derived from bamboo [4] and sawdust [2]. Malaysia is the world's largest producer of industrial kenafs. The main objective of this study is to investigate the effects of the aforementioned types of organics to create pores, as well as understand the properties of kenaf powder with firing clay processes.

## II.  EXPERIMENTAL

The raw clay materials used in this study was obtained from bricks and tiles at construction sites in Lao PDR. These areas have traditionally been an important place for the production of building bricks and tiles. The clay behavior during sintering was examined using similar process parameters as that of traditional techniques used in local brick manufacturing operations. The kenaf core waste was selected from Malaysia, then grinded to form the powder. Selected mixtures containing 0, 10, 20 and 30 wt % kenaf powder were prepared (Table1).

Table 1 The proportions of the mixtures for the formulations (wt.%)

| Formulation | Clay (BC) | Kenaf powder (KP) |
|---|---|---|
| BC | 100 | 0 |
| BCK10 | 90 | 10 |
| BCK20 | 80 | 20 |
| BCK30 | 70 | 30 |

The mineralogical analyses of the raw clay samples as well as its corresponding clay fraction were carried out utilizing (XRF) and X-ray diffraction techniques (XRD). The XRD patterns were obtained with a Rigaku Rint-2200 (Japan) diffractometer operating at a tube voltage and current of 30 kV and 30 mA respectively using monochromatic Cu-Kα1 radiation (λ=1.5406 Å). Diffraction patterns were recorded between 2 and70$^°$ 2θ with scanning rates of 2$^o$/min.

Differential thermal analysis (DTA) of the clay was performed with a ramp rate of 10$^o$C/min from room temperature to 1200$^o$C in air. The presence of possible defects in the sintered samples as well as their surface morphology was inspected with Scanning Electron Microscopy (SEM SHIMADZU SSX-550).

The raw materials (Table1) were mixed and sieved using a 500 µm screen. The specimens were then hand-pressed in a hydraulic system using stainless steel moulds. The samples had a diameter of 23mm and thickness of 4mm. Similar samples were also prepared and sintered for determining the tensile strength via diameteral compressive methods (DMA). The green body samples were dried at 80°C for 24h to attain equilibrium residue moisture content in the clay bodies. Dried samples were then sintered with heating rate 5°C/min at a maximum temperature of 1175°C with soaking time of 3h and allowed to cool down naturally inside the furnace. The shrinkage, density, porosity, water absorption and compressive strengths were determined in accordance with ASTM standards (C326, ASTM C373, 2005).

## III. RESULTS AND DISCUSSION

### a. Analysis of materials

The crystalline phases were in agreement with the results observed via XRF (Table.2), whereby the clay and kenaf powder consisted mainly of $SiO_2$ and $Al_2O_3$ which make up about 78% of BC in accordance with the quantitative XRD analysis. Table 2 presents the chemical composition of the raw clay and kenaf powder. The clay minerals and kenaf powder are presented a typical composition, which constitutes mainly of silica, alumina and minor contents of Fe, Mg, Ti, K and Ca oxides. The amount of CaO and MgO was low and indicated the absence for carbonates. Particle size distribution was determined by Laser particle analyzer on 0.1-100µm fractions. The particle size distributions of the clay sample of the arranged particle size is 0.68 µm.

X-ray diffraction (XRD) was used to identify the mineralogical phase of the raw clay where the following compounds were found in the raw clay material: Quartz ($SiO_2$), Kaolinite ($Al_2(Si_2O_5)(OH)_5$), Illite ($KAl_2(Si_3AlO_{10})(OH)_2$), Gibbsite ($Al_2(OH)_3$) and Montmorollonite ($(Na,Ca)_{0.3}(Al,Mg,Fe)_2Si_4O_{10}(OH)_2xH_2O$). In the fired samples phases are identified as oxides and hydroxides, as well as silicate in addition to residue quartz as mentioned by [7]. Above 1100°C, new crystallite phases are formed, which are quartz($SiO_2$) and mullite ($2Al_2O_3 SiO_2$) with a dominant presence of quartz [8], phase could be found in presence of a minor amount of MgAl2O4 spinel and mullite phases. As the sintering temperature increased from 1100 to 1175°C, the diffraction peaks of the cordierite phase became more intense, suggesting that the crystallinity of the cordierite phase in the membrane improved. As a result the highly crystalline structure composed of mullite in clay [9]. It is important to notice that mullite contents increased at 1175°C as shown in X-ray pattern in Figure 2.

Table.2. Chemical compositions of the black clay and kenaf (BC and KP) (wt.%)

| Oxides | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | $TiO_2$ | $K_2O$ | CaO | $NaO_2$ | L.O.I |
|--------|---------|-----------|-----------|---------|--------|------|---------|-------|
| BC | 55.00 | 25.00 | 3.60 | 0.76 | 2.60 | 1.30 | 0.24 | 14.00 |
| KP | 2.52 | 0.41 | 0.24 | 0.06 | 1.45 | 0.06 | 0.62 | 92.87 |

LOI*, Loss on ignition at 1000°C

Figure.2. shows the TG/DTA curves of the raw powder. At temperatures less than 100°C, followed by dehydrroxylation ether are endothermic DTA peak and about 6 wt% mass loss, which were caused by the removal of residual physically adsorbed water. There is a small endothermic DTA peak at 167°C and about 4 wt% weight loss because during crystallization water evaporated from basic magnesium carbonate. Because the ceramic powder was pre-heated at 1200°C, during which kaolinite transformed into meta-kaolinite and aluminum hydroxide into alumina, no weight loss or thermal effect is shown for the phase changes in ceramics themselves. Between 400 and 600°C, a large exothermal DTA peak appears which is attributed to the phase transformation from metakaolinite to Al-Si spinel. For temperatures ranging between 900 to 1000°C, the exothermic DTA peak indicates the crystallization of $MgAl_2O_4$ spinel phase as revealed from TG curve has no weight loss.
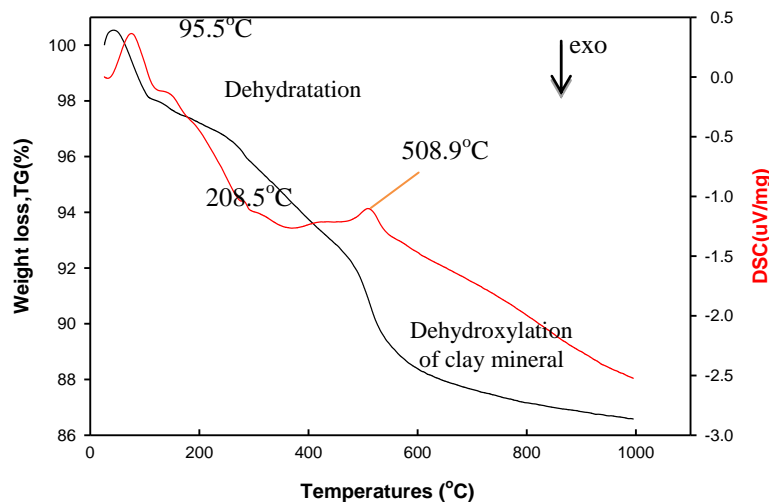


Figure 2.TG/DSC curses of the LC raw clay powder.
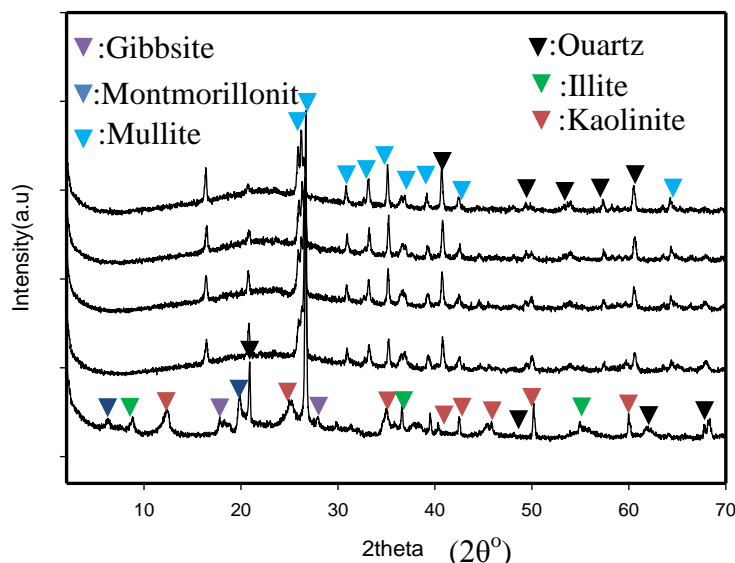


Figure.3. XRD diffraction patterns of the BCKP30 at fired different temperatures (a): raw; (b): 1100; (c): 1125; (d): 1150 and (e): 1175°C

### b. Sintering behaviour

The samples were fired from 1100 to 1175°C followed by measurement for shrinkage, density, apparent porosity and water absorption. These properties are shown in Fig.4. The shrinkage, density apparent porosity and water absorption changed depending on sintering temperatures and kenaf powder content. An increase in kenaf powder (KP) waste content from 10 to 30 wt.% showed an increase in shrinkage, porosity and water absorption. The main reason for such a trend is the composition of organic residues during the sintering. [2]. In this case, the effect is related to kenaf powder (KP) composition residues whereby all of organics were burnt off with the firing processes.

In addition, the shrinkage, apparent porosity and water absorption all of values of sample were found that both of properties were increased with increasing KP content addition while the densities were significantly reduced [2-4]. However, the shrinkage and density increased with increasing sintering temperature, while apparent porosity and water absorption decreased with sintering temperatures as depicted in Figure. 4(a-d).


(c)


(d)
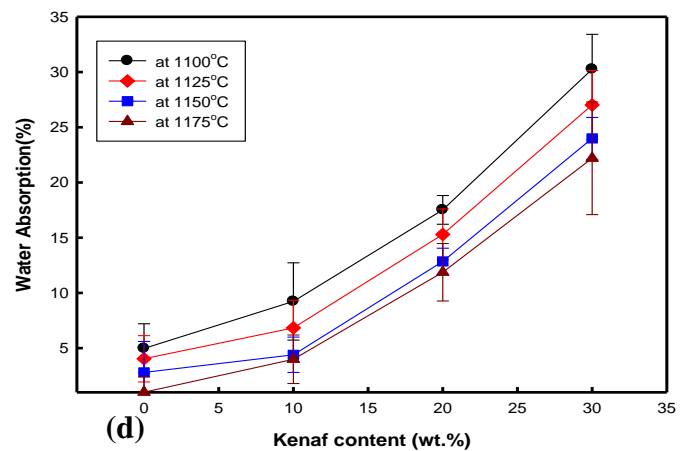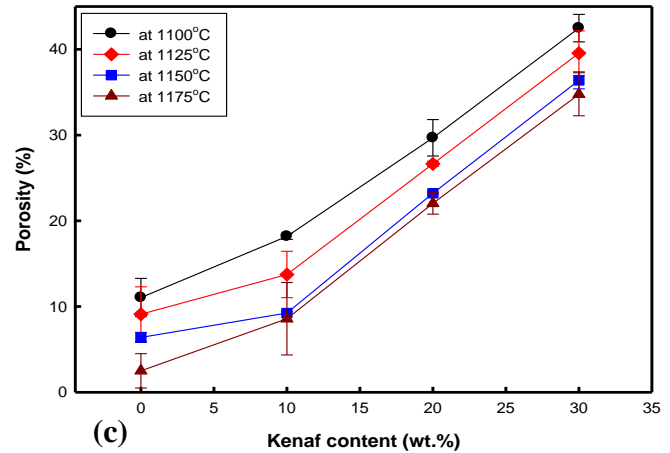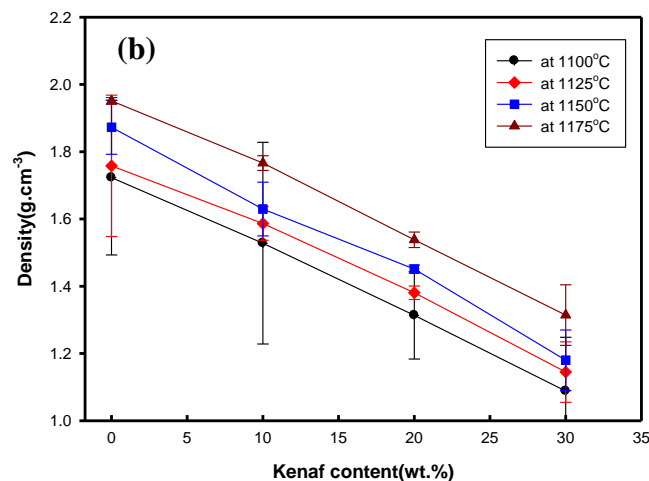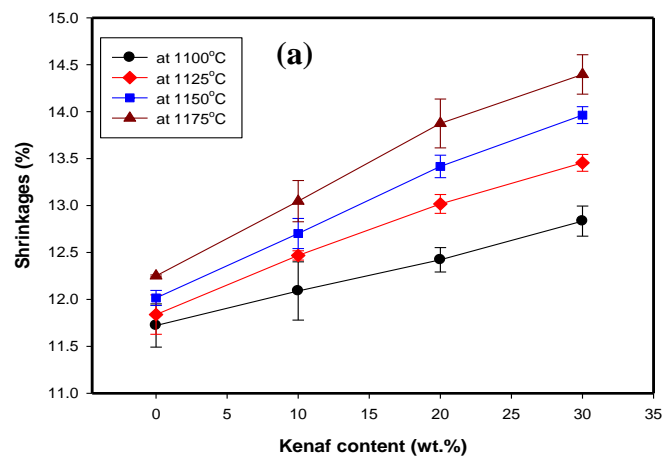
Figure4. Shrinkage, density, porosity and water absorption of the samples BCKP with kenaf contents sintered at different temperatures.

### c. Mechanical properties and Structural morphology observations

The mechanical properties of the samples were determined in terms of diameteral tensile strength (DTS). This is performed to obtain the mechanical properties of the sintered porous clay samples. It can be seen that the tensile strength decreased as KP content increased. The DTS of the porous clay ceramic samples having increasing KP content decreased especially when the ratio increased between 10 to 30 wt.%. Such a behavior is mainly related to factors such as decomposition of organic matter from the KP waste which generates pores in the fired structure [3; 4; 10].


(a)


(b)
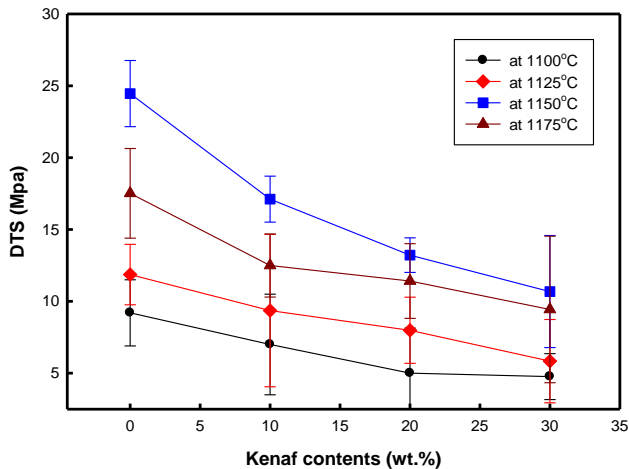
Figure5. Diametral tensile strength (DTS) of the samples BCKP sintered at different temperatures.

The sintering process involving ceramic materials has been widely studied and is known to have a pronounced impact on the resulting microstructure [7]. The microstructure of sintered samples was studied with a scanning electron microscope (SEM) to determine the size, shape morphology and distribution of the pores in the microstructure. The SEM images in Figure 6 show the evolution of the microstructure of the sintered samples. The fracture surface of bodies sintered at 1100°C is characterized by the presence of interconnected pores essentially, distributed homogenously in the ring fracture surface whose size are significantly larger than those sintered at 1175°C. Spherical pores were observed in mature microstructure where a sort of equilibrium between the gas pressure and capillary pressure was reached. At 1150°C some of the pores were closed and the homogeneity of the ceramic ring decreased.

Figures 6(c - h) showed that the pore size and shape increased when kenaf powder increased from 10 to 30 wt.%. The results show that all clay minerals were transformed to mullite phases. This was also seen via X-ray diffraction studies seen (Fig.3), thus the formation of mullite phases may have started at this temperature [11]. However, when the sintering temperature increased, the pores and grain sizes decreased because of an increase in density of the material itself.

It is reported that mullite has a special crystallographic structure, which demonstrates strong- bond chain links [9; 12]. This could explain the grain growth great with increasing KP content as shown in Fig.6. It is very clear that the densification was due to enhanced grain growth along the grain boundaries.
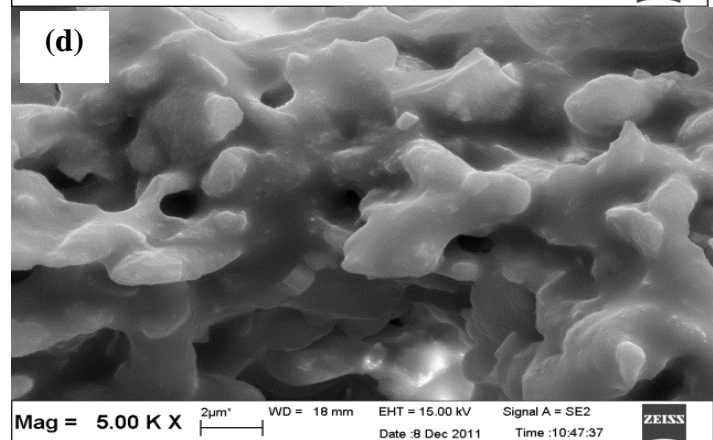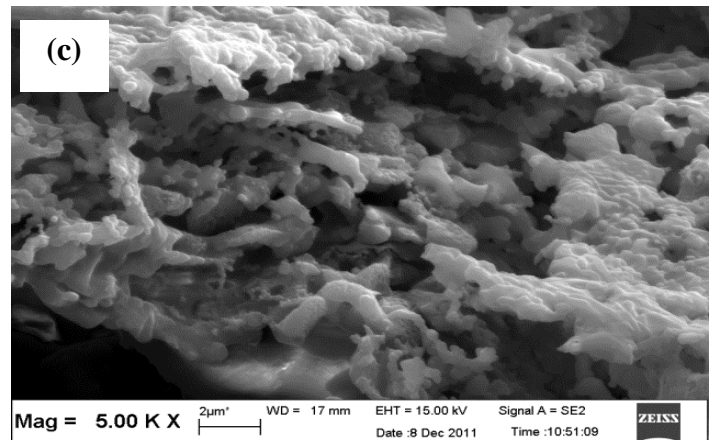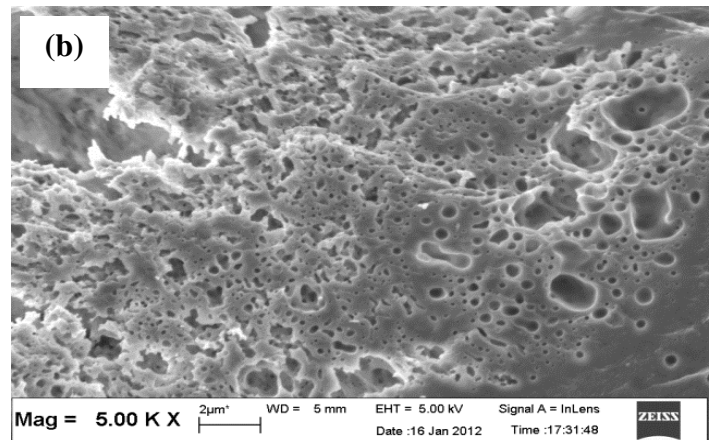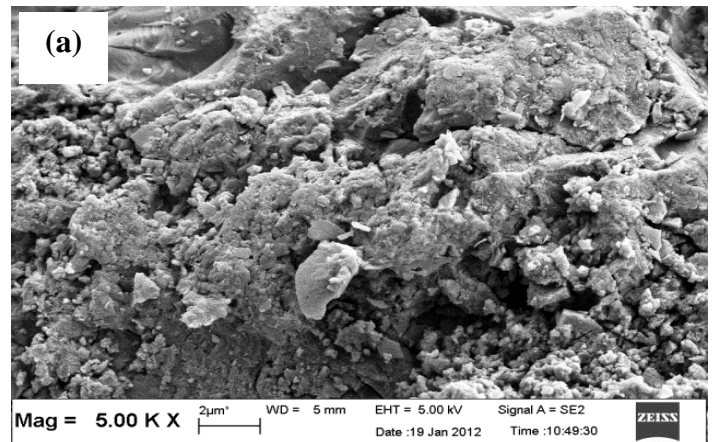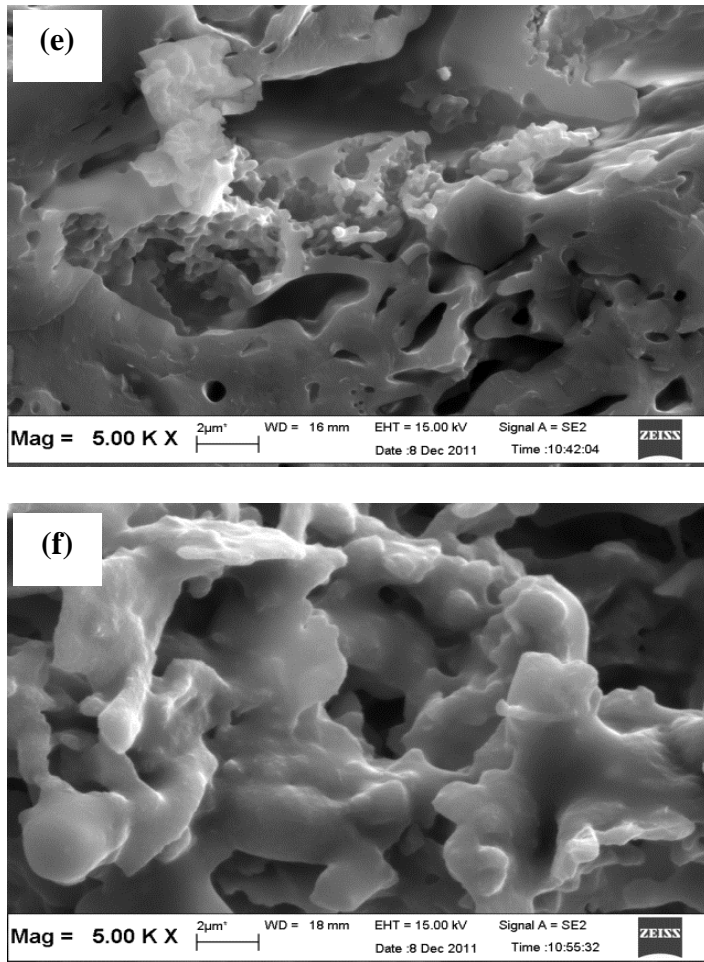
Figure.6. the SEM micrographs of BCKP fracture surface samples with (10; 20wt.%) of kenaf powder fired at different temperatures: (a-b) 1100$^o$C; (c-d) 1125; (e-f) 1150 and (g-h) 1175$^o$C (10 and 20 wt.%).

## IV. CONCLUSION

In this literature work, the focus is to develop porous clay ceramic materials which were fabricated using kenaf powder waste as a pore forming agent. Based on the experimental investigations reported in this paper, the following conclusion can be made:

(1). By increasing the organic content in the clay body, an increase in shrinkage, porosity and water absorption was seen, which also reflected in a decrease of density and tensile strength.

(2). The organic residues are easily burnt off from the clay body during firing.

(3). Organic residues can be effectively used for pore-forming for up to 30wt.% residue addition by weight. It has been found that further addition of organic residues is not very effective for decreasing the density of the clay body. The residues increased the porosity and decreased density of the material.

(4). The organics residues can be used as a pore-forming additive in clay bodies without any damaging effect on the clay product's manufacturing process itself.

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# Adrenal Cortisol Response to One Microgram Adrenocorticotropin Stimulation Test in Children with Type – 1 Diabetes Mellitus

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*Abstract-* **Objective:** The study was done with the purpose of evaluating the adrenal cortical response to 1 microgram ACTH stimulation test in children with type-1 diabetes and compared with that of controls.
**Design:** Case – control study. 28 children with type – 1 diabetes attending the outpatient department of endocrinology department, M.S.Ramaiah Medical College and Teaching Hospital and 20 age and sex matched controls from Happy Home Orphange, KGF were infused with 1µg ACTH.
**Methods:** Cortisol levels were estimated using radio immunoassay technique, before and 30 minute after 1 µg ACTH infusion.
**Results:** The cortisol levels significantly increased in normal as well as children with type – 1 diabetes.  But the increase was not found to be the same in both the groups.  The effect of ACTH in increasing cortisol levels is much more in normal as compared to children with type-1 diabetes.
**Conclusion:** The results suggest a blunted adrenal cortisol response to ACTH in children with type-1 diabetes, which might influence the control of the disease and play a role in the development of its chronic complications.

*Index Terms*- ACTH stimulation test, type-1 diabetes

## I.  INTRODUCTION

Diabetes mellitus is a disease that has many facets among which is its influence on the hypothalamo pituitary – adrenal axis. Conflicting results have been reported on adrenal steroid secretions in patients with type – 1 diabetes mellitus (1). Studies done on human and animal models with type-1 DM showed controversial results with majority showing hypercortisolism (2-8) and some showing hypocortisolism (9-12).  Hence the present study was undertaken to evaluate adrenal cortisol in children with type – 1 DM.

Moreover, in the present study, the more sensitive 1 µg ACTH stimulation test was administered to detect even mild adrenal suppression.

## II.  SUBJECTS AND METHODS

**Subjects and protocol:**
A consecutive series of 28 children with type-1 diabetes attending Endocrinology OPD, M.S. Ramaiah Medical Teaching Hospital were studied.  The study was approved by the institutional ethical committee. A written consent was obtained from the cases and controls as well as from their parents. The parents were also thoroughly assured that a meager dose of  1µg of synacthen absolutely had no side effects on the children. All patients had a complete physical examination. The duration of diabetes since diagnosis, current diabetic medications, weight, height and any recent weight loss or severe hypoglycemia requiring inpatient admission during the past year were recorded. All patients were in good physical health and none had required hospital admission for poor glycemic control during the previous year or had any hypoglycemic episode during the 24 – 48 hours preceding the test.  No patient showed evidence of renal, hepatic, thyroid, cardiac or adrenal disease.

22 normal children were recruited through volunteer office of happy home orphanage.  They were age and sex matched with the diabetic patients.  All controls were physically well and medication free and had a normal physical examination.  The cases and controls were asked to report in a fasting state and blood sample was drawn for measurement of plasma glucose and cortisol at 9.00am. Thereafter  1 microgram tetracosactrin (synacthen) was injected as a bolus.  Blood samples were again drawn 30 minutes later for estimation of cortisol.  The blood samples were stored at -20°C, later they were subjected for quantitative determination of cortisol levels using the Gamma Coat Cortisol Radio Immuno Assay Kit.

## III.  ACTH PREPARATION

0.25mg ampoule of synacthen was diluted in 100ml of normal saline.  0.4ml containing 1 microgram of synacthen was injected.

## IV.  ASSAY PROCEDURE

Serum cortisol concentrations were determined using the Gamma coat 125 cortisol radioimmuno assay kit.  The procedure is based on the competitive binding principles.

## V.  STATISTICAL ANALYSIS

The data obtained was analyzed using paired student t test.

## VI.  RESULTS

Normal children consisted of 13 females and 7 males. Children with type – 1 diabetes consisted of 21 females and 7 males.  Diabetics had a mean age of 10.39± 3.45 years compared with a mean age of 10.85± 2.92 for controls.  The duration of diabetes was 2-3 years.  Patients had mean fasting plasma glucose levels of 110.5±9.35 mg/dl as compared with 66.95± 7.8 mg/dl in controls.  In the diabetics, mean plasma glycated haemoglobin levels at the time of study were 8.0% (SD 1.0%).

The results of the study showed a blunted response to 1 microgram ACTH stimulation test in children with type – 1 diabetes (effect size being 1.61) as compared to normal children (effect size being 2.61).

Study Design: A Case –control study

**Table 1**
**Basic characteristics**

| Basic Characteristics | Normal (Mean ± SD) | Type 1 DM (Mean ± SD) | Significance |
|---|---|---|---|
| Age in years | 10.85 | 10.39 | P=0.633 |
| Sex | Male=7 (35.0%) Female=13 (65.0%) | Male=7 (25.0%) Female=21 (75.0%) | P=0.452 |
| Inference | Samples are age and sex matched (P>0.05) | | |

**Table 2**

| Cortisol levels (Microgram/dl) | Male (Mean ± SD) | Female (Mean ± SD) | Overall |
|---|---|---|---|
| **Normal Children** | | | |
| Basal | 5.77±1.38 | 6.92±2.47 | 6.52±2.19 |
| ACTH | 12.29±0.95 | 14.85±3.89 | 13.95±3.38 |
| Significance By student t | 11.320** | 7.367** | 7.430** |
| Effect size | 5.50 | 2.78 | 2.61 |
| **Type 1 Diabetics Children** | | | |
| Basal | 16.60±3.78 | 17.44±7.64 | 16.90±6.89 |
| ACTH | 27.60±9.94 | 34.24±12.81 | 32.75±12.05 |
| Significance | 3.687** | 5.836** | 7.000** |
| Effect size | 1.46 | 1.59 | 1.61 |

## VII.  DISCUSSION

The study was undertaken to determine whether abnormalities of adrenal function occur in children with type – 1 diabetes mellitus.  This was evaluated using the most sensitive 1 microgram ACTH stimulation test.

Adrenal function can be assessed by various methods e.g. by measuring serum cortisol or 24 hr. excretion of cortisol and its metabolites in urine with gas chromatography – mass spectroscopy (3).  More recently, the corticotrophin releasing hormone test was also used to assess the function of the hypothalamic – pituitary – adrenal axis (14). Adrenal response in a stressful situation is mainly assessed by the insulin tolerance test (ITT) and the synthetic adrenocorticotrophic hormone (ACTH) (synacthen) stimulation test (15).  However, ITT has been linked to deaths in children as a result of the insulin – induced hypoglycemia or its treatment (16).  In contrast, the dosage of ACTH used in the standard (0.25 mg) synacthen test (SST) produces supraphysiological ACTH levels that are never found in response to a real – life stress situation.  In recent years, the low dose (1 microgram) synacthen test (LDST) has been used as a more physiological stimulus to the adrenal gland (17), that is more sensitive than the standard synacthen test (0.25 mg) in detecting mild adrenal suppression (18, 19).  Therefore, in the present study, we administered the low dose synacthen test – 1 µg ACTH stimulation test to detect adrenal abnormalities.

Studies done on adrenal function in patients with type – 1 diabetes mellitus shows highly conflicting results as evidenced by the following examples.

## VIII.  STUDIES SUGGESTING HYPERACTIVITY OF HPA AXIS

- Results of a study done on patients with diabetic neuropathy showed specific and persistent increase in the activity of the HPA axis (20).
- Study conducted among diabetic outpatients showed significantly elevated 9 A.M plasma levels of cortisol as well as significantly elevated plasma levels of cortisol and adrenocorticotropic hormone at both 4 PM before and 4 PM after dexamethasone (6).
- Diabetic patients with moderate – to – severe retinopathy had significantly higher postdexamethasone plasma levels of adrenocorticotropic hormone than patients with minimal or no retinopathy (8).
- A review article examined some of the evidence indicating hyperactivation of HPA axis in patients with diabetes.  They concluded that hyperactivation is associated with increased expression of hypothalamic corticotrophin – releasing hormone (CRH) MRNA and hippocampal mineralocorticoid receptor (MR) MRNA (21).

## IX.  STUDIES INDICATING HYPOCORTISOLISM

- In an animal study, diabetic, insulin – treated diabetic and nondiabetic rats underwent a hyperinsulinemic – hypoglycemic glucose clamp to evaluate central

mechanisms of HPA axis and counter regulatory responses to insulin – induced hypoglycemia. Increases in plasma ACTH, corticosterone and epinephrine were significantly lower in diabetic rats versus controls (22).

- In another study, counter regulatory hormone secretion during a 3 hr. hypoglycemic hyper insulinemic clamp were measured in well controlled, poorly controlled IDDM subjects. They concluded that ACTH, cortisol and epinephrine responses during hypoglycemia area reduced in IDDM patients in strict glycemic control (23).

In comparison to the results of the above stated studies, the results of our study revealed significantly increased cortisol levels to the test in both the control and the study groups. But there appears to be a blunted response, effect size being 1.61 in children with type – 1 diabetes as compared to normal children, the effect size being 2.61. The most likely mechanism which can explain the results of our study is the mechanism cited in the study of Brendan T et al (23). Strict glycemic control of insulin dependent diabetes mellitus significantly reduces the incidence of diabetic complications (24, 25). This benefit of improved glycemic control is achieved at the expense of a 3 – fold increase in the incidence of severe hypoglycemic events (24, 26). Numerous studies of IDDM subjects in strict glycemic control have shown that these patients exhibit altered catecholamine, cortisol and GH responses to hypoglycemia (27 – 34). These subjects also exhibit reduced symptom perception of hypoglycemia, and require lower glucose levels to activate counter regulatory hormones (34 – 39). Exposure to recurrent hypoglycemia is the most common mechanism by which these alterations occur in subjects with IDDM, as similar defects can be detected in subjects with insulinomas (40 – 42) and can be induced in subjects with IDDM and in normal volunteers exposed to recurrent hypoglycemia. (43 – 49). These defects in counter regulation can be largely reversed by avoidance of hypoglycemia (50 – 55). The exact mechanism by which hypoglycemia induces these alterations in counter regulation remains uncertain. The most likely mechanism for these adaptations is a central adaptation to recurrent hypoglycemia that maintains cerebral glucose utilization during hypoglycemia, resulting in decreased activation of the cerebral glucose sensors. Thus, there is less activation of the hypothalamic – pituitary adrenal axis and sympatho adrenal medullary system with resultant reduction in the counter regulatory hormone response to hypoglycemia (56 – 59).

In conclusion, this study has shown mild adrenal cortical suppression to short synacthen test in children with type-1 diabetes. The exact mechanism underlying these alterations remains uncertain. A better understanding of these mechanisms may be important in developing new treatment modalities for patients with diabetes mellitus.

## X.   LIMITATIONS OF THE STUDY

Follow up study of the same patients is required to study the response of the adrenal gland in these patients.

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# SYNTHESIS AND ELECTRICAL CHARACTERIZATION OF POLYANILINE-MULTIWALLED CARBON NANOTUBE COMPOSITES WITH DIFFERENT DOPANTS

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**Abstract**: Conductive polymers or, more precisely, intrinsically conducting polymers (ICPs) are organic polymers that conduct electricity. Such compounds  may have metallic conductivity or can be semiconductors. Electrical conductivity of conducting polymers can be tuned from insulating to metallic through proper doping. Examples of conducting polymers include polyaniline(PANI),Polypyrrole, Polythiophene, Polyacetelyne etc. Amongst the family of conducting polymers, PANI is unique due to its ease of synthesis, environmental stability, and simple doping/dedoping chemistry.  They can offer high electrical conductivity through proper doping.Making PANI with suitable materials is another method to enhance it's conductivity.Multiwalled Carbon Nanotube is one such highly pursued material due to its high electrical conductivity,mechanical strength and thermal stability. In the present work, PANI-MWCNT composite is prepared using  Hyrochloric acid(HCL) & Camphor sulphonic acid(CSA) as dopants&compared it's d.c. conductivity with PANI prepared using HCL &CSA as dopants.The FTIR, XRD& SEM analysis of the samples were done. PANI-MWCNT composite showed good conductivity compared to PANI samples.In the case of composite, aniline molecules are polymerized in the special gaps between MWCNT bundles.They are absorbed at the surface of MWCNTs&subsequently polymerized.The MWCNT may serve as conducting bridges connecting the isolated PANI.The sample prepared with HCL as dopant showed more conductivity than that of the sample prepared using CSA. Comparatively higher d.c. conductivity of HCL doped sample may be due to the presence of  lighter dopant ions ie CI—ions in HCL.The light weight  CI-- ions have greater mobility than SO3--- ions in CSA.

*Index Terms:* Conducting polymers, PANI, MWCNT,CSA ,HCL & D.C. Conductivity

## I. INTRODUCTION

A polymer is a material whose molecule contains a very large number of atoms linked by covalent bonds, which makes it a macromolecule. The fundamental repeating unit in a polymer is known as "monomer". Although the term polymer is sometimes taken to refer to plastics, it actually encompasses a large class of compounds comprising both natural and synthetic materials with a wide variety of properties.
Conductive polymers or, more precisely, intrinsically conducting polymers (ICPs) are organic polymers that conduct electricity. Such compounds may have metallic conductivity or can be semiconductors. Electrical conductivity of conducting polymers can be tuned from insulating to metallic through proper dopping. They have a conjugated structure with alternate σ and π bonds. The π bonds are delocalized throughout the entire polymer network. This results in enhanced electrical conductivity[1-2].Preparing conducting

polymer composite is a clever way to improve the conductivity of conducting polymers.PANI-MWNT are widely explored nowadays[3]

In the present work,the sample polyaniline-Multiwalled Carbonnanotube(PANI-MCNT) composite is prepared using  Hyrochloric acid(  HCL) & Camphor sulphonic acid(CSA) as dopants& tried to compare the D.C.electrical conductivity of the composite with PANI prepared using HCL &CSA as dopants. The FTIR spectral analysis , XRD analysis&SEM analysis  confirmed the presence of PANI &MWNT.The D.C.electrical conductivity of the prepared samples were measured .In both cases,the composite showed more conductivity than the PANI prepared using same dopant.

## II.    EXPERIMENTAL TECHNIQUES

### PREPARATION OF POLYANILINE AND PANI-MWNT COMPOSITE USING CAMPHOR SULPHONIC ACID&HCL AS A DOPANTS

Polyaniline is prepared using chemical oxidative polymerization. For this aqueous solution of one molar distilled aniline and one molar Camphor Sulphonic acid(CSA) were mixed to form a solution.Ammoniumpersulphate(APS) is used as oxidant. This solution is kept in a magnetic stirrer. After two hours of stirring the polymer is filtered, washed with dopant electrolyte solution, and dried in air oven at $60^0$ C. The dried polymer is finely powdered.The same procedure is repeated using HCL as dopants.

For preparing HCl doped PANI-MWNT  composite high pure MWNT  is dispersed in 1M HCl solution.Freshly distilled aniline is added to it.APS dissolved in water is added dropwise to the mixture with continuous stirring for 4-5 hrs.The precipitate obtained is filtered, washed and dried.The same procedure is repeated using CSA as dopant.

### XRD Analysis

The XRD analysis of the sample is carried out using a fully automated Rigaker 1710 X-ray diffractometer. In our set-up, filtered Cu-K2 radiation having wavelength 1.542 Å is used for diffraction. The accelerating potential applied to the X-ray tube is 30 KV and the tube current is 20mA.

*Fourier Transform Infrared Spectroscopy (FTIR Spectroscopy)*

The sample powder is mixed with KBr to form very fine powder.The  powder is then compressed into a thin pellet & FTIR spectrum is taken using an Avatar 370 spectrometer employing DTGS KBR detector.

### SEM Analysis

Field emission SEM is used for high resolution imaging.High quality low voltage images are obtained with negligible electrical charging of samples.

### Measurement of electrical conductivity

Conductivities of different samples of polyaniline were measured using four probe set-up instrument. Electrical conductivities of polymer pellets were measured with a constant - built current source accompanied with four -probe set up.

Fig 1 Four -probe set up.

The circuit used for resistivity measurements are shown in figure 2.
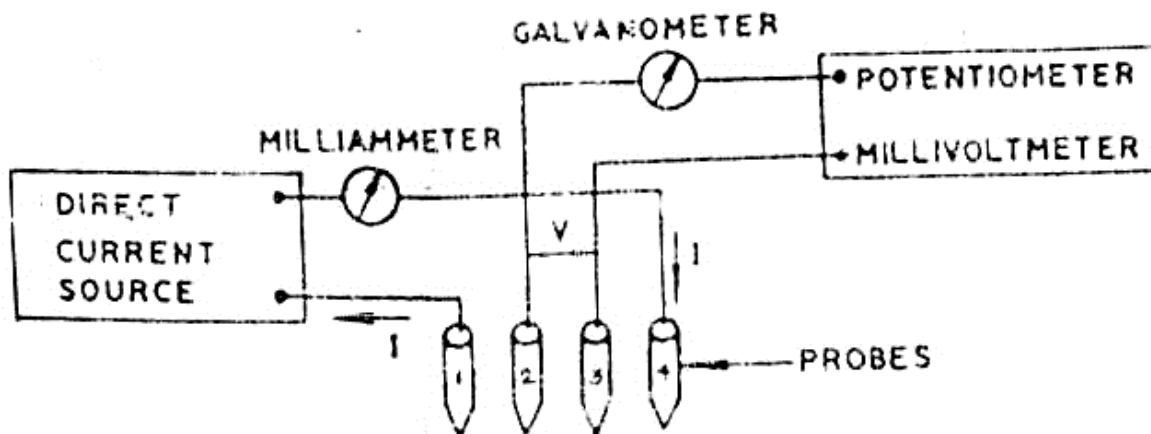


Fig 2 Circuit for resistivity measurements

Current 'I' is passed through the outer probes (1 and 4) and the floating potential 'V' is measured across the inner pair of probes( 2 and 3). When the point spacings are equal i.e. $S_1=S_2=S_3=S$, the equation for resistivity for a large sample using probe technique is

$\rho=2\pi S * V/I$ .Therefore the conductivity $\sigma =I /\rho$

The sample pellet was put on the base plate of the four probe arrangement and the four probe was gently placed on the pellet and a very gentle pressure was applied and tightens the pipe. By adjusting the milliammeter reading current was kept   constant. The millivoltage was then measured. Repeat the experiment with the other side of the pellet. Again the same experiment was repeated using another pellet of the same polymeric sample.

## III.   RESULTS &DISCUSSION

XRD spectrum of PANI doped with Hydrochloric acid and Camphor sulphonic acid are  shown below in  figure 3 and 4 respectively.
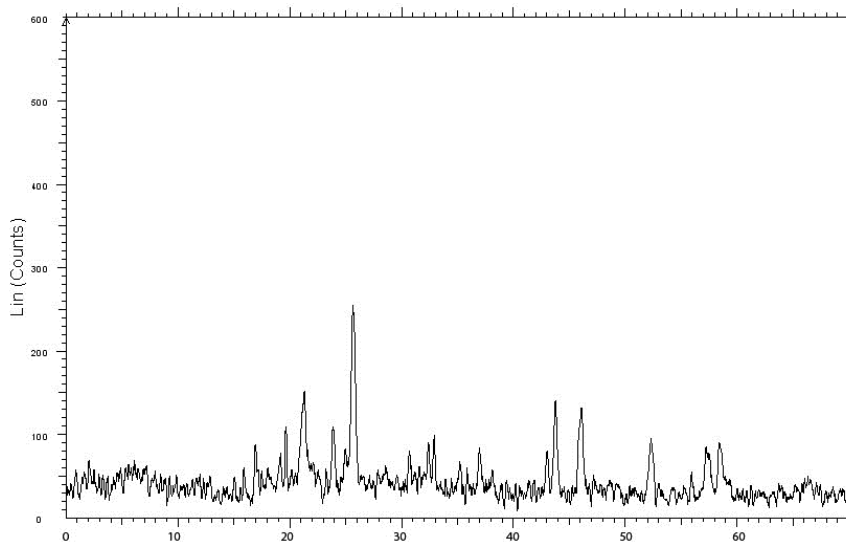


Fig 3 XRD spectrum of PANI doped with HCl
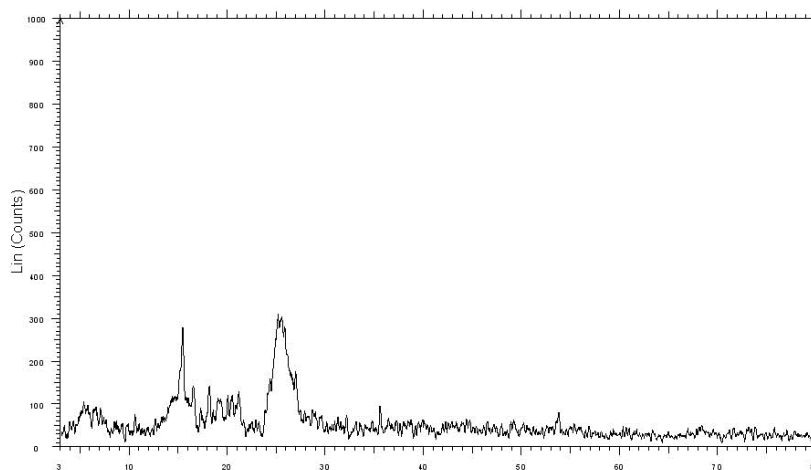


Fig 4 XRD spectrum of PANI doped with CSA

The peak around 25˚ is the characteristic of π conjugation in PANI.    PANI is only partially crystalline with conducting metallic islands separated by large amorphous regions as evident from the XRD spectrum. Conductivity is limited by strong disorder. XRD spectrum of PANI(HCl)-MWNT &PANI (CSA)-MWNT  composites are  shown in Figures 5 and 6 below.
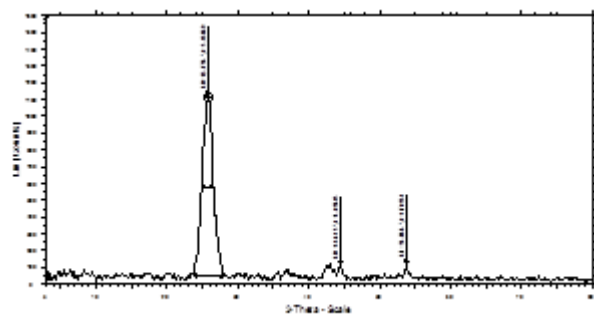
Fig 5 XRD spectrum of PANI(HCl)-MWNT composite
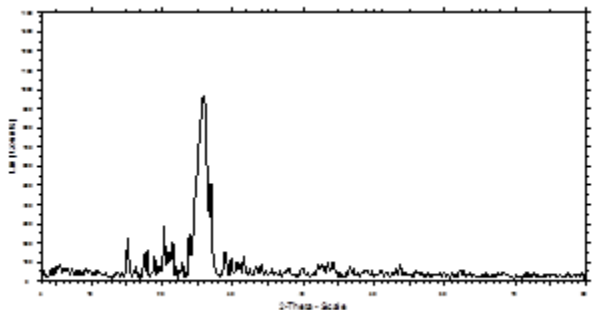


Fig 6 XRDspectrum of PANI (CSA)-MWNT composite

PANI-MWNTcomposite shows the crystalline peaks at 25° with high intensity and sharpness.The appearance of diffraction peak at25° which is common in both PANI and MWNT,indicate the prsence of long range –conjugation, in both samples.This peak is very much sharper in PANI-MWNT composite because of much enhanced – conjugation in MWNTs.[4-5]

**FOURIER TRANSFORM INFRARED STUDIES**

FTIR spectrum of PANI doped with Hydrochloric acid & Camphor sulphonic acid are  given in figures 7 and 8 respectively below.
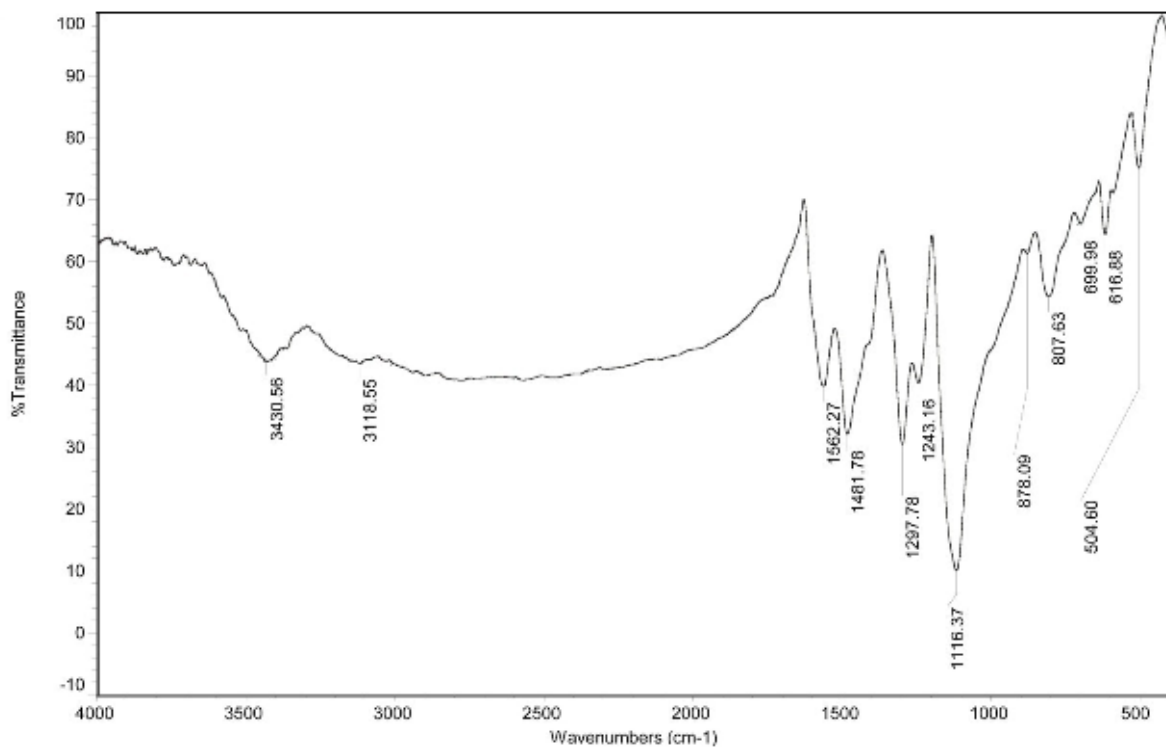
Fig 7 FTIR spectrum of PANI doped with HCl
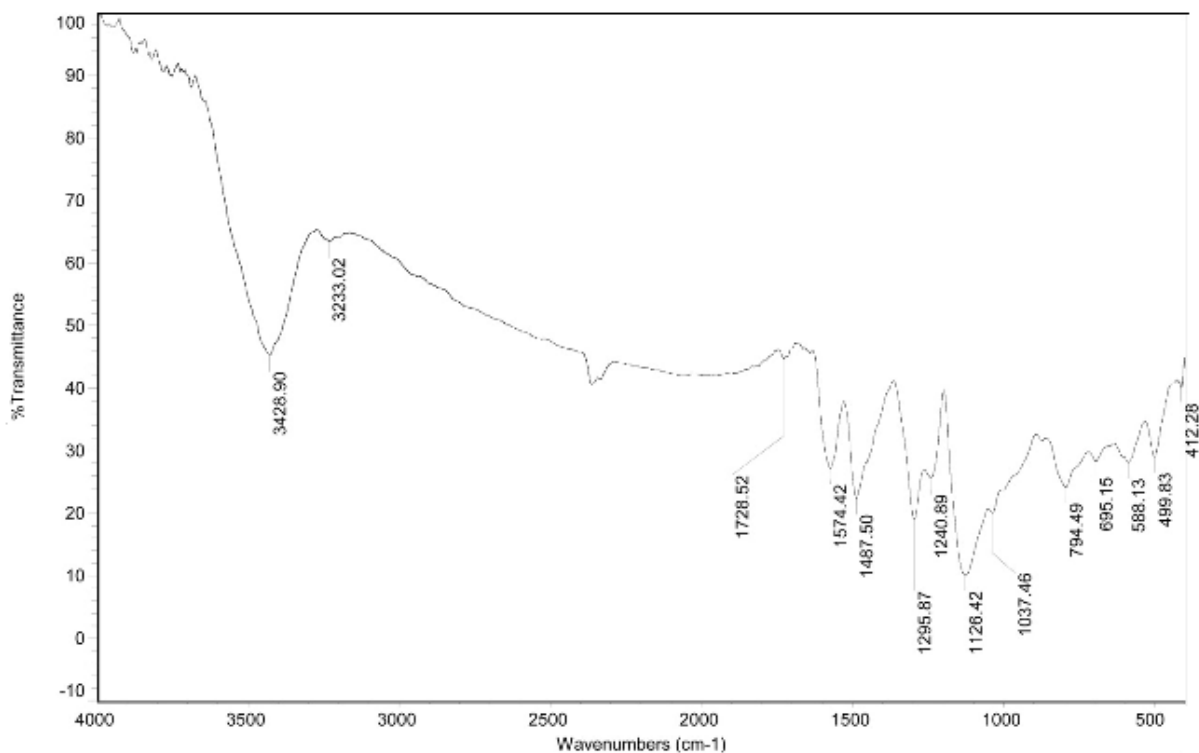


Fig 8 FTIR spectrum of PANI doped with CSA

In HCl doped PANI,the major peaks are at around 3500/cm(N-H stretching vibration),3200/cm(O-H usually broad), 1780/cm(cyclobutanone), 1570/cm(C=N strech of the quinonoid unit of PANI),1470/cm(C=C strech of the benzoid unit of PANI) In

CSA doped PANI ,the major peaks are at around 3500/cm(N-H stretching vibration),2900/cm(CH stretching vibration),1570/cm(C=N strech of the quinonoid unit of PANI),1470/cm(C=C strech of the benzoid unit of PANI) and 1100/cm(quinonoid unit of vibration of doped PANI). FTIR spectrum of PANI(HCl)-MWNT &PANI (CSA)-MWNT composites are shown in figures 9 and 10 below.
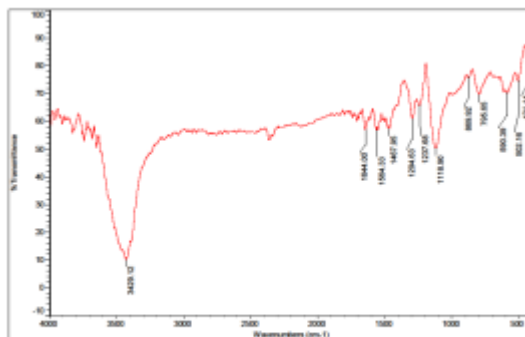


Fig 9 FTIR spectrum of PANI(HCl)-MWNT composite
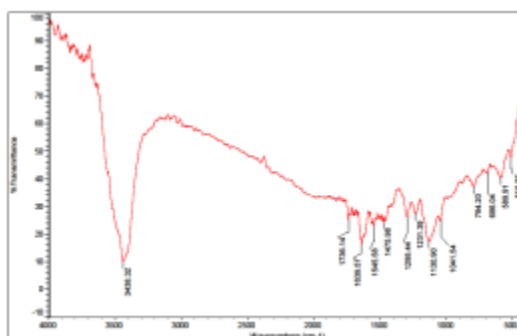


Fig 10 FTIR spectrum of PANI (CSA)-MWNT composite

In both cases, the two spectrum resemble each other closely with only small shifts in absorption wave numbers.Since the characteristic C=C vibrations of MWNT are more or less in the same frequency range as those in doped PANI,the presence of MWNT in the composite can not be clearly established from the FTIR spectrum.But the XRD &SEM investigations clearly establish the formation of PANI-MWNT composite.[6-7]

4 .**SEM ANALYSIS**

The SEM images of PANI(HCl)-MWNT &PANI (CSA)-MWNT composites are shown in figures 11 and 12 below
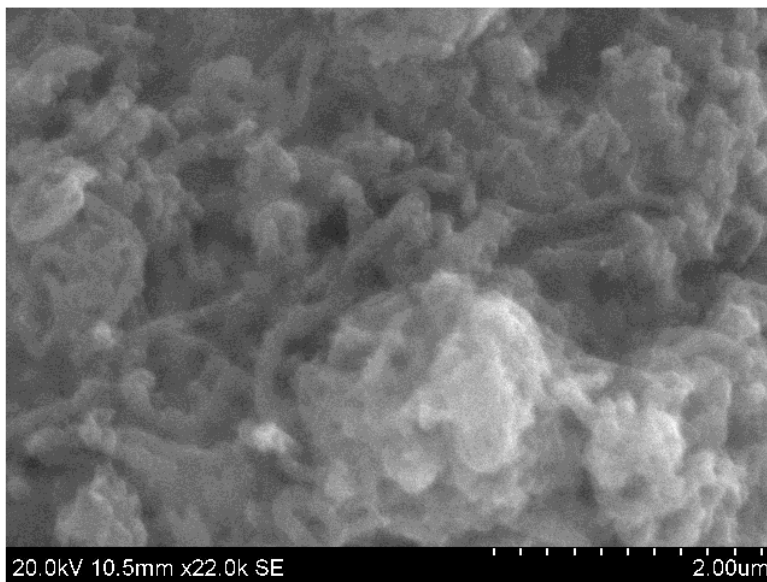
Fig 11 SEM image of PANI(HCl)-MWNT composite
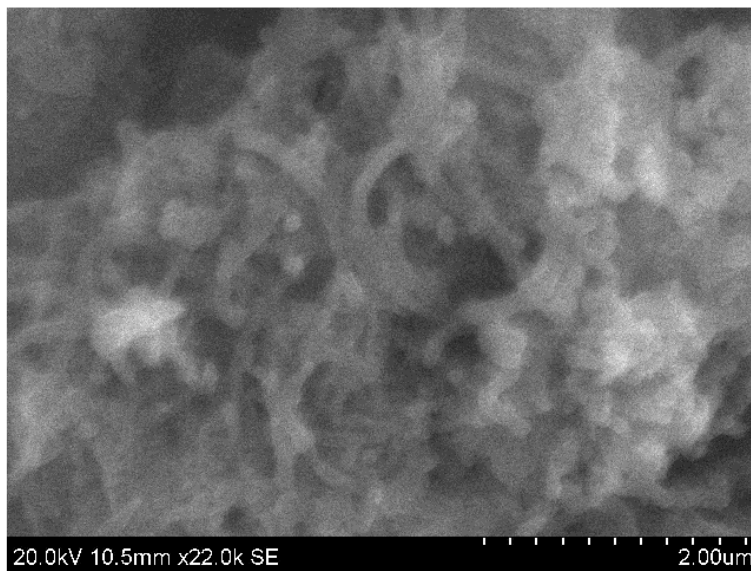


Fig 12 SEM image of PANI (CSA)-MWNT composite

The SEM images give the surface morphology of the samples.From the figure,it is clear that aniline is polymerized between the wedges of MWNTs as well as on the tube surfaces.The rod like and coiled like structures of MWNTs are dispersed in the PANI matrix PANI macromolecules can also be absorbed at the surface of MWNTs forming a tubular shell of the composite [8].

4 DC CONDUCTIVITY STUDY

**Measurement of conductivity of    PANI(HCl)-MWNT composite**

Probe distance(S) =0.200±2% cm (fixed)

| Current I(Ma) | Voltage V(Mv) | V/I Ω |
|---|---|---|
| 25.1 | 2.44 | 0.0972 |
| 30.2 | 2.95 | 0.0972 |
| 34.8 | 3.42 | 0.0982 |

| 39.9 | 3.92 | 0.0982 |
|------|------|--------|
| 45.0 | 4.43 | 0.0984 |
| 50 | 4.93 | 0.0984 |
| 55.1 | 5.44 | 0.0986 |
| 69.8 | 6.91 | 0.0989 |

Resistivity $\rho_0 = V/I \times 2\pi S = 0.1232$ Ω-cm
Correction factor $G_7(w/s) = 2.78$,
Corrected $\rho = 0.04435$ Ω-cm
Conductivity $\sigma = 1/\rho = 22.5479$ S/cm

**Measurement of conductivity of PANI (CSA)-MWNT composite**

| Current I(mA) | Voltage V(mV) | R=V/I |
|---------------|---------------|-------|
| 30 | 3.28 | 0.1093 |
| 39.8 | 4.38 | 0.11005 |
| 49.8 | 5.5 | 0.11044 |
| 60 | 6.56 | 0.109 |
| 70 | 7.9 | 0.1128 |
| 80.1 | 8.92 | 0.1113 |
| 90.2 | 10.05 | 0.1114 |
| 101.3 | 11.29 | 0.11145 |

Resistivity $\rho_0 = V/I \times 2\pi S = 0.13906$ Ω-cm
Correction factor $G_7(w/s) = 2,78$
Corrected $\rho = 0.05$ Ωcm
Conductivity $\sigma = 1/\rho = 20$ S/cm

HCl doped PANI showed a conductivity of 2S/cm.But PANI(HCl)-MWNT composite showed a conductivity of 22S/cm.It is almost 3times greater than that observed for pristine MWNTs(7S/cm) used in the present work.  Due to the large aspect ratio (length is very large compared to diameter) and surface area of MWNTs ,MWNTs may serve as conducting bridges between scattered PANI islands, boosting charge delocalization[9].The improved crystallanity of PANI with the addition of MWNT as evident from the XRD investigations is another reason for the increase in conductivity.CSA doped PANI showed a conductivity of 0.09S/cm.But PANI(CSA)-MWNT composite showed a conductivity 20S/cm.In this case also, there is considerable increase in the conductivity of composite as compared to PANI.

## IV.   CONCLUSION

PANI-MWNT composite is successfully synthesized by chemical oxidative polymerization using HCl&CSA as dopantS. The XRD analysis revealed that PANI is only partially crystalline with conducting metallic islands separated by large amorphous regions. This peak is very much sharper in PANI-MWNT composite because of much enhanced – conjugation in MWNTs.The FTIR analysis confirmed the formation of PANI. SEM image shows that aniline is polymerized between the wedges of MWNTs as well as on the tube surfaces.The rod like and coiled like structures of MWNTs are dispersed in the PANI matrix.PANI macromoleules  absorbed at the PANI-MWCNT composite showed good conductivity compared to PANI samples.The MWCNT may serve as conducting bridges connecting the isolated PANI.The sample prepared with HCL as dopant showed more conductivity than that of the sample prepared using CSA. Comparatively higher d.c. conductivity of HCL doped sample may be due to the presence of  lighter dopant ions ie $CI^-$ ions in HCL.The light weight  $CI^-$ ions have greater mobility than $SO_3^{---}$ ions in CSA.

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# Reducing False Alarms in Vision Based Fire Detection with NB Classifier in EADF Framework

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*Abstract*- Computational vision-based fire and flame detection has drawn significant attention in the past decade with camera surveillance systems becoming ubiquitous. Signal and image processing methods are developed for the detection of fire, flames and smoke in open and large spaces with a range of up to 30m to the camera in visible-range (IR) video. This paper proposes a new approach to computational vision-based fire and flame detection by using a compound algorithm and a decision fusion framework with Naïve Bayes classifier as classification tool. The compound algorithm consists of several sub-algorithms, the fusion network is to fuse the results obtained by each of these sub-algorithms and Naïve Bayes classifier is useful for the final classification. This approach is to improve the accuracy of fire and flame detection in videos and to reduce the false alarm rate to a great extent.

*Index Terms*- Computer vision, decision fusion, feature extraction, fire detection, generic color model, image processing, online learning.

## I. INTRODUCTION

Surveillance cameras have become an important aspect in security and have become a necessity to keep proper check. As the number of surveillance cameras being installed in various fields increased, computational vision based object detection has become vital worldwide. In computer vision, this is the task of finding a given object in an image or video sequence. Several image processing techniques are developed for the detection of different objects from images and video sequences. Detection of fire, flame and smoke is a subfield of vision based object detection and is potentially a useful technique in the implementation of both indoor and outdoor fire alerts. It offers advantages over the traditional methods.

Since fire is a complex but unusual visual phenomenon, unlike normal objects, it has dynamic texture. Due to its frequent shape and size alterations, computational vision-based fire and flame detection algorithms are upon multi-feature-based approaches. The hope and the goal of such algorithms is to find a combination of features whose mutual occurrence leaves fire as their only combined possible cause [1]. Colour, motion, shape, growth, flickering, and smoke behaviour etc. are some of the low level distinctive features of fire regions. Along with these distinctive features, spectral, spatial and temporal features are also used for distinguishing fire regions artificially.

## II. RELATED WORKS

W. Phillips, M. Shah, and N. Lobo. [2] propose a system that uses motion and color information computed from video sequences to locate fire. First of all a Gaussian-smoothed color histogram is created and then uses an approach based on this histogram for the detection of fire-colored pixels. Then, temporal variation of pixels is calculated and by using these calculations the algorithm determines which of these pixels actually fire pixels are. Next, using an erode operation, some spurious fire pixels are automatically removed and using region growing method, some missing fire pixels are found. The technique detects fire reliably under normal conditions. Lack of hardware implementation is a disadvantage. So the algorithm can only be used as part of a robust, real-time system. High false alarm rate is another disadvantage.

A technique based on Markov models was presented by Toreyin, B.U. et. al. in [3] to detect flames in video. In this technique, Markov models are generated to represent the flame and flame colored ordinary moving objects. Then these models are used to distinguish flame motion from motion of flame colored moving objects. Spatial color variations in flame are also evaluated by the same Markov models, as well. Final decision is made by combining these clues. Advantages of hidden Markov models based flame detection are its' robustness and computational efficiency to detect flames in color video. False alarms due to ordinary motion of flame colored moving objects are greatly reduced. It has the following disadvantage. Since the spreading characteristics of flame depend on the strength of the wind, it is impossible to use the same location within a fixed time to model the periodic behavior of flame boundaries.

Luis Merino et. al. [4] presents a framework for cooperative fire detection by means of a fleet of heterogeneous UAVs. Cameras and other types of fire sensors are incorporated into UAVs. Cameras capture visual images and sensors sense infrared. Computer vision techniques are used to detect and localize fires from these information. The algorithm is based on the fact that visual color images of fire have high absolute values in the red component of the RGB coordinates and that the ratio between the red component and the blue and green components. The algorithm uses UV radiation characteristic of fire also. It uses a cooperative state estimation procedure, which estimates the position of the fire and the nature of the fire. Data association is a key problem. Here a simple nearest neighbor strategy is considered. However, in complex scenario, this can lead to bad association. For this kind of sensor, a grid-based localization technique is more suitable for fire localization.

An algorithm which is based on the temporal variation of fire intensity captured by a visual image sensor was proposed by G. Marbach, M. Loepfe, and T. Brupbacher in [5]. Analysis of the full image sequences helps to select a candidate flame region. Characteristic features extraction is done from the candidate flame region and combined to determine the presence of fire or non-fire patterns. If the fire pattern persists over a period of time, fire alarm is triggered. The ''YUV'' representation of the video data is assumed here. Luminance and chrominance are computed. The time derivative of the luminance is zero for the stationary scene regions, and is non-zero for moving objects. Six characteristic features are extracted: Luminance, frequency, amplitude, number of active pixels, number of saturated pixels, number of fire-color pixels. Finally, an "indicator" is used to describe the presence of fire or non-fire.

It has high reliability and a strong robustness towards false alarm in normal environments. The reaction time and the sensitivity of the algorithm can be adjusted according to the scene complexity and light condition, increasing the flexibility. It has the following disadvantages also. False alarm rate is very high under specific lighting conditions. High brightness or luminance causes image pixels to saturate.

Turgay Celik and Hasan Demirel [6] proposed a rule-based generic color model for flame pixel classification. The proposed algorithm uses YCbCr color space. YCbCr color space is more effective to separate the luminance from the chrominance than color spaces such as RGB or rgb. The key idea is that the fire pixels shows the characteristics that their Y color value is greater than Cb color value and Cr color value is greater than the Cb color value. Even though RGB color space can be used for pixel classification, it has disadvantages of illumination dependence. It means that if the illumination of image changes, the fire pixel classification rules cannot perform well. So it is needed to transform RGB color space to one of the color spaces where the separation between intensity and chrominance is more discriminate. Since the flame region is generally the brightest region in the observed scene, the mean values of the Y, Cb and Cr channels, in the overall image contain valuable information.

The number of arithmetic operations for the proposed color model is linear with image size and algorithm is of low computational complexity. This makes it eligible for the real-time applications. It has the following disadvantage. Non-fire regions such as car lights, flame reflections, and changing neon lights often exhibit a similar pattern over time; hence, this method cannot provide time analysis of the spread of fire regions in a video sequence.

C. Ho [7] proposed a novel real-time machine video-based flame and smoke detection method. This method can easily be incorporated with a surveillance system for early alerts. In this technique, potential flame and smoke candidate regions are identified by checking weightage of the statistical distribution of the spectral, spatial and temporal probability density is with a fuzzy reasoning system to identify. Smoke and flame color histogram models are compared in HSI color space and the spectral probability density is represented. The spatial probability density is represented by computing the flame and smoke turbulent phenomena with the relation of perimeter and area. Flickering area from the video sequences are extracted and alias objects from the flame and smoke region are separated to represent the temporal probability density. Experimental results under a variety of conditions show that the proposed method is capable of detecting flame and smoke reliably. This system requires additional research on fuzzy reasoning in complex moving environments and it requires a complementary tracking algorithm for multiple concurrent fire regions.

A new vision sensor-based fire-detection method was proposed by Byoung ChulKo et. al. in [8] for an early-warning fire-monitoring system. First, any candidate region detection method such as the detection of moving regions and fire-colored pixels is used for the detection of candidate fire regions. Next, a luminance map is made. The key idea behind the generation of this map is that the fire regions generally have a higher luminance contrast than neighboring regions. This luminance map is used to remove non-fire pixels. Thereafter, the algorithm creates a temporal fire model with wavelet coefficients. This temporal fire model is applied to a two-class support vector machines (SVM) classifier. The kernel used by the classifier is a radial basis function (RBF) kernel. The SVM two-class support vector machine with RBF kernel is then used for the final fire-pixel verification. This approach has strong robustness to noise such as smoke, and exquisite differences between consecutive frames. This approach has got some disadvantages. Occurrence of frequent false alarms because it uses heuristic features. SVM classifier needs additional computation time depending on feature dimension.

Paulo Vinicius Koerich Borges, and Ebroul Izquierdo [9] proposed a method that analyses the changes of specific low-level features in the consecutive frames. This analysis helps describing potential fire regions. These low level features are area size, color, boundary roughness, surface coarseness, and skewness within estimated fire regions. The gradual modification of each one of these features is evaluated, and then combines the results according to the Bayes classifier for accurate recognition of fire. In addition, the classification results are significantly improved by using a priori knowledge of fire events captured in videos. It has the following advantage. Very fast processing, making the system applicable for real time fire detection as well as video retrieval in news contents. High brightness or luminance causes image pixels to saturate.

Yusuf Hakan Habiboglu et. al. [10] proposed video fire detection system which uses a spatio-temporal covariance matrix of video data. This system divides the video into spatio-temporal blocks and computes covariance features extracted from these blocks to detect fire. Feature vectors are classified using an SVM classifier. The SVM classifier is trained and tested using various video data containing flame and flame colored objects. The feature vectors takes advantage of both the spatial and the temporal characteristics of flame colored regions. This method is a computationally efficient method. But if the fire is small and far away from the camera or covered by dense smoke the method might perform poorly. Since the method assumes a stationary camera for background subtraction it cannot correctly classify most of the actual fire regions.

David R. Thompson, William Johnson, and Robert Kremens [11] proposed a method for the detection of wildfire which is used in airborne or orbital image sequences. This technique captures multiple overlapping frames using space vehicles and recognizes stable interest point features in these overlapping frames. It

analyses motion between contiguous frames and detects candidate regions over time. To improve sensitivity, the final detection decision joins signal strengths from multiple view. The algorithm is computationally tractable for real-time use on autonomous robotic platforms and spacecraft. It has got higher acquisition rates and potentially improved coverage for remote monitoring. Multiple detections problem is a disadvantage.

Byoung Chul Ko, Sun Jae Ham, and Jae Yeal Nam [12] proposed a novel method using fuzzy finite automata (FFA) for fire-flame detection. FFA is used with probability density functions based on visual features. It provides a systemic approach to handling irregularity in computational systems and it has the ability to handle continuous spaces by combining the capabilities of automata with fuzzy logic. First, using background subtraction moving regions are detected, and then identify the candidate flame regions by applying flame color models. As the flame regions have a continuous irregular pattern, the variation in intensity, motion orientation and wavelet energy are used to generate probability density functions and it is then applied to the FFA.

This technique is robust for similar cases such as shadows, reflective surrounding areas, rapid changes in color and motion, and changing neon signs and it performs better if the fire is near to the camera. But if the fire is small and far away from the camera or covered by dense smoke the method might perform poorly.

J. Zhao, Z. Zhang, S. Han, C. Qu, Z. Yuan, and D. Zhang [13] proposed an approach based on SVM. A Gaussian mixture model is built based on 3D point cloud of the collected sample fire pixels and it helps to segment some possible flame regions in an image. Then the newly identified flame pattern is defined for forest, and three types of fire colors are labelled accordingly. With 11 static features and 27 dynamic features, the SVM classifier is trained and filters the segmented results. This trained SVM is used for final decision. It has the following advantage. A total of 27 dynamic features are considered for SVM based final classification, and the features are extracted from every 20 consecutive video frames. Therefore, except for accuracy, the detection algorithm can perform and give alarms in real time. It has the following disadvantages also. This approach has lower accuracy for fire with small regions, and the performance is even worse for small fires covered by smoke.

Y. Habiboglu, O. Gunay, and A. Cetin [14] proposed a video-based fire detection system which uses color, spatial and temporal information. The video sequence is divided into spatio-temporal blocks by the algorithm extracts covariance-based features from these blocks. By using these extracted features fire is detected. Feature vectors take advantage of both the spatial and the temporal characteristics of flame-colored regions. A support vector machine (SVM) classifier is used to train and test the extracted features. Since the system does not use a background subtraction method to distinguish moving regions from non-moving objects, this system can be used with non-stationary cameras to some extent. Its computational cost is low in terms of memory and processing power. The disadvantage is that if the fire is small and far away from the camera or covered by dense smoke, the method might not perform well.

Martin Mueller, Peter Karasev, Ivan Kolesov and Allen Tannenbaum [15] proposed a set of motion features based on motion estimators for computational vision-based flame detection. In general, fire motion is fast and turbulent. On the other hand, objects other than fire are having structured and rigid motion. The key idea of this algorithm consists of exploiting the difference between these two motions. Classical optical flow methods cannot be used for representing the characteristics of fire motion. So two other optical flow methods are specifically designed for the fire detection task: Fire with dynamic texture is represented using optimal mass transport scheme and saturated flames are represented using a data-driven optical flow scheme. This algorithm extracts characteristic features related to the flow magnitudes and directions from the flow fields. Then these features are used distinguish fire and non-fire motion. The technique requires minimum spatial resolution. It is robust to changes in the frame rate and it has maximum allowable bounds on the additive noise level. It has the following disadvantage. Little false detection is observed in the presence of significant noise, partial occlusions, and rapid angle change.

Osman Gunay et. al. [16] propose an entropy-functional-based online adaptive decision fusion (EADF) framework for image analysis and computer vision applications. In this framework, there is a compound algorithm which consists of several sub-algorithms. Each sub-algorithm has a weight associated with it and the weights are updated online according to the decisions of a security guard. Decision values obtained by the sub-algorithms are linearly combined with these weights. For the purpose of final classification, a Support Vector Machine is used.

Since it uses online adaptive fusion scheme, the learning duration is decreased. The error rate of this method is low. The proposed framework for decision fusion is suitable for problems with concept drift. It has the following disadvantages. Since the approach uses SVM classifier, learning takes long time. SVM algorithm has several key parameters that need to be set correctly to achieve the best classification results for any given problem. The user may, therefore, have to experiment with a number of different parameter settings in order to achieve a satisfactory result. Computationally expensive, thus runs slow.

## III.   USE OF NAÏVE BAYES IN THE DECISION FUSION FRAMEWORK

A better enhancement to the EADF framework to overcome its disadvantages of using SVM classifier is to introduce a Naive Bayes classifier. In the EADF framework, there exists a compound algorithm which consists of several sub-algorithms. Each sub-algorithm yields its own decision as a real number centred around zero, representing the level of confidence of that particular sub-algorithm. Each sub-algorithm has a weight associated with it and the weights are updated online according to an active fusion method in accordance with the decisions made by a security guard. So, the weight of a sub-algorithm with poor performance decreases during the training phase and the importance of that sub-algorithm becomes low in the decision making process. Decision values obtained by the sub-algorithms are linearly combined with these weights. The proposed automatic video-based wildfire detection algorithm is based on five sub-algorithms:

1) Slow moving video object detection;
2) Smoke-coloured region detection;
3) Wavelet-transform-based region smoothness detection;

4) Shadow detection and elimination; and

5) Covariance-matrix-based classification using Naïve Bayes classifier.

In this paper, for the purpose of final classification, we use Naive Bayes classifier. Various studies in image processing show that Naive Bayes classifier outperforms all other sophisticated algorithms such as SVM and is a best tool for image classification [17]. A Naive Bayes classifier is a simple probabilistic classifier based on applying Bayes' theorem with strong independence assumptions. If these independence assumptions actually hold, a Naive Bayes classifier will converge quicker than other classifiers. Even if the NB assumption doesn't hold, a NB classifier still performs surprisingly well in practice and it need less training data. Naive Bayes classifier is Fast to train (single scan), fast to classify, and not sensitive to irrelevant features. It can handle real, discrete and streaming data well. Naive Bayes classifiers have worked quite well in many complex real-world situations. There are sound theoretical reasons for the apparently implausible efficacy of naive Bayes classifiers

## IV. CONCLUSION

Computational vision-based fire detection is the task of finding the presence of fire regions in an image or video sequence. It has drawn significant attention in the past decade with camera surveillance systems. Various schemes for computational vision-based fire and flame detection had been discussed in this paper. Most of these algorithms use spectral, spatil, temporal and other low level features of fire for distinguishing it from other objects in video sequences.

EADF framework is useful to fuse a set of decisions made by several sub-algorithms and hence makes a combined decision. Naive Bayes classifier outperforms all other sophisticated algorithms and hence it can be used for the final classification in EADF frameworks. With this, detection of fire regions in video sequences can be made easier and false alarm rates can be reduced to a great extent.

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# An Explicit Formulation of Franklin Fresnelets

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***Abstract-*** The *Fresnel* transform is applied on an ideal wavelet basis for $L^2(\mathbb{R})$, the $B$-splines [1], which results into the $F$-splines.In digital holography the image recorded on a $CCD$ has to be reconstructed. Though the underlying idea of *Fresnelets* are given in [2], a detailed mathematical derivation is provided here. As a special instance of *Fresnelets*, the *Franklin Fresnelets* are considered. To meet the requirements of retrieving the image,the *Fresnelets* are more effective than the *wavelets* derived from the $B$-spline scaling functions.

***Index Terms-*** *F-splines,Scaliing functions,Wavelets, Fresnelets, Franklin Fresnelets*.

## Introduction

To reconstruct a complex wave near an object the *Fresnel* diffraction integral is applied. Since the process is involving lenseless $CCD$ device, standard wavelets are inefficient to provide the detail at the edges of the image which are recorded poor when applied to hologram [2]. Though *Gabor Wavlets* are good, the excellent choice is $B$-spline due to several factors.

When the *Fresnel* transform is implemented on a $B$-spline, we get an $F$-spline. The $B$-splines are the scaling functions of a *Multi Resolution Analysis*[3]. So do the $F$-spline except for the fact that the two scale relation for $F$-spline which involves the parameter $\tau$ slightly differ from that of $B$-spline.

In section (1) we have some definitions and theorems and in section (2) we prove our main results.

### 1. F-splines

We begin with some preliminary notions.

**Definition 1.** [4] *The cardinal B-spline* $\beta^{\mathbf{n}}$ *of order* $n$ *is a function in* $C^{n-1}(\mathbb{R})$ *equally spaced with integer knots and are polynomials of degree* $n$ *in the interval* $[2^{-m}k, 2^{-m}(k+1)]$.

It has compact support in $[0,n]$ and $V_0 = $ span $\{\beta^n(x-k) : k \in \mathbb{Z}\}$ is a subspace of $L^2(\mathbb{R})$. By writing $V_j = $ span$\{\beta^n(2^j x-k) : k \in \mathbb{Z}\}$, the multi resolution analysis in $L^2(\mathbb{R})$ is defined as the following.

**Definition 2.** *[Multi Resolution Analysis]* [1]

    (i) $V_j \subseteq V_{j+1}$, $\bigcap_{j \in Z} V_j = \{0\}$ and $\overline{\bigcup_{j \in Z} V_j} = L^2(\mathbb{R})$

    (ii) $f(x) \in V_j \Leftrightarrow f(2x) \in V_{j+1}$    $\forall f \in L^2(\mathbb{R})$ (scale invariance)

    (iii) $f(x) \in V_0 \Leftrightarrow f(x-k) \in V_0$    $\forall f \in L^2(\mathbb{R})$ (shift invariance)

    (iv) The set $\{\beta^n(x-k) : k \in \mathbb{Z}\}$ is an orthonormal basis for $V_0$

**Proposition 1.1.** [1] *The B-spline of order* $1$ *is defined as* $\beta^1(x) = \chi_{[0,1]}(x)$, $\chi$ *is the characteristic function. Inductively,*

$$\beta^n(x) = \beta * \beta * \mathrm{K}\,\mathrm{K}\,\mathrm{K} * \beta(x)\,(n\,factors). \text{ Then } \beta^n(x) = \sum_{k=0}^{n+1}(-1)^k \binom{n+1}{k}\frac{(x-k)_+^n}{n!} \text{ where } x_+^n = (0,x)^n$$

In the Fourier domain $\hat{\beta}^n(w) = (\hat{\beta}^1(w))^n$. We have $\hat{\beta}^1(w) = e^{-\frac{iw}{2}} \dfrac{\sin\frac{w}{2}}{\frac{w}{2}} = e^{-\frac{iw}{2}} sinc(\dfrac{w}{2})$.

Therefore $|\hat{\beta}^n(w)| = |\hat{\beta}^1(w)|^2 = |sinc(w/2)|^n$ where $sinc\, x = \begin{cases} \dfrac{\sin x}{x} & , x \neq 0 \\ 0 & , x = 0 \end{cases}$.

**Definition 3.** *[2] The Fresnel Transform of $f \in L^2(\mathbb{R})$ is a unitary map $\tilde{f}_\tau : L^2(\mathbb{R}) \to L^2(\mathbb{R})$*

*defined by $\tilde{f}_\tau(x) = f * k_\tau(x)$, where the Fresnel operator $k_\tau(x) = \dfrac{1}{\tau} e^{i\pi(\frac{x}{\tau})^2}, \tau > 0$.*

**Properties**

The *Fresnel Transform* satisfies the following properties :

(i) $\tilde{f}(\cdot - x_0)_\tau(x) = \tilde{f}_\tau(x - x_0)$ (shift invariance)

(ii) $f^*(x) = (\tilde{\tilde{f}_\tau})_\tau(x)$ (Duality)

(iii) $(\tilde{f}(\dfrac{\cdot}{s}))_\tau(x) = \tilde{f}_{\frac{\tau}{s}}, s \neq 0$ (Dilation);

(iv) $\langle f, g \rangle = \langle \tilde{f}_\tau, \tilde{g}_\tau \rangle$ and $\|f\| = \|\tilde{f}_\tau\|$ (Parseval Relation and Plancheral property)

(v) In the Fourier domain $\hat{k}_\tau(w) = e^{i\frac{\pi}{4}} e^{-i\pi(\tau w)^2}$

**Definition 4.** *The definition of $F$-spline goes along with that of $B$-spline. It is expressed as the Fresnel Transform of the $B$-spline $\beta^n(x)$, that is the $F$-spline $\tilde{\beta}_\tau^n(x) = \beta^n * k_\tau(x)$*

**Theorem 1.** [2] *The $F$-spline satisfy all the three requirements of a valid scaling function viz. $(i)$ It is a Riesz basis, $(ii)$ It has partition of unity and $(iii)$ It has two scale relation*

**Remark 1.** *Due to the presence of the parameter $\tau$ the two scale relation has the modified form $\tilde{\beta}_\tau^n(x) = \sum_{k \in \mathbb{Z}} h(k) \tilde{\beta}_{2\tau}^n(2x - k)$.*

## 2. Fresnelets

In this section we make a concrete construction of Fresnelets.

**Definition 5.** *Fresnelets are the wavelets derived out of the scaling functions F-splines. To develop this we derive the Franklin wavelets, the wavelets associated with the B-spline of order 2.*

**Lemma 1.** [4] *The set $\{\phi(x - k)\}$ is an orthonormal system in $L^2(\mathbb{R}) \Leftrightarrow \sum_{k \in \mathbb{Z}} |\hat{\phi}(w + 2k\pi)|^2 = 1$*

**Theorem 2.** [4] *A function $\phi$ is a scaling function in $L^2(\mathbb{R})$ if and only if*

$$\hat{\phi}(w) = \left( \dfrac{\sin(\frac{w}{2})}{\frac{w}{2}} \right)^2 m_\phi(w), \text{ where } m_\phi \text{ is a } 2\pi \text{ periodic function in } L^2([0, 2\pi)).$$

**Proposition 2.1.** *The $B$-spline $\beta^2$ satisfy the identity*

$$\sum_{k \in \mathbb{Z}} |\hat{\beta}^2(w + 2\pi k)|^2 = 1 - \dfrac{2}{3} \sin^2(\dfrac{w}{2})$$

*We know* $|\hat{\beta}^n(w+2\pi k)|^2 = \dfrac{\sin^{2n}(\frac{w}{2})}{(\frac{w}{2}+\pi k)^{2n}}$     $\Theta$     $|\hat{\beta}^n_\psi(w)| = \sin cw$

*Replace* $w$ *by* $2w$ *and sum over all* $k \in \mathbb{Z}$

$$\sum_{k\in\mathbb{Z}} |\hat{\beta}^n(w+2\pi k)|^2 = \sin^{2n}(w) \sum_{k\in\mathbb{Z}} \frac{1}{(w+\pi k)^{2n}}$$

*Differentiating the identity* $\sum_{k\in\mathbb{Z}} \dfrac{1}{w+k} = \cot w,\ (2n-1)$ *times,*

$$\sum_{k\in\mathbb{Z}} \frac{1}{(w+\pi k)^{2n}} = \frac{-1}{(2n-1)!}\ \frac{d^{2n-1}}{dw^{2n-1}}(\cot w) \qquad (1)$$

*on substitution*

$$\sum_{k\in\mathbb{Z}} |\beta^n(2w+2\pi k)|^2 = \frac{-\sin^{2n}(w)}{(2n-1)!}\ \frac{d^{2n-1}}{dw^{2n-1}}(\cot w)$$

*Put* $n=1$ *in (1),*

$$\sum_{k\in\mathbb{Z}} \frac{1}{(w+\pi k)^2} = \frac{1}{4} cosec^2(\frac{w}{2}) \qquad (2)$$

*Differentiating (2),* $(2n-1)$ *times*

$$\sum_{k\in\mathbb{Z}} \frac{1}{(w+\pi k)^{2n}} = \frac{1}{4(2n-1)!}\ \frac{d^{2n-2}}{dw^{2n-2}}(cosec^2(\frac{w}{2}))$$

*For* $n=2$, $\sum_{k\in\mathbb{Z}} \dfrac{1}{(w+\pi k)^4} = \dfrac{1}{(2\sin\frac{w}{2})^4}(1-\dfrac{2}{3}\sin^2\dfrac{w}{2})$

$$\sum_{k\in\mathbb{Z}} |\hat{\beta}^2(w+2\pi k)|^2 = 16\sin^4(\frac{w}{2})\sum_{k\in\mathbb{Z}} \frac{1}{(w+2\pi k)^4} = 1-\frac{2}{3}\sin^2(\frac{w}{2}) \qquad (3)$$

**Theorem 3.** *The wavelet* $\psi$ *associated with the scaling function* $\varphi$ *in* $L^2(\mathbb{R})$ *satisfy*

$$\hat{\psi}(w) = e^{i\frac{w}{2}}\frac{\sin^4(\frac{1}{4}w)}{(\frac{1}{4}w)^2}\left(\frac{1-\frac{2}{3}\cos^2(\frac{1}{4}w)}{(1-\frac{2}{3}\sin^2(\frac{1}{2}w))(1-\frac{2}{3}\sin^2(\frac{1}{4}w))}\right)^{\frac{1}{2}}$$

*Proof:* From $(3)$ above

$$\sum_{k\in\mathbb{Z}} |(1-\frac{2}{3}\sin^2(\frac{w}{2}))^{-\frac{1}{2}}\hat{\beta}_2(w+2\pi k)|^2 = 1$$

If we write $\hat{\phi} = (1-\dfrac{2}{3}\sin^2\dfrac{w}{2})^{-\frac{1}{2}}\hat{\beta}_2(w)$ then $\hat{\phi} = \left(\dfrac{\sin\frac{w}{2}}{\frac{w}{2}}\right)^2 m_\phi(w)$ where

$$m_\phi(w) = (1-\frac{2}{3}\sin^2\frac{w}{2})^{-\frac{1}{2}} \qquad (4)$$

The two scale equation for the scaling funtion $\phi$ with low pass filter $m_0(w)$ is $\hat{\phi}(2w) = m_0(w)\hat{\phi}(w)$. Using (4)

$$m_0(w) \quad = \frac{(\sin w)^2 (1 - \frac{2}{3}\sin^2(\frac{1}{2}w))^{\frac{1}{2}}}{(2\sin(\frac{1}{2}w))^2(1 - \frac{2}{3}\sin^2 w)^{\frac{1}{2}}}$$

$$= (\cos(\frac{w}{2}))^2 \left( \frac{1 - \frac{2}{3}\sin^2(\frac{1}{2}w)}{1 - \frac{2}{3}\sin^2 w} \right)^{\frac{1}{2}}$$

If the orthonormal wavelet associated with $\phi$ is $\psi$ then $\psi$ satisfies

$$\hat{\psi}(2w) = e^{iw}\overline{m_0(w+\pi)}\hat{\phi}(w)$$

Using above result we get

$$\hat{\psi}(2w) = e^{iw} \frac{\sin^4(\frac{1}{2}w)}{(\frac{1}{2}w)^2} \left( \frac{1 - \frac{2}{3}\cos^2(\frac{1}{2}w)}{(1 - \frac{2}{3}\sin^2 w)(1 - \frac{2}{3}\sin^2(\frac{1}{2}w))} \right)^{\frac{1}{2}} \tag{5}$$

The wavelet $\psi$ is called *Franklin Wavelet*.

**Remark**: Now we turn on to $F$-spline and derive the *Franklin Fresnelet*, the wavelet associated with the $F$-spline. If $\phi$ is the scaling function associated with the $F$-spline $\hat{\beta}_\tau^2$ then (4) will become

$$\hat{\phi}(w) = (1 - \frac{2}{3}\sin^2(\frac{w}{2}))^{-\frac{1}{2}}\hat{\beta}_\tau^2(w)$$

$$= \hat{\beta}_2(w)\hat{k}_\tau(w)(1 - \frac{2}{3}\sin^2(\frac{w}{2}))^{-\frac{1}{2}} \Theta \hat{\beta}_\tau^2(w) = (\beta^2 * k_\tau)(w)$$

$$= e^{\frac{i\pi}{4}}e^{-i\pi(\tau w)^2}\left( \frac{\sin(\frac{w}{2})}{\frac{w}{2}} \right)^2 (1 - \frac{2}{3}\sin^2(\frac{w}{2}))^{-\frac{1}{2}}$$

Computing as in the previous case the $m_0(w)$ associated with this scaling function $\phi$ differ from the earlier one (4) by a factor of $e^{-i3\pi(\tau w)^2}$. Hence the Franklin Fresnlet $\psi$ in the Fourier domain is expressed as in the RHS of (4) except for a multiple of $e^{-i3\pi(\tau w)^2}$.

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# Correlation of Various Prognostic Factors in Breast Cancer

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*Abstract*- **Background:** Prognostic factors of breast cancer not only act as a guide to overall prognosis but also determine the need for adjuvant therapy.These factors are interrelated and hormone receptor status is an important determinant of prognosis of ca breast. **Objective:** The aim of this study was to correlate the various prognostic factors in breast cancer.Tumor size (T) ,nodal status (N) ,grade of the tumour and ER PR status were taken as prognostic factors. **Materials and Methods:** Mastectomy Specimen of fifty patients of carcinoma breast were studied to ascertain it's size,status of margin,histology of the tumor ,lymph node metastasis to determine modified Richards Bloomson's(MRB) score and Nottingham Prognostic Index(NPI). The Estrogen and progesterone receptor status was identified, data was analysed statistically by using Chi-square test and conclusion was drawn. **Results:** Most of the patients were 40-60 yr of age group, however most were postmenopausal and 40% of the patients had no metastasis in axillary lymph nodes Tumour was hormone receptor positive in two third of the patients.Hormone receptor positivity decreased with increase in size of the tumour , axillary lymph node positivity and grade of the tumour. Hormone receptor positivity increased as the age advances and positivity was more in postmenopausal as compared to premenopausal. Axillary lymph node involvement were increased with size of the tumour also increased size of the tumour leads to increase in the grading of the tumour. **Conclusion:** More number of patients are presenting in early stage as majority of patients have operable breast cancer. Most of the patients were between 40-60 yr of age which suggest shift towards younger age groups as compared to the traditional presentation of older age. Tumour was hormone receptor positive in two third of the patients. Small size, low grade and tumours without axillary lymph node metastasis have more chances of receptor positivity.

*Index Terms*- prognostic factors,Nottingham prognostic index,er pr status.

## I. INTRODUCTION

Worl-over carcinoma breast is the most frequent type of cancer among females. In India, it is the second most prevalent cancer among females after carcinoma of cervix, not only this but it is leading cause of cancer death in women aged 40 to 44 years, and second leading cause of cancer death for women overall.

There has been slight decline in breast cancer mortality overall, which can be attributed both to success of early detection programs and to advances in treatment, particularly development in systemic therapy.[1]

The current management of primary breast cancer involve the need for prognostication and the optimal selection of therapy. Estrogen receptor status has been clearly shown to be a predictive factor for hormonal therapy, in both the adjuvant and metastatic disease settings. Prognostication is especially important in identifying patients whose prognosis are so favorable that adjuvant systemic therapy is unnecessary. Prognostic factors can also be useful in identifying patients whose prognosis with conventional treatment are so poor as to warrant consideration of more aggressive investigational therapies.[1]

Prognostic factor not only act as a guide to overall prognosis but they may also determine need for adjuvant treatment.Clinical and pathological factors important and useful in progrostication are axillary lymph node status, stage of disease, size of primary tumor, histological grade, oestrogen and progesterone receptor status, lymphatic and vascular invasion, DNA flow cytometry, S-phase fraction, HER-2/new oncogene, cathepsin-D and epidermal growth factor receptor.[2]

The most established prognostic factor is the number of positive axillary lymph node based on at least a level I or II axillary dissection and a detailed histologic evaluation.[1].

Overall 10-year survival is reduced from 75% for node-negative patients to 25-30% for node-positive patients. The prognosis is also related to the number and level of locoregional lymph nodes involved. The greater the number of nodes involved, the poorer the prognosis.[4]

Tumor size, one of the first prognostic variables accurately quantified, is also a valuable prognostic factor. Tumor size correlates with the number of histologically involved nodes, but has independent prognostic significance. The size of the primary tumor is strongly correlated with lymph node metastasis.[6] Axillary nodes are involved in 45% of patients when the tumor is equal to or less than 1cm and is 60% when the tumor size is greater than 5cm.

Tumor grade is commonly provided on pathology reports and several investigators have demonstrated that it is an important prognostic factor in individual series. The use of tumor grade, however, has been limited by poor reproduction.[8]

Among clinical factors, young patient age has been reported to be an adverse prognosis.Women who are younger than 50 years of age at the time of diagnosis have the best prognosis. Relative survival declines after the age of 50 years and is particularly low in older women.[9]

Oestrogen receptors and progesterone receptors were used primarily as predictive factors for hormone responsiveness in

metastatic breast cancer.[16] Subsequently, they were also shown to be determinants of prognosis in early disease.[17] The presence of oestrogen receptors correlates inversely with certain histological features such as histological and nuclear grade, tumour proliferative index, lymphocytic infiltration and tumor necrosis; while it correlates positively with elastosis.[18] Oestrogen receptor positivity is a better predictor of overall than disease free survival and this has been interpreted as suggesting that the prognostic influence of oestrogen receptors is largely related to better survival of oestrogen receptor positive patients after relapse.[19,20] In addition to being a predictive factor for hormone responsiveness in metastatic breast cancer estrogen receptor status has been shown to predict benefit from tamoxifen in both pre and postmenopausal women in the adjuvant setting.[21]

Oestrogen receptor and prognosis : Most studies agree that expression of ER is a marker of favourable prognosis and patients have an overall survival advantage. There is a positive correlation between tumor differentiation, absence of lymph node metastases and positive ER status. Size and type of tumor are also important; smaller tumours and certain histological types, such as lobular carcinoma, are more likely to be receptor positive. ER levels are usually higher and incidences are usually more frequent in postmenopausal patients.[22]

## II. Materials and Methods

The study was conducted on 50 patients of carcinoma breast Cases of carcinoma breast diagnosed by clinical examination and confirmed by fine needle aspiration and cytology (FNAC) and histopathological examination were included in the study.Routine and special investigations such as USG abdomen and pelvis, X-ray chest, CT scan of chest / abdomen / head were conducted wherever required to detect distant metastasis.After initial tissue diagnosis on FNAC / biopsy and clinical staging, patients were taken up for surgery. The specimens were sent in buffered formal saline for detailed gross and microscopic examination to ascertain its size, status of margin, histology of the tumor, lymphnode metastasis etc. to determine modified Richards Bloomson's (MRB) score and Nottingham Prognostic Index (NPI).

MRB grade was obtained by adding up the scores for tubule formation, nuclear pleomorphism and mitotic count. Each of which was given 1, 2 or 3 points. This resulted in a total score of between 3 and 9.The final grading was given as below

1. 3 to 5 points – grade I
2. 6 to 7 points– grade II
3. 8 to 9 points–grade III.

The Nottingham Prognostic Index was calculated by using three prognostic factors – lymph node stage, tumor size and histologic grade. Index formula which used was

NPI = [Size (cm) x 0.2] + [Lymph node stage (1-3)] + [grade (1-3)].

According to NPI three prognostic groups were identified ; a good group with scores of less than 3.4 ; a moderate group with scores of 3.4 − 5.4; a poor group with score of over 5.4.The sections of the tumors were stained by standard immunohistochemical stains for Estrogen and progesterone receptor status. Estrogen receptor and progesterone receptor status of the specimens were obtained. All relevant data thus obtained was put into chart and observation tables were made. Data was analysed statically by using Chi-square test and conclusion was drawn.

## III. RESULT

Out of fifty cases 20(40%) were of 50-59 years , 19(38%) were 40-49 years,4(8%)were of 30-39 years and 7(1.4) were of >60 years age group.Out of fifty 41(82%) were postmenopausal and 9(18%) were premenopausal.Receptor status showed 31(62%) were ER PR +,6(12%) were ER PR −ve,3(6%) were ER+PR −ve and 10(20%) were ER-PR+ve.Histopathological grading of the tumor showed 41(82%) were grade II,5(10%) were grade I and 4(8%) were grade III. Correlation of hormone receptor status with tumor size in showed that in T1 stage out of 6 patients, 5(83%) were ER PR +ve ,in stage T2 out of 38 patients 24(63%) were ER PR +ve and 4 out of 38 (10%) were ER PR −ve. In the stage T3 out of 5 patients 2(40%) were ER PR +ve and 1 out of 5(20%) was ER PR −ve.Out of fifty 26(52%) were of N1 stage,4(8%) were stage N2 and 20(40%) were without axillary lymph node involvement.Correlation of lymph node status and size of the tumors showed that 26 out of 50(52%) patients were of N1. T2, T3 and T4 shows increase in lymph node positivity as three out five(60%) in the T3 was in N2 lymph node status, whereas all of T4 was of N2 lymph node status. Correlation of hormone receptor status and axillary lymph node status showed that among the ER PR+ve group, 45.16% of patients had no nodal involvement, 51.61% was of $N_1$ lymph node status and only 3.22% was of $N_2$.While in ER PR-ve group 83.33% of patients had $N_1$ nodal involvement and 16.66% had $N_2$ lymph node status. Histopathological grading and hormone receptor status correlation showed that out of 41 grade II patients 24(58%) were ER PR +ve ,5 out of 41(12%) were ER PR −ve.In grade III ,2 out of 4 (50%) were ER PR +ve ,1 out of 4(25%) were ER PR −ve.Whereas all the 5 patients of grade I were hormone receptor positive. Correlation of histopathological grading and size of the tumour showed that in grade II most were of $T_2$ size 33 out of 41(81%),5(12%) were of either T3 or T4.In the grade III 3 out of 4 (75%) were of size T2 and 1 out of 4(25%) was of T2.In grade I out of 5 patients 3(60%) were of T1 and the rest 2 out of 5 (40%) were of T2 size. Lymph nodes status and histopathological grading correlation showed that out of 41 grade II tumours 24 was of N1 lymph node status 16 was of NO and the rest 1 was of N2 status. In the grade III out of four three were of N2 lymph node status one was of N1 and there was none without lymphatic involvement.

## IV. DISCUSSION

Present study of breast carcinoma showed 40% belonged to 50-59 year age group, 38% to 40-49 year age group ,8 % to 30-39 year age group and 1.4% to >60 year of age group . These findings showed that most (78%) of the breast cancer in our study was of the age group 40-60 yr and of early stages.These results are suggestive of changing pattern of indian society in

which there is increase awareness for carcinoma breast. 68.29% of postmenopausal patients were ER PR+ and 33.33% of premenopausal patients were ER PR+,menopausal status increases hormone receptor positivity. Hormone receptor status correlation with tumor size in breast cancer, showed that in T1 stage out of 6 patients, 5(83%) were ER PR +ve ,in stage T2 out of 38 patients 24(63%) were ER PR +ve and 4 out of 38 (10%) were ER PR –ve. In the stage T3 out of 5 patients 2(40%) were ER PR +ve and 1 out of 5(20%) was ER PR –ve. It showed that ER PR+vity is decreased with increase in size of the tumour and hormone receptor negativity was increased with tumour size.

Hormone receptor correlation with axillary lymph node status showed that among the ER PR+ve group, 45.16% of patients had no nodal involvement, 51.61% was of $N_1$ lymph node status and only 3.22% was of $N_2$.While in ER PR-ve group 83.33% of patients had $N_1$ nodal involvement and 16.66% had $N_2$ lymph node status. This showed that lymph node involvement is more in hormone receptor negative tumour as compared to hormone receptor positive tumour.

When histopathological grading and hormone receptor status was correlated ,it was found that out of 41 grade II patients 24(58%) were ER PR +ve ,5 out of 41(12%) were ER PR –ve.In grade III ,2 out of 4 (50%) were ER PR +ve ,1 out of 4(25%) were ER PR –ve.Whereas all the 5 patients of grade I were hormone receptor positive.These findings suggest that as the grading of the tumour is increasing its hormone receptor positivity is decreasing while hormone receptor negativity is increasing.

When lymph node status and size of the tumors were correlated it was found that 26 out of 50(52%) patients were of N1. T2, T3 and T4 shows increase in lymph node positivity as three out five(60%) in the T3 was in N2 lymph node status, whereas all of T4 was of N2 lymph node status.Therefore axillary lymph node involvement were increased as the tumour size was increased.When histopathological grading was correlated with size of the tumour,it showed that most of the patients of ca breast were of grade II, 41 out of 50(82%),only five was of grade I and four was of grade III. In the grade II most were of $T_2$ size 33 out of 41(81%),5(12%) were of either T3 or T4.In the grade III 3 out of 4 (75%) were of size T2 and 1 out of 4(25%) was of T2.In grade I out of 5 patients 3(60%) were of T1 and the rest 2 out of 5 (40%) were of T2 size.Therefore as the size of the tumours were increased its grade were also increased.

**Relationship between ER PR status and lymph node involvement in breast cancer patients**

| ER/PR Status | LYMPH NODE | | | | | | | | Total No. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $N_0$ | | $N_1$ | | $N_2$ | | $N_3$ | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| ER+ve PR+ve | 14 | 45.16 | 16 | 51.61 | 01 | 3.22 | | | 31 | 62 |
| ER+ve PR-ve | | | 2 | 66.66 | 01 | 33.33 | | | 3 | 06 |
| ER-ve PR+ve | 06 | 60 | 03 | 30 | 01 | 10 | | | 10 | 20 |
| ER-ve PR-ve | | | 05 | 83.33 | 01 | 16.66 | | | 6 | 12 |
| Total | 20 | 40 | 26 | 52 | 04 | 8 | | | 50 | 100 |

**Relationship between histopathological grading and ER PR status in breast cancer patients**

| S.No. | ER PR Status | Histopathological Grade | | | | | | Total No. | |
|---|---|---|---|---|---|---|---|---|---|
| | | Grade – I | | Grade – II | | Grade – III | | | |
| | | No. | % | No. | % | No. | % | | |
| 1 | ER+ve PR+ve | 05 | 16.12 | 24 | 77.41 | 02 | 6.4 | 31 | 62 |
| 2 | ER+ve PR-ve | | | 02 | 66.66 | 01 | 33.33 | 3 | 06 |
| 3 | ER-ve PR+ve | | | 10 | 100 | | | 10 | 20 |
| 4 | ER-ve PR-ve | | | 05 | 83.33 | 01 | 16.66 | 6 | 12 |
| | Total | 05 | 10 | 41 | 82 | 04 | 8 | 50 | 100 |

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# Design of Progressive Draw Tool

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*Abstract-* Before converting raw materials to a finished product we need an accurate design of the product and also data required for manufacturing. If the design is not accurate then defects will occur in the manufactured product; small mistakes in designing a product makes the manufactured product useless so more amount time is allotted for designing a new product (or) for modifying the existed design. In this work the use of a software namely Pro/E for designing a progressive die to manufacture cup for the oil filter has been incorporated. A progressive die is a multiple station die. In this work authors have designed a progressive die which has two stages of operation. The former operation is piercing and is followed by blanking. In both operations a finite volume of metal is removed from the sheet metal. If the final product happens to be removed portion then the operation is blanking, on other hand if pierced sheet metal is the final product then the operation is piercing. Both the operations are performed simultaneously in a single stroke of press, thus enabling the user to obtain the final product in a single stroke. This design procedure can also be extended for manufacturing washers for M-series bolts by modifying the punch and die plate dimensions.

*Index Terms*- Progressive dies, cups, Design, forces for punching and blanking

## I. DESIGN OF PROGRESSIVE DIE

A progressive die performs a series of fundamental sheet metal operations at two or more stations during each press stroke in order to develop a work piece as the strip stock moves through the die. The work piece on progressive dies travels from one station to another, with separate operations being performed at each station. Usually the work piece is retained in the stroke until it reaches the final station, which cuts off the finished piece .All station work simultaneously at different points along the work strip ,which advances on station at each stroke of ram. Thus a complete part is produced with each stroke .Progressive dies generally include blanking and piercing operations but a complicated progressive die can do the operation of bending, forming, curling and heading also .Each workstation performs one or more distinct die operation, but the scrip must move from the first through each succeeding station to produce a complete part .One or more idle station may be incorporated in the die ,not to perform work on the metal but to locate the strip, to facilitate inter station strip travel, to provide maximum size die sections or to simplify their construction . The operation performed in a progressive die could be done individual dies as separate operations but would require individual feeding and producing .In a progressive die the part remains connected to the stock strip, which is fed through the die with automatic feeds and positioned by pilots with speed and accuracy. The linear travel of the strip stock at each press stock is called the progression, advance or pitch and is equal to the interaction distance. The unwanted parts of the strip are cutout as it advances through the die, and one or more tabs are left connected to each partially completed part to carry it through the stations of the die. Sometimes parts are made from individual blanks, neither a part of, nor connected to a strip in such cases mechanical fingers or other devices are employed for the station to station movement of work piece. The selection of any multi-operation tool, such as progressive die, is justified by the principle that the number of operations achieved with one handling of the stock and produced part is more economical than production by a series of single operation dies and a number of handling for each single die.

Where tool production requirements are high, particularly of production rates are large, totally handling cost is saved by progressive fabrication compared with a series of single operation are frequently greater than the costs of the progressive die. A progressive die should be heavily constructed to withstand the repeated shock and continuous runs to which it is subjected, precision guide post and bushings should be used to maintain accuracy .Lifters should be provided in die cavities to lift up or eject the formed parts and carrier rails or pins should be provided at the last station .When practical, punches should contain shudder or kicker pins to aid in disposal of slugs. Adequate piloting should be provided to ensure proper location of the strip as it advances through the die. The striper plates should engage guides before contacting the strip. The dropping of the work pieces through the die is the most desirable method of part ejection, but cannot always be obtained. Cutting the scrap in to small section simplifies the material handling problems and produces a greater price and return when sold as scrap metal. In the present project the progressive die set is used to produce component that is washer the specification are as follows Stock strip material is mild steel. Thickness of strip : 1.6mm Outer diameter : 26mm Inner diameter : 12.5 mm

## II. PRINCIPLE OF METAL CUTTING

The metal is brought to the plastic stage by pressing the sheet between two shearing blades so that fracture is initiated with the movement of the upper shear, finally result in the separation of the slug from the parent strip. The metal under the upper shear is subjected to both compressive and tensile stresses. In an ideal shearing operation. The upper shear pushes the metal to a depth equal to about the third of its thickness. Because of pushing the material into the lower shear the area of cross-section

of the metal between the cutting edge of the shear decreases and causes the initiation of the fracture. The portion of the metal which is forced into the lower shear is lightly burnished and would appear as a bright band around the blank lower portion. The fractures which are initiated at both the cutting points would progress further with the movement of the upper shear and if the clearance is sufficient, would meet, thus completing the shearing action. The two shearing elements of the press tool are the hardened punch and the die plate having sharp edges and a certain shearing clearance. Both the shapes of the punch and the die opening conform to the required shape of the component. The punch is connected to the ram of the power press and while descending contacts the stock, exerts pressure over the stock around the cutting edges and shears it through. Exactly the same phenomenon that takes place where in blanking (or) in piercing (or) in any other shearing operation. In the process of shearing four important stages are usually distinguished according to the observation.

**STAGE I: Plastic Deformation** The stock material has been placed on the die and the punch is driven towards the die. The punch contacts the stock material and exerts pressure upon it. When the elastic limit of the stock material is exceeded, plastic deformation takes place.

**STAGE II: Penetration** As the driving force of the ram continues, the punch is forced to penetrate the stock material and the blank or slug is displaced into the die opening a corresponding amount. This is true shearing part in of the cutting cycle, from which the term "shearing action" is derived.

**STAGE III Fracture** Further continuation of the punching pressure that causes fractures to start at the cutting edges of the punch and the die. Under proper cutting conditions, the fractures extended toward each other and meet. When this occurs, the fracture is complete and the blank or slug is separated from the original stock material. The punch then enters the die opening, pushing the blank or slug slightly below the die cutting edge.

**STAGE IV:** As the punch completes the down stroke up to the lower point, the component of slug is pushed through the die opening. Strictly speaking this action is a consequence of the dynamic fracture at the stage III and only in certain case the push through takes place where the punch takes place where the punch travels beyond the land of the die. This is the simplest approach on the shearing action. Before dealing with the details of the phenomenon, the attention is drawn on the same other allied factors which calls for deeper deliberations on the shearing process.

## III. THE AMOUNT OF SHEARING CLEARANCE PER SIDE

At a certain value of shearing clearance, which depends on the thickness, kind and its heat treated conditions of the stock, the crack line meet, resulting in easy action, low vertical force, low horizontal force, low stripping, low wear high die life but fairly distorted sheared contour. At narrower clearance secondary cracks develop that is the two cracks do not meet, resulting in unfavorable increase in forces but some improvement is found in the quality of the cut contour, due some burnishing of the shaped secondary cracks.

**Importance of cutting clearance** Proper cutting clearance is necessary to the life of the die and the quality of the piece part. Excessive cutting clearance results in objectionable piece part characteristics, insufficient cutting clearance causes undue stress and wear on the cutting members of the tool because of greater punching effort required. If the amount of clearance is optimum, then the two fracture lines meet and a clean edge is obtained after the operation. If the clearance is too small then the fracture lines miss each other and a secondary deformation taken place resulting in an unclear edge. When the amount of clearance is too large obvious that significance amount of drawing action takes place and the quality of the work piece is again quite poor. Importance of angular clearance Angular clearance is of vital importance in any die where blanks or slugs pass through the die opening. Like cutting clearance, angular clearance is a "per side" measurement. A clearance of ¼ per side is suggested for die work of good quality when the stock material is less than 1.5mm thick. All die-opening walls should have smoothly finished surfaces throughout. Owing to the lessening of the back pressure from blanks or slugs, small or delicate punches will also benefit from slightly increased angular clearance in the die opening. **(4)..**

## IV. FORCE CALCULATIONS

**Punching and Blanking**

The punching and blanking process cannot strictly speaking grouped under forming operations. In these processes a finite volume of sheet metal is removed by using a die and a punch. The shape and size of the portion removed are determined by the geometry of the die and the punch. If the final product happens to the removed portion, then the operation is termed as blanking. On the other hand if the pierced sheet metal is the final product then the operation is called punching.

**Blanking** It is a process in which the punch removes a portion of material from the stock which is a strip of sheet metal of the necessary thickness and width . The removed portion called a blank and is usually further processed to be of some use**.**

**Piercing:-** This operation consist of simple hole punching is piercing is making holes in a sheet it is identical to blanking except if the fact that the punched out portion coming out through the die in piercing is scrap .piercing is always accompanied by the blanking operation either before , after(or) at the same time.

**Punching Force** The force required to be exerted by the punch in order to shear out the blank from the stock can be estimated from the actual shear area and shear strength of the material using formulae $P = L \times T \times \tau$  $\tau \rightarrow$ shearstrength (mm)

$L \rightarrow$ perimeter of cut (mm)
$T \rightarrow$ stock thickness (mm)
Shearing force (Fsh)
$F_{sh} = L \times T \times \tau$  L=Length of cutting edge
T=Thickness of the stock strip
$\tau$ =shear strength of the material Newton/sq.mm Force required for piercing operation
$F1 = L \times T \times \tau = \pi \times 18 \times 0.8 \times 125 = 319654N$
Force required for blanking operation:
$F2 = L \times T \times \tau = \pi \times 140 \times 0.8 \times 125 = 43998N$
Total shearing force

F=F1+F2 =75963N
Taking factor of safety=1.5
The capacity of press required is 111.21KN

**Blank Holding Force**:

Blank holding force or stripping force is the force, which controls the metal flow .It is the force applied by the blank holder on the blank to control the flow of the metal in to the die cavity. Important consideration in tooling for sheet metal forming wrinkling of sheet as it is being formed. Hold down can best be provided by hold down ring .However by using mechanical spring or an auxiliary air cylinder, hold down can be provided in a single action press.

Stripping force required =k×L×T×τ
K=stripping constant =0.0207(for low carbon steels above 1.5 mm thickness)
=0.0207×π×(140+18)×0.8×390 =3206.18N =0.3206KN
Total force=shearing force + stripping force =111.21+0.3206 =111.50KN
Capacity of press required for punching operation=111.5KN

**SPRING DESIGN** Spring are used to obtain the required blank holding forces , Spring has to take up the total force and it should be designed for this load.
Pmax=Shearing force+blank holding force =113700N
Springs has to be designed for this force δ/n=(8×W×D3)/(Gd4)
δ=deflection of spring n=number of active coils
W=axial load in spring
D=mean diameter
G=modules of rigidity for spring material
d =diameter of spring wire In the present project
δ=10mm D=22mm
W=111500N
10/n=(8×111500×223)/(84000×d4)--------------(1)
We also know that free length of spring
Lf=Solid length + maximum compression +clearance between adjacent coils
=n|×d+C+0.15×C Where n|=n C=max compression Lf=35mm
35=nd+10+0.15×10---------------- (2)
Solving (1) & (2) n=3turns d =12.00mm D=22mm

## V. DESIGN OF DIE ELEMENTS USING PRO/E

**(5a)DIE BLOCK DESIGN:** A tool-steel block which is bolted to the bed of a punch press and into which the desired impressions are machined. The part of an extrusion mold die holding the forming bushing and core. The die block constitutes the female half of the two mated tools, which carry the cutting edges. A vertical opening extending through the block determines the size and outline of the blank. The exact opening is provided in the die to obtain a predetermined clearance between punch and the die. The amount of angular clearance and vertical land in the die opening is necessary in order to prevent the possibility of a blank or slug jamming in the passage. The overall dimensions should be obtained by having minimum die wall thickness required for strength and by the is space needed for mounting screws, dowels, and stripper plate. The material to be used in manufacturing is HCHC and to be heattreated60-62HRC.

Using pro/E software a new file is opened in part mode. The sequence of commands are used. Select the plane→front→ ok
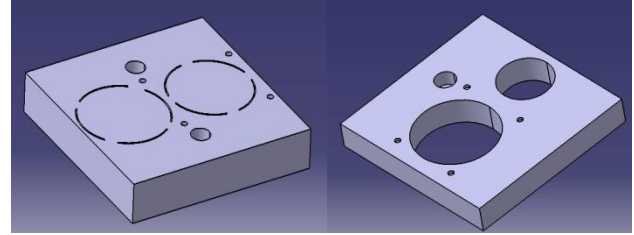


**Fig 1) 3-D Model Of Die Block**

After completion of these command a proper sketching plane is selected to draw the sketch as shown in the drawings and depth is given to the 2-D sketch such that solid model is obtained. Change PRO/E default units to user specified units from menu manager.

Select a plane give direction of sketching plane a new window sketcher arises on the screen. Toggle off the grid and refresh, draw a rectangle with given dimensions specify the depth of the die plate (rectangle) Select the part -> extrude -> done Select a proper plane and give direction of cut specify dimensions for the cutting portions. Give Thru all -> done -> ok for creating hole in die plate of specified dimensions. Feature->sketch->circle->ok For standard hole set ISO standards and select proper screw size add thread surface click on thru all, thru thread ,select primary reference plane select linear reference plane1 and plane2 with given distances check the preview and ok A signal standard hole is created. Feature->copy->mirror->dependent->done Select a feature to be mirrored, select a plane to mirror, the standard hole using copy command created, four standard holes using cut command remove material up to specified depth to have a step. Feature->extrude->remove->thru all Draw rectangle on the top surface of the die plate highlighted entities be aligned. Specify step depth, die plate of 3D progressive die plate with specified dimensions is created. FIA 1: 3DMODEL The similar steps are repeated for stripper plate, punch plate , top and bottom plates.

**5b) DESIGN OF STRIPPER PLATE** The primary purpose of a stripper is to remove the stock from the punch after a blanking or piercing operation. However the stripper serves two other secondary function also. Firstly it guides the strip if fixed to the die block surfaces. Secondly, it holds the blank under pressure before the punch descends fully if the stripper is of spring loaded type. The thickness of stripper is 14.3mm and the material used is EN 8.
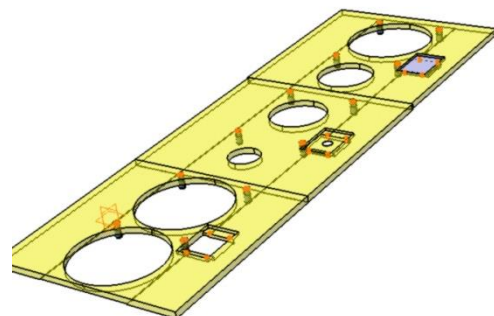
**Fig 2) 3D Model Of Stripper Plate**

**5c) DESIGN OF PUNCH PLATE** Punch plate is essentially sheet metal with regularly spaced holes and is used to classify material in applications from dredges to trammels and everything in between. Classification is obviously dependant on the size of the holes and that is dependent on application. Punch plates hold and support piercing, notching, and cut-off punches. They are usually made of machine steel, but can also be made of tool steel that has been left soft for high grade dies. Punch plates range from small simple blocks for holding single piercing punches to large, precision- machined plates for holding hundreds of perforators The thickness of punch plate is 15mm and the material to be used in manufacturing is EN8. Upper part of the punch plate is provided with a shank equal in diameter to the ram hole. The shank is locked in position with a side screw. This part which is dowelled together with the top plate retains or holds the punches. The center distances is picked up or transferred from the hardened die block to eliminate the possibility of misalignment of punches and die openings due to dimensional changes during heat treatment. Holes to receive the body of punches are provided with H7 fit in order to bare a light press fitting.

**5d) DESIGN OF STOCK GUIDES:** The size of stock guides are dependent upon the size of strip and the size of the die block. Two stock guides (front gage and back gage) of the same size 2'21'83 mm are used. Both the front back games are separate units assembled in the die block. Both are extended and provided with strip rest to aid in aligning the strip for starting and feeding.\

**5e) DESIGN OF PUNCHES:**

The exact dimensions of pitch diameter are determined by providing clearance between punch and die. The punch is usually designed with a wide shoulder to facilitate mounting and to prevent deflection under load In case of smaller punches the punch may be held in a retainer which in turn is a mounted against the punch holder. The exact length of a punch can be found out by laying the whole assembly drawing only as the sheet height as to be made up from the die block, die shoe, punch , punch holder. Punches of diameter less than the stock thickness must be designed carefully because unit compressive stress in punches rises 4 times the unit shear stress of the material when punch diameter is equal to stock thickness. The height for these punches are 90mm,the material used for manufacturing in HCHC heat treated to 60-62 HRC . Clearance between punch and die is 0.06mm is selected from the table which is equal to 5-7%.



**Fig 3) 3D Model Of Punch**

**5f) DESIGN OF TOP PLATE** Top plate (upper shoe) holds the upper half component of the die, clamped to the ram by means of the shank being screwed on its top surface where the center of pressure is located .The thickness of the top plate is determined the product of 0.9 times of the thickness of the die

block which is equal to 19mm.The material to be used for manufacturing this part is EN8.
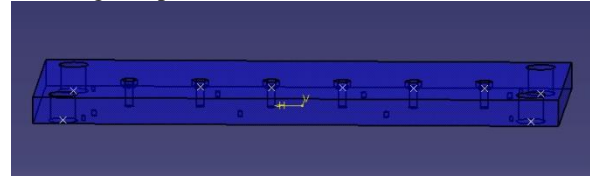


**Fig 4) 3D Model Of Top Plate**

**5g) DESIGN OF BOTTOM PLATE** The function of the bottom or lower shoe primarily as a base for the complete die assembly and in turn is bolted or clamped to the bolster plate over the press bed. The thickness of the bottom plate is 16.8mm. Openings are made with respect to the die openings plus allowance, to allow stamped components to fall freely. The material to be used for manufacturing this part is EN8.

**5h) GUIDE PILLERS AND GUIDE BUSHES** These elements of die are responsible for the alignment of the lower and upper part of the die. It should withstand deflection during continuous production. Standard dimensions of these parts are used so that manufacturing would not be a problem when these are available in the market
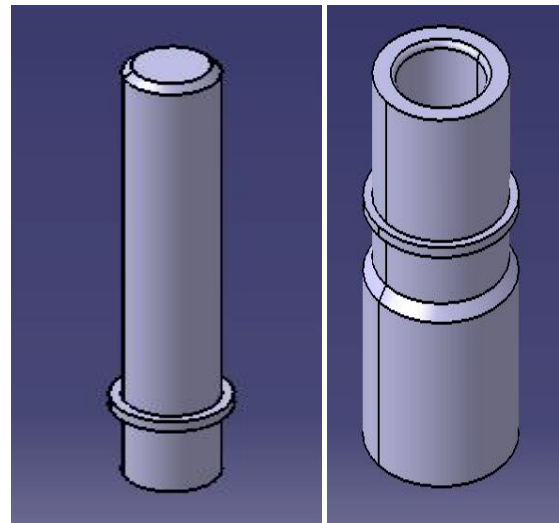


**Fig 5) 3D Model Of Guide Pillers ,Guide Bush**

## VI.   ASSEMBLY OF DIE
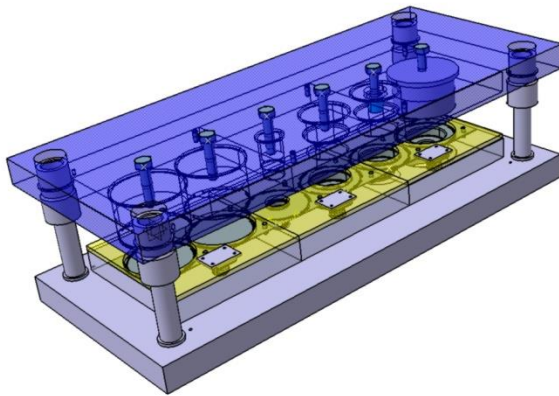


**Fig 6) Progressive Assembly View**

## VII.   CONCLUSION

By the implementation of computer in design field accuracy of design is improved and design field accuracy of design is improved and design process time is reduced drastically than by traditional method. In the process of creating the documentation for the product design much of required data base to manufacture the product is also created. Many design problems which are complicated to estimate by traditional methods are eliminated by using CAD system. as the designs have more standardization they can be imported to any other software and also CAD provide better functional analysis to reduce prototype testing Regarding progressive die design of progressive die is simple. Advantage of progressive die is it perform two or more operations simultaneously by a single stroke. Progressive die is used for high rate of production This design procedure can also be extended for manufacturing washers for M-series bolts by modifying the punches and die plate dimension.

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# Swot Analysis of Mobile Cloud Computing

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**Abstract:** Mobile Cloud Computing (MCC) has revolutionized the way in which mobile subscribers across the globe leverage services on the go. The mobile devices have evolved from mere devices that enabled voice calls only a few years back to smart devices that enable the user to access value added services anytime, anywhere. MCC integrates cloud computing into the mobile environment and overcomes obstacles related to performance (e.g. battery life, storage, and bandwidth), environment (e.g. heterogeneity, scalability, availability) and security (e.g. reliability and privacy). *This paper explains about Mobile cloud computing and SWOT analysis of MCC. This analysis is useful for mobile providers.*

**Index Terms**: Mobile Cloud Computing, Cloud Computing

## I.  INTRODUCTION

**M**obile devices (e.g., Smartphone, tablet Pcs, etc) are increasingly becoming an essential part of human life as the most effective and convenient communication tools not bounded by time and place. Mobile users accumulate rich experience of various services from mobile applications (e.g., iPhone apps, Google apps, etc), which run on the devices and/or on remote servers via wireless networks. The rapid progress of mobile computing (MC) [1] becomes a powerful trend in the development of IT technology as well as Commerce and industry fields. However, the mobile devices are facing many challenges in their resources (e.g., battery life, storage, and bandwidth) and communications (e.g., mobility and security) [2]. The limited resources significantly impede the improvement of service qualities. Cloud computing (CC) has been widely recognized as the next generation's computing infrastructure.CC offers some advantages by allowing users to use infrastructure (e.g., servers, networks, and storages), Platforms (e.g., middleware services and operating systems), and software (e.g., application programs) provided by cloud providers (e.g., Google, Amazon, and Salesforce) at low cost. In addition, CC enables users to elastically utilize resources in an on-demand fashion. As a result, mobile applications can be rapidly provisioned and released with the minimal management efforts or service provider's interactions. With the explosion of mobile applications and the support of CC for a variety of services for mobile users, mobile cloud computing (MCC) is introduced as an integration of cloud computing into the mobile environment. Mobile cloud computing brings new types of services and facilities for mobile users to take full advantages of cloud computing.

## II.  OVERVIEW

### (A)  What is Mobile Cloud Computing?

 "Mobile Cloud Computing at its simplest refers to an infrastructure where both the data storage and the data processing happen outside of the mobile device. Mobile cloud applications move the computing power and data storage away from mobile phones and into the cloud, bringing applications and mobile computing to not just Smartphone users but a much broader range of mobile subscribers".

Mobile devices that access the Internet are performing mobile cloud computing: handsets need to borrow storage and computing power from the cloud because of their limited resources or because it makes more sense. For example, consider modern wireless car navigators, like the Dash: these devices not only can store locally the maps and calculate routes, but they rely on the cloud to get real time information about traffic conditions and plan the routes accordingly. Accessing data in the cloud from mobile devices is becoming a basic need.

**Some of the key features are**:

- We access the data anywhere and the data is available any device.
- Optimize tasks for using both on device and cloud computing.
- Enable previously impossible scenarios on mobile (offload computationally intensive tasks to the cloud).

- Mobile access to enterprise applications and data becomes easier.

**(B) The Range of Mobile Devices**

- Smart Phones
- Laptops, "Net-books", iPads
- Sensors
- Embedded Systems (e.g. RFID Readers, Biometric Readers, OnStar)
- Satellites

**(C) Mobile cloud computing differ from other forms of cloud computing in** Location of variable, Perishable user demand Answer-based, not document hit list-based services, More difficult to anticipate the need for a particular service ,Location-aware and proximity-aware applications, and Small screen real estate and small physical interface make interaction is difficult.
.
**(D) Architectures of Mobile cloud computing**
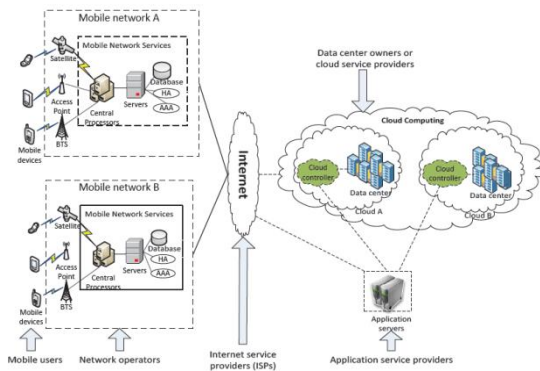


Fig.1. Mobile cloud computing architecture

From the concept of MCC, the general architecture of MCC can be shown in Fig.1. In Fig. 1 mobile devices are connected to the mobile networks via base stations (e.g., base transceiver station (BTS), access point, or satellite) that establish and control the connections (air links) and functional interfaces between the networks and mobile devices. Mobile users' requests and information (e.g., ID and location) are transmitted to the central processors that are connected to servers providing mobile network services. Here, mobile network operators can provide services to mobile users as AAA (for authentication, authorization, and accounting) based on the home agent (HA) and subscribers' data stored in databases. After that, the subscribers' requests are delivered to a cloud through the Internet. In the cloud, cloud controllers process the requests to provide mobile users with the corresponding cloud services. These services are developed with the concepts of utility computing, virtualization, and service-oriented architecture (e.g., web, application, and database servers).

**(E) Types of MCC**

**Private Clouds:** are typically owned by the respective enterprise and / or leased. Functionalities are not directly exposed to the customer, though in some cases services with cloud enhanced features may be offered – this is similar to (Cloud) Software as a Service from the customer point of view.
Example: eBay.
**Public Clouds:** Enterprises may use cloud functionality from others, respectively offer their own services to users outside of the company. Providing the user with the actual capability to exploit the cloud features for his / her own purposes also allows other enterprises to outsource their services to such cloud providers, thus reducing costs and effort to build up their own infrastructure. As noted in the context of cloud *types*, the scope of functionalities thereby may differ.
Example: Amazon, Google Apps, Windows Azure.
**Hybrid Clouds:**
Hybrid cloud computing is the combination of private cloud and public cloud computing. Hybrid offered in one of two ways: vendor has a private cloud and form a partnership with a public cloud provider, or a public cloud provider forms a partnership with a vendor that provides private cloud platforms.

**(F) Delegation of MCC**

**Infrastructure as a Service (IaaS)**: IaaS is built on top of the data center layer. IaaS enables the provision of storage, hardware, servers and networking components. The client typically pays on a per-use basis. Thus, clients can save cost as the payment is only based on how much resource they really use. Infrastructure can be expanded or shrunk dynamically as needed. The examples of IaaS are Amazon EC2 (Elastic Cloud Computing) and S3 (Simple Storage Service).

**Platform as a Service (PaaS):** PaaS offers an advanced integrated environment for building, testing    and deploying custom applications. The examples of PaaS are Google App Engine, Microsoft Azure, and Amazon Map Reduce/Simple Storage Service.

**Software as a Service (SaaS):** SaaS supports a software distribution with specific requirements. In this layer, the users can access an application and information remotely via the Internet and pay only for that they use. Salesforce is one of the pioneers in providing this service model. Microsoft's Live Mesh also allows sharing files and folders across multiple devices simultaneously

## III.   SWOT ANALYSIS

SWOT analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project.

### (A) STRENGTH

**Extending battery lifetime:** Battery is one of the main concerns for mobile devices. Several solutions have been proposed to enhance the CPU performance [5], [6] and to manage the disk and screen in an intelligent manner [7], [8] to reduce power consumption improving data storage capacity, Computation *offloading technique* is proposed with the objective to migrate the large computations and complex processing from resource-limited devices (i.e., mobile devices) to resourceful machines (i.e., servers in clouds). This avoids taking a long application execution time on mobile devices which results in large amount of power consumption.

**Processing power:** Storage capacity is also a constraint for mobile devices. MCC is developed to enable mobile users to store/access the large data on the cloud through wireless networks. First example is the Amazon Simple Storage Service (Amazon S3) which supports file storage service.

**Improving reliability:** Storing data or running applications on clouds is an effective way to improve the reliability since the data and application are stored and backed up on a number of computers. This reduces the chance of data and application lost on the mobile device

**Scalability:** The deployment of mobile applications can be performed and scaled to meet the unpredictable user demands due to flexible resource provisioning. Service providers can easily add and expand an application and service without or with little constraint on the resource usage.

**Multi-tenancy:** Service providers (e.g., network operator and data center owner) can share the resources and costs to support a variety of applications and large number of users.

**Ease of Integration**: Multiple services from different service providers can be integrated easily through the cloud and the Internet to meet the users' demands.

#### Some of other Strength :

- Mobile cloud computing offers access to a wide range of applications on a need basis.
- It eliminates the need of being tied up to a single cell phone service provider.
- Mobile devices do not have sufficient storage capacity. Mobile cloud computing enables users to store/access large amounts of data in cloud. So, computing and storage will be in the cloud and the presentation of product and/or service will be on device.
- Running applications in the cloud is an effective way to improve reliability. When the mobile device is lost or destroyed, the data stored in cloud is preserved.
- Service providers can easily add and expand an application.
  Other benefits include mobile commerce, mobile learning, mobile healthcare, mobile gaming, photo sharing, keyword and video searching.
- Advanced reservation of resources.

### (B) WEAKNEES

**Resource-poor:** Mobile devices are resource-poor compared to other client devices. Even as mobile devices continue to evolve and improve, basic mobile related properties such as weight, power and size will always put a limitation on computational resources such as processor speed, memory size, and storage capacity. In mobile cloud computing, mobile device needs to be able to cooperate with the cloud to overcome the resource limitation.

**Network:** Mobile network is characterized by lower bandwidths, higher error rates, and less reliable connections. Requirements on latency and delay are different per each application through mobile network.

**Internet dependency:** Although the quality of service rendered may be good network and internet outages are an issue with regards to continuous availability of the SaaS service.

**Specificity:** An organization that has a very specific computational need might not be able to find the application available through SaaS.

**Vendor "Lock-in":** A customer might pay a provider to use an application, but once they do, they may be unable to port that application to a new vendor or a hefty fee may be charged for the same.

**Dependency:** The customer is totally dependent on the know-how of the service provider and is limited by the capabilities of the service provider

**Complexity:** The company has to make the tough decision on how much can they afford to store their sensitive data at a physically distant location.

**Integration:** Even though most of the hardware is online, the firm would require a few components like printers, local network devices, etc, to be at the company premises. The integration of these devices with IaaS is cumbersome


## (C ) OPPORTUNITIES

**Sensor Integration:** Smartphone's are equipped with myriad of sensors. These sensors play a vital role in developing intelligent applications. The sensor will improve the applicability of Mobicloud.

**Power and connectivity aware processing:** Mobile devices have limited storage, processing power and connectivity. Applications can be made to make smarter use of the battery power and connectivity by dynamically changing the behavior of the application. This however, takes significant effort in programming. MobiCloud can automatically generate the required code to efficiently manage the communication. For example, it can store content locally when the connectivity is via 3G and the data size is large, and complete the transfer when Wi-Fi is available, thereby saving power and bandwidth.

**Mobile cloud is an opportunity for free software providers:** With so many new mobile devices hitting the market, billions of new users have the issue of freedom for the software on the device and freedom in the mobile cloud. The Free Software community has the opportunity to participate in the mobile cloud debate and shape this new environment.

**Flexibility:** Systems can be changed and modified without harm to the entire IT system.

**Management:** With IaaS offerings, IT management can be provided as part of the service for a much lower fee.


## (D) THREATS

**Integrity:** It may be difficult to maintain the integrity of a database if it is too complex or changes too quickly

**Open source software:** If companies are inclined, they can put their open source applications on hardware that performs better and costs less than SaaS.

**Security:** The threat of security remains the topmost concern for service consumers of the internet for the data and applications.


## IV.   CURRENT MARKET ANALYSIS

According to a recent study by ABI Research, a New York-based firm, more than 240 million businesses will use cloud services through mobile devices by 2015. That traction will push the revenue of mobile cloud computing to $5.2 billion, and  a recent study by the international Data Corporation(IDC)predicts that nearly 14 million new jobs will be created worldwide by 2015[9].


## V.   CONCLUSION

This article has provided an overview of mobile cloud computing (MCC) in which its definitions, architecture, and some features have been presented and by doing SWOT analysis it is concluded that the MCC users can get the optimal services.


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# Image Property of Light

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## I. Introduction

We all knew that light exhibit dual behaviour, particle and wave nature.

Newton was the first to say that light is made up of particle, but he unable to prove that fact.

Later, Einstein and Plank make this prediction proof by explaining blackbody radiation and photoelectric phenomenon with the help of particle behaviour of light.

Plank said that every particle photon of light "hv", v is the frequency of that particle.

This was all about energy and wave behaviour of light. One of the most important behaves imaging forming by light.

## II. Research elaboration

The Ray optic of light can explain the correct position of image forming successfully.

But it still lake to say how image carry by light from one plane to another. Here I am going to explain this behaviour of light by some evidences.
Let us consider an illustration.
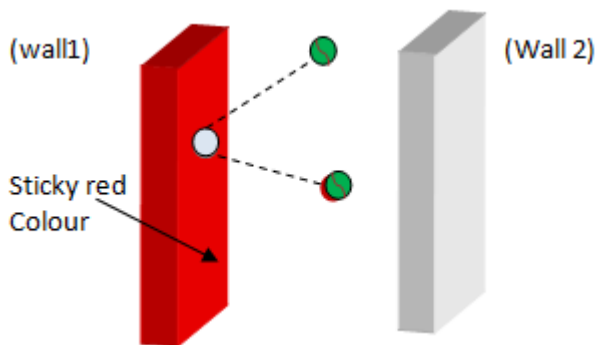


Let us consider two parallel smooth. It wall standing to each other. Wall (1) is painted with sticky red paint on the inner face which is facing wall (2). Suppose a tennis ball is hit in the inner side of red sticky wall (1), this tennis ball will bounce to the wall (2). If the tennis ball fall on the (2) by the side of which it interact with red wave, it will imprint the image of red portion on wall (2) which is taken by the tennis ball from the wall (1).

The probability of imprinting image on wall (2) will increase with decrease in size of tennis ball.

Probability of imprinting image ᾱ 1/size of tennis ball. (Where as ᾱ means proportional)

Photon particle of light behave similar to that tennis ball. It move with most fastest speed ever by any particle in the universe, with each reflection from any object it carry that amount of image of its size and carry until to the next reflection.

After every reflection photon changes its image which it carries on its surface.

But refraction of photon particle does not affect its image carried on its surface.

Since there are millions of photon in a single beam of light striking to a small area of object and carry its complete image continuously by their continuous sticking photon, until reflection from another rigid body.

This photon has specific image transmitting property to the particle of similar size, like electron. The quality of image form by this photon is proportional to the intensity of illumination of light.
Again let us consider two walls such as.
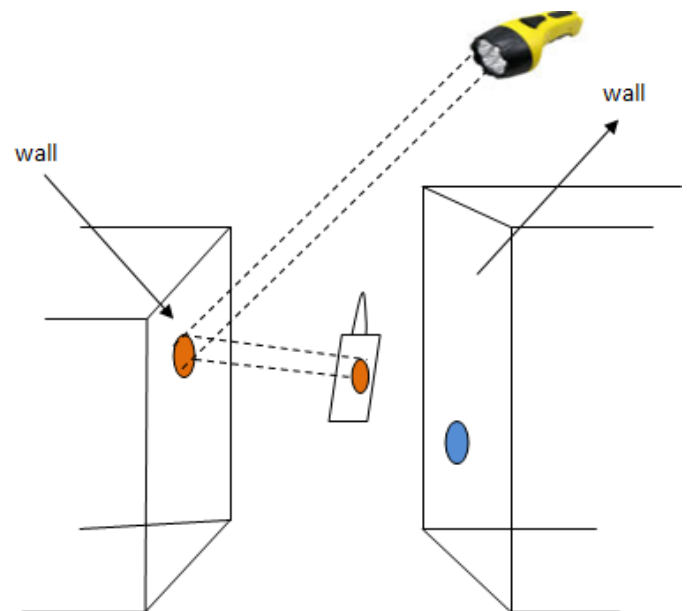


Figure:1
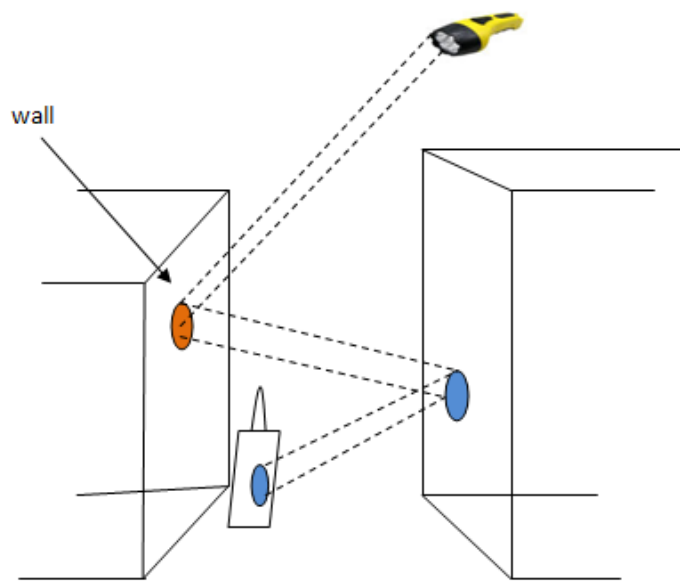
Figure: 2

When light beam from torch is incident on Red circle, we see the image of red circle on mirror from (figure 1).

In case II, when the same light beam reflected from blue colour circle, we see the image of blue circle in mirror and not the image of red circle.

This shows that by reflection of photon from blue circle it changes its image of red circle to blue circle and gives blue circle image on mirror.

Image carried by photon of having frequency of visible region is only detected by human eye, but the photon particle of lower or upper frequency range from visible light also carry image but not seen by any normal method.

## III.  CONCLUSION

Image carrying property of light is very important phenomenon to enable us to see object. Ray optics can only give correct position of image, but this explanation give correct evidence that how photon carry image on its surface.

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# An Effective E-Commerce Management using Mining Techniques

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*Abstract*— Web Mining is a technique to extract useful information through web, here we are using web usage mining approach, in this mining scheme some special features are there like analyse usage data, surfing information, and Marketing information. Here we are using web usage mining algorithms to find the useful information about the users, We are providing items to the users and as per the ratings we are collecting the ontology information about the users. Users can select and give the ratings for the items, suppose we are providing movie to the users so as per the users interest users can give the ratings, Organization can check the users information. Here we are using S-PLSA algorithms for the online reviews with the help of these algorithm we can get and analyse the user interest and user behaviour. Clustering is used for the same times of items and for the sentiments, we are preparing chart for the sales information where companies can check the sales information, and predict the sales information for future .We are gathering the overall ratings and we are using Collaborative filtering  for the result which is given by the user through web mining technology, users can select the items as per own choice and through the payment portal they can pay the amount also. Organizations can check the review details and they can prepare better strategy for the future.

*Index Terms*- Web Mining, Clustering, S-PLSA Techniques, CRM, Collaborative Filtering.

## I. INTRODUCTION

Now a day, posting reviews online has become an increasingly popular way for people to express opinions and sentiments toward the products bought or services received. Analysing the large volume of online reviews available would produce useful actionable results for the better service[5][7][16]. In this paper, we are presenting E-Commerce features and deal with the problem of mining reviews for predicting product sales performance. Our analysis shows that both the sentiments expressed in the reviews and the quality of the reviews have a significant impact on the future sales performance of products in question[1][10][15]. For the sentiments we are using Sentiment PLSA (S-PLSA) approach, in which a review is considered as a document generated by a number of hidden sentiment factors, in order to capture the complex nature of sentiments[8][13]. Organization can check the final ratings about the movies for which one option is available they the filter the database and they can get the final ratings about the items. Web content mining and web usage mining we are using for the review as per the figure1 given below with various categories of web mining techniques.



Fig.1. Categories of Web Mining (It shows the categories of the web mining and what are the uses of each web mining category)

## II. RELATED WORK

Since review mining is a part of text sentiment analysis, it is related with work of subjective classification and sentiment classification. Most existing work on sentiment mining focuses on determining the semantic orientations of documents[2][3][14]. Among them, some of the studies attempt to learn a better or bad results means like positive and negative class, In this paper we are using two types of web mining techniques first one is web content mining we can gather and mine the audio, video, text related things, then we are using web usage mining in which we can collect the information about the users[11][6], his session and his whole record, with this concept we can give the ratings and own choice regarding any product,through clustering we can easily predict the same types of result and items.Web mining usage for different purpose we can use this concept for many purpose as follows:A)Subjective Classification B)Sentiment Classification C) Review Mining D)Clustering E)Users behavior[18]

## III. IMPLEMENTATION

The users enters to website and then register for the use after registration users can get his login details then with this users can access the website after the login users can select multiples items and  as per the quality of the product he can give the ratings also, users can give the payments online[4][17].He can select as per the category he need like suppose he wants to see the movies then he can select own types of movies and gives the ratings for that, another side admin can put the items and delete the items, he can check the response also about the movies, and at the admin side with graph  representation admin can get the whole sell details profit loss, which is bad or good and the response of the customer and customers behaviour  also[10][12].At last if the admin filter the database which is stored in the weblog then he can get the final result like average, good or very good, bad like that.

### A. Existing System

Consider the past sale performance of the same product, in the movie domain, past box office performance of the same items. We capture this effect through the use of an Autoregressive (AR) model, which is used for series of analysis problems, especially in econometric contexts[4][10]. Accuracy and Efficiency will be less. We don't analyse the feeling of people about a items. We can't analyse the future of one product. Vendors are considering only the volume of items sales. Users' information details not easy to get everytime, sales information for future very hard to predict, Customer relationship management techniques is tough to apply. It is difficult to achieve better result.

### B. Proposed Model

We are proposing an approach which is called as a novel approach for sentiment mining based on Probabilistic Latent Semantic Analysis (PLSA), which we call Sentiment PLSA (S-PLSA).Different from the traditional PLSA, S-PLSA focuses on sentiments rather than topics [5]. Instead of considering all the words we focus primarily on the words that are sentiment related. We propose the S-PLSA model, which through the use of appraisal groups provides a probabilistic framework to analyse sentiments in reviews[7][13]. The sentiment-aware model is for predicting future product sales. We can get the users details, filtered results, ratings about the items[2].

### C. Review Mining

With the rapid growth of online reviews, review mining has attracted a great deal of  attention.Early work in this area was primarily focused on determining the semantic orientation of reviews.Among  them, some of the studies attempt to learn a positive/negative classifier at the document level[6][10]. There are also studies that work at a finer level and use words as the classification subject. They classify words into two groups "good" and "bad" and then use certain functions to estimate the overall "goodness" or "badness" score for the documents[7][11].

### D. Sentiment PLSA:

In this section ,we purpose a probabilistic approach to analyzing sentiments in reviews,which will serve as the basis for predicting sales information.we first consider the problem of feature selection,how to represent a given review as an input to the mining algorithms.we are using appraisal taxonomy[10][6].Sentimental Analyzer is used to analyze the sentiment terms of people about one product Based on Sentiments such as Type of Movie (Horror, Family Movie, Heart Touching) we are going to mine reviews of movie to improve sales performance[5][8]. In most of the studies cited above, the sentiments are captured by explicit rating indication such as the number of stars, few studies have attempted to exploit text mining strategies for sentiment classification. Our work is similar to in the sense that we also exploit the textual information to capture the underlying sentiments in the reviews. Compute the (relative)

frequencies of various words in a given blog, Use the resulting multidimensional feature vector as the representation of the blog, sentiments are often multifaceted, differ from one another in a variety of ways, just classify the sentiments expressed in a blog as either positive or negative, too simplistic, a blog can be considered as being generated under the influence of a number of hidden sentiment factors, each hidden factor focusing on one specific aspect of the sentiments, accommodate the intricate nature of sentiments model sentiments and opinions as a mixture of hidden factors and use PLSA for sentiment mining[7][9].with the sentiments we are applying clustering and we are also using appraisal words for the customers evaluation, We are using Probability Technique for the review mining and in which we are applying S-PLSA Algorithm.(Refer from http://www.patentgenius.com/patent/7844449.html) November,2010.

Now we are formally present S-PLSA notations,suppose we are given a set of review $\mathbf{F}=\{\mathbf{e_1,….e_n}\}$ and set of words(Appraisal words) from a vocabulary $\mathbf{R}=\{\mathbf{s_{1,……}s_n}\}$.The review data can be describes as a $\mathbf{NxM}$ matrix $\mathbf{H}=(\mathbf{c(e_i,s_j)})_{i,j}$,where $\mathbf{c(e_i,s_j)}$ is the number of times $\mathbf{w_j}$ appears in review $\mathbf{e_i}$.each row in $\mathbf{H}$ is then a frequency vector that corresponds to review[10].

**Algorithm:**

01.Pick a blog document b from B with probability P(e);

02.Choose a hidden sentiments factor z from Ƶ with probability P(z|e)

03.Choose a word from the set of appraisal words W with probability P(s|z)

04.Result-

$$\mathbf{P(e,s) = P(e) \ P(s|e)}$$

**Where,** $\quad \mathbf{P(s|e) = \sum_{z\in Ƶ} \quad P(z) \ P(e|z) \ P(s|z)}$

05.Estimate mode Parameters: P(z),P(e|z),P(s|z)

06.Maximize the following likelihood function:

$$\mathbf{L(F,R)= \sum_{e\in F} \quad \sum_{s\in R} \quad c(b,w) \ log \ P(b,w)}$$

**EM-Procedure:**

1. An Expectation step (E-step), where posterior probabilities for the latent variables (in our case, the variable z) are computed, based on the current estimates of the parameters.
2. A Maximization step (M-step), where estimates for the parameters are updated to maximize the complete data likelihood.

**In E-Step,we compute:**

$$\mathbf{Pr(z|e,s) = \frac{Pr(z)Pr(e|z)Pr(s|z)}{\sum_{z'\in Z} Pr(z')Pr(b|z')Pr(w|z')}}$$

**In M-Step we compute:**

$$\mathbf{Then, \ Pr(e|z) = \frac{\sum_{e\in F} c(e,s) \ Pr(z|e,s)}{\sum_{e\in F} \sum_{s'\in R} c(e,s') \ pr(z|e,s')}}$$

$$\mathbf{Pr(w|z) = \frac{\sum_{s\in S} c(e,s) \ Pr(z|e,s)}{\sum_{e'\in F} \sum_{r\in R} c(e',s) \ pr(z|e',s)}}$$

$$\mathbf{So, \ Pr(z) = \frac{\sum_{e\in F} \sum_{s\in R} c(e,s) \ Pr(z|e,s)}{\sum_{e\in F} \sum_{s\in R} c(e,s)}}$$

It can be shown that each iteration above monotonically increases the complete data likelihood, and the algorithm converges when a local optimal solution is achieved.

*E. System Structure:*

The system is depend upon the user side and admin side we can get the review result from the admin side and we can get the filtered result from the system after customers evaluation, the overall working is given below in the figure2.



Fig.2. Architectural Diagram of the System(It shows the overall system architecture how the application works what are the modules are available, features of the application)

## IV. RESULTS AND DISCUSSION

We are gathering the result of the current sale and future sale. users information we are fetching from the database with his session time payment details, ratings report and overall ratings for all the items means about the online marketing of an particular organization through customers with the help of this application. We are taking organization data means sales information regarding selling of items in months and year with the help of this we are preparing the review analysis with chart.(we are applying PLSA approach here) We are preferring PVR Cinema sales information for the year wise, monthly wise, week wise and day wise(Refer to http://money.rediff.com/companies/PVR-Ltd/17040122/bse/day) for that we are using the company dataset of the year 2012-2013 and we are comparing with the algorithm, how to achieve better revenue and how to create better relationship with the customers,so for the proposed algorithm we are analysing from the sales details of PVR Cinema and using own data sets with this we are preparing graph.We are predicting the future sales means it will be Bad or Good from the last sales. figure no.3 and Fig.6 shows the current details and future details about the sale and revenue of the organization.
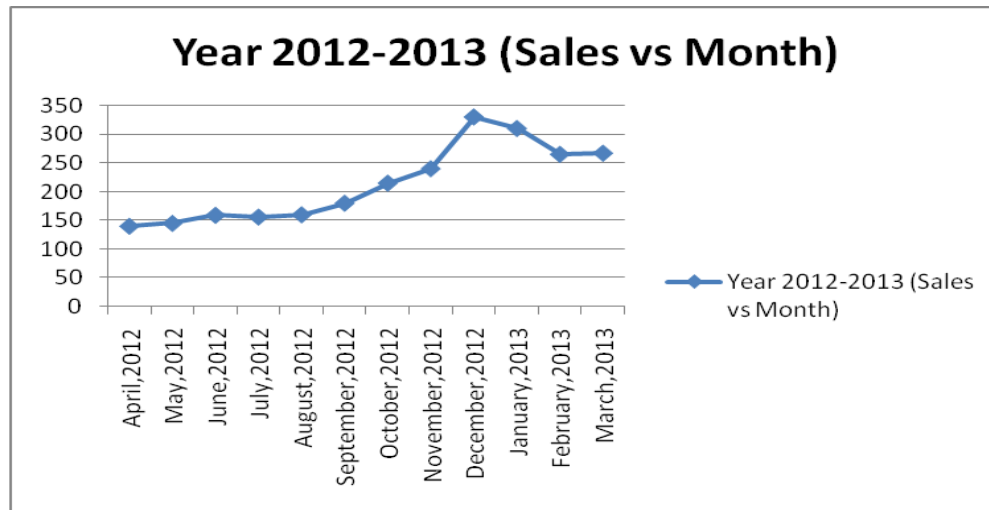
Fig.3. Refer to PVR sales Data (Year wise), It shows the year wise sales of the PVR Cinema, how it increase or decrease in each month.
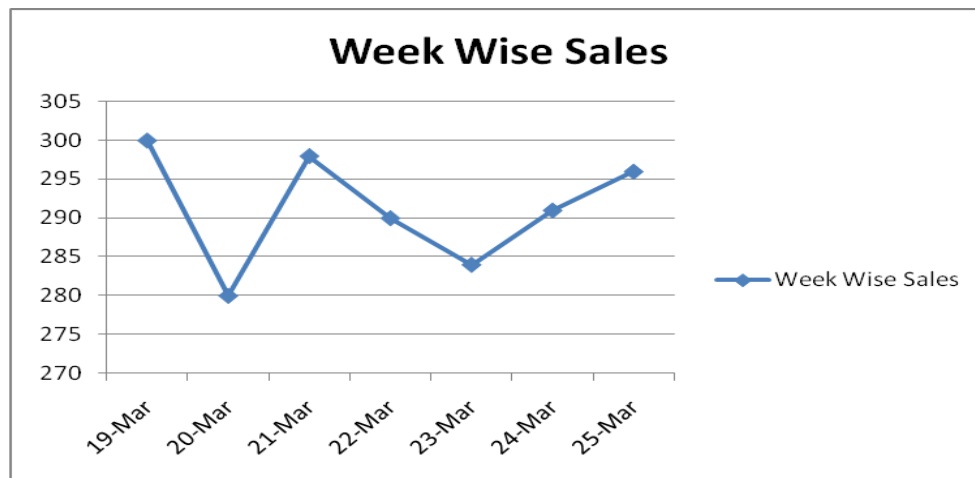


Fig.4. Refer to PVR Cinema Sales Data (Week Wise), It shows the Weekly Sales ,in each week how the sales performance are varying.
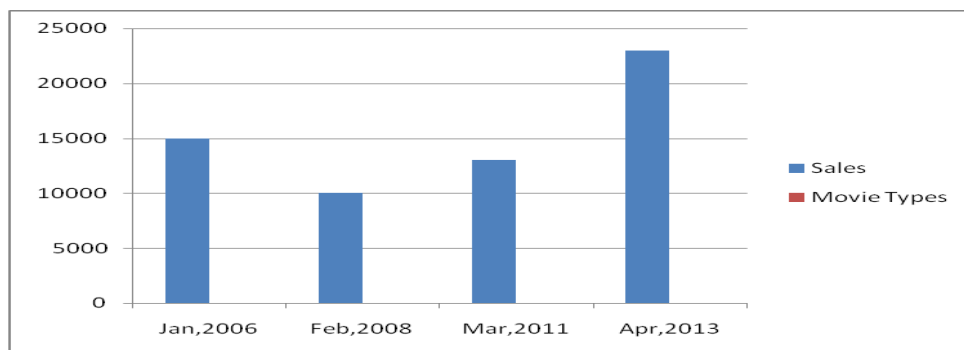


Fig.5. PLSA Result

Table.1.  PLSA Analysis

| Year/Month | Sales | Movie Type |
|---|---|---|
| Jan,2006 | 15,000 | Comedy |
| Feb,2008 | 10,000 | Romantic |
| Mar,2011 | 13,000 | Horror |
| April,2013 | 23,000 | Comedy |

For the future sales we are gathering the databases of the organization and with this we are applying S-PLSA approach so with this we are preparing the chart for the future increament or decreament of sales and finding the ratio of sales in terms of months and year.
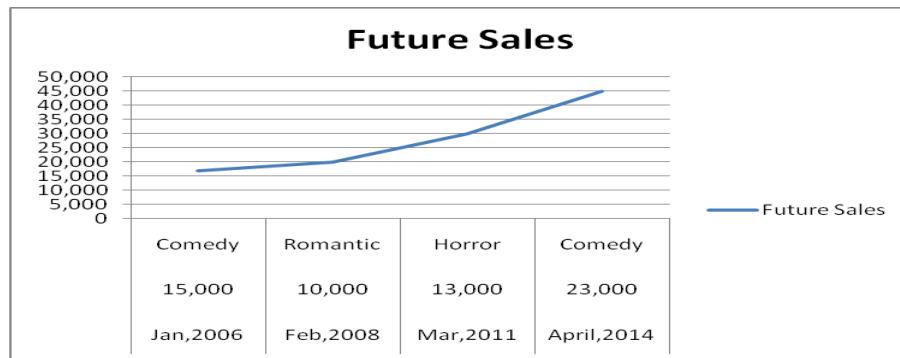


Fig.6. S-PLSA Result

Table.2. S-PLSA Analysis

| Year/Month | Current Sales | Movie Type | Future Sales |
|---|---|---|---|
| Jan,2006 | 15,000 | Comedy | 17,000 |
| Feb,2008 | 10,000 | Romantic | 20,000 |
| Mar,2011 | 13,000 | Horror | 30,000 |
| April,2014 | 23,000 | Comedy | 45,000 |

## V. CONCLUSION AND FUTURE WORK

The wide spread use of online reviews as a way of conveying views and comments has provided a unique opportunity to understand the general public's sentiments and derive business intelligence. In this paper, we have explored the predictive power of reviews using the movie domain as a case study, and studied the problem of predicting sales performance using sentiment information mined from reviews. We have approached this problem as a domain-driven task, and managed to synthesize human intelligence (e.g., identifying important characteristics of movie reviews), domain intelligence (e.g., the knowledge of the "seasonality" of box office revenues), and network intelligence (e.g., online reviews posted by moviegoers). The outcome of the proposed models leads to actionable knowledge that be can readily employed by decision makers. A center piece of our work is the proposal of S-PLSA,Using S-PLSA as a means of "summarizing" sentiment information from reviews, we have developed ARSA, a model for predicting sales performance based on the sentiment information and the product's past sales performance. We have further considered the role of review quality in sales performance prediction. with the analysis and from the dataset we are getting the sales performance and customers behavior with his full information, with company dataset we are getting his current sales details how it is varies from 247-300 units or 105-350 units with respect to year, week and as per the algorithm the sales details are varies with the movie type with respect to year and month. so as per the current sales of the company we are presenting a better procedure to increase the sales in future and how to establish a better relation with the customers with his full details, For future work, we would like to explore its role in clustering and classification of reviews based on their sentiments. It would also be interesting to explore the use of S-PLSA as a tool to help track and monitor the changes and trends in sentiments expressed online.

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# Determination of Self-Esteem from the Practice of an Intense Exercise and Rehearse With Post-Adolescent Athletes

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*Abstract-*This study aimed to investigate the relationship between self-esteem and the practice of repeated shuttle sprints ability (RSA) in young post-adolescent athletes. Twenty-one students aged between 16 and 18 affiliated to sporting clubs with different disciplines have participated to this study. All recognized subjects have presented in this study by responding to the Self Esteem Scale EES-10. The same subjects realized the evidence of RSA test intersected with a recovery time of 25 s ($6\times$ (20+20m)). This test allowed the measure of the Total Time ($RSA_{TT}$), the Maximum Time ($RSA_{max}$) and the Fatigue Index ($RSA_{IF}$). Statistical analysis has revealed a very significant correlation between $RSA_{TT}$ at the self-esteem ($r = 0.58$, $p < 0.001$). A considerable correlation ($p < 0, 05$) has been also observed between self-esteem and $RSA_{max}$ ($r = 0.50$, $p < 0,001$). This has leaded the study to conclude that getting a good performance in repeated sprints would increase significantly the level of self-esteem in adolescents and has played a vital role in the mental and physical health of these people.

*Index Terms:* RSA test, young athletes, self-esteem, motivation.

## I. INTRODUCTION:

The Work on self-esteem occupies a prominent place in the history of psychology as one of the most recent Sciences and Technology of Sport and Physical Activities (STAPS). The Self-esteem is defined as a conscious perception of its own qualities (Tesser and Campbell, 1983). The Recent literature made this concept determinate a variable level of commitment of a subject in a physical practice (Coleman and Iso-Ahola, 1993) or as an indicator of good mental health (Harter, Waters and Whitsell, 1998). Other authors have emphasized : the considerable part of the perception of the body in the construction and evolution of self-esteem (Bruchon-Schweitzer, 1990; Biddle and Goudas, 1994; Fox, 1997), the hierarchies models (Fox, 1997; Fox & Corbin, 1989) offers an absolute better understanding of the mutual links between physical practice and self-esteem & The determination of self-esteem from the practice of intense exercise and the repeated post-adolescent athletes  (Fox & Corbin, 1989; Marsh and Shavelson, 1985). This necessity has been followed by the request of the Physical Education Professionals or wanting the rehabilitation to assess the effects of their actions on self-esteem and sentimental populations in charge (Fox and Corbin, 1989; Sherrill, 1997). It was not until 1989 for the first work in English validation to shine an inventory of self-esteem to be centred on the body area and the Physical Self-Perception Profile (PSPP) of (Fox and Corbin, 1989).

The Research in physical education and sport psychology has confirmed the importance and the perception of the body in building self-esteem. This work has highlighted the development of the perceived physical value contributed to the enhancement of self-esteem (Biddle et Goudas, 1994) and a certain level of self-confidence was required to maintain the commitment of a subject in the physical practice (Roberts, Kleibert & Duda, 1981). For this reason the improvement of self-esteem has become a priority in some

PE programs. In the UK, for example, one of the eleven objectives of the EP program is to strengthen the self-esteem of pupils. The same way, one of the priorities of stakeholder's physical activity suits is to restore self-image issues either mental or physical disabilities (Sherrill, 1997).

Under the influence of some particular concept (Bandura, 1977), and the developing of feeling of competence (Harter, 1982). This concept designates the valuation that a subject does on its competencies on different domains (Harter, 1982). These areas are designed to a multidimensional manner where structure of self-concept, the value of self-worth or overall self-esteem (Harter, 1982) being the next level and covering all. The multidimensional approach Bond considers the esteem not as a self-global entity taking into account the context, but rather as a self-perception of several areas of competence such as work, social relations, sports, physical appearance and behaviour (Harter, 1988). The main advantage of this is that the modelling about self-value and the field of competence is comparing other according to a given context, (Harter 1988) and Laboret validun questionnaire (Self Perception Profile) for each major period of life (childhood, adolescence and adulthood).

The multidimensional approach allowed a better understanding of areas affecting the overall self-esteem without nevertheless being able to qualify this influence with precision (Harter, 1998). The hierarchical model obtained was able to realize the relationship between perceptions of a sub domain and global self-perceptions. This relationship has been working in an upward or downward in hierarchical structural way. For example, a high level of satisfaction in a task (juggling soccer) would reinforce the sub domain sports competence with high importance for the subject. This enhancement has improved the perceived field of the physical value, which has positively influenced the level of overall self-esteem. Conversely, a sudden global impairment of self-radiates in lower areas, for example in the physical realm would influence self-evaluation in a specific sub domain. The hypothesis of this model is that the concrete sub-domains (appearance, competencies sports, fitness, strength) are subject to variations due to valuation contexts while overall self-esteem is more stable and independent entrance of life events (Fox, 1997). As per this field study, its literature does not cover the verification of the existence of a relationship between self-esteem and physical exertion; however it aims to investigate the relationship between self-esteem and practices the repeated shuttle sprints in young post-adolescent pupils.

## II. METHODOLOGY

### 1. Subjects

The population study is composed of 21 pupils from a secondary school, aged between 16 and 18 years old & affiliated with different sports club disciplines. These are subjects being engaged in daily sports activities at the rate of 4 times per week with an average of 1.30 hours of practice.

### 2. The experimented Protocols:

*The repeated-sprint ability test* - Before the test, the subjects should have a ten minute warming exercise based on jogging followed by some acceleration over short distances. The repeated sprint test RSA intersects the period of recovery of 25s (6× (20+ 20 m)) (Impellizzeri, 2008). The first sprint has been done after a stopping departure on a standing position. There were no signs of departure the subject would decide his departure time with a maximum of speeding, however, the sprints signals were a sign of recovery. A demonstration has been done to understand this test. Well all Assessments were done on a broke ground of handball. The subjects were a continuous encouragement to run the maximum at every rehearsal. This time the rehearsal was different and recorded with electrics units' photo. At the end of this physical assessment, the same subjects were called one more time to fill the (EES-10).This assessment enabled to calculate and measure the total time ($RSA_{TT}$), The fatigue index ($RSA_{IF}$), the maximum time ($RSA_{Max}$) and possess a quantification of the self-esteem degree pre and post RSA.

### 3. The Psychological Protocol:

*The level of the self-esteem of Rosenberg-*

5 minutes of recovery after the RSA test, subjects would fulfil carefully the self-esteem (EES-10). The level of the self-esteem of Rosenberg, developed by Rosenberg (1965), remains the more used test in the research in psychology to measure the overall level of self-esteem, and virtually known for his work on the self-concept. He defined the self-esteem as a positive or negative orientation to himself, a global evaluation of his value. It is, according to his model, a component of self-concept that is all negative thoughts and negative feeling of the person toward himself. In addition to self-esteem, other components of self-concept are feeling self-efficiency, which is the belief about its capabilities to achieve goals, and self-identities.

*4. The statistics procedures*

To analyse the collected data given on the population study, we have chosen the statistical tools most frequently used in the field of sports and physical activities. The perusal statistics data on the population survey, has been used with the descriptive, the variance the analysis and the study of correlation. In the descriptive statistics, we have used the means & standard deviation. This was the correlation between the performance indices of the repeated performance and psychological parameters studied. The coefficient of simple correlation of Pearson has been used and 0.05 was the confidence level admitted for the significance of appearance.

### III. RESULTS

The data obtained for all performance parameters are presented in Table 1. The mean ($\pm$SD) for the values indices measured, $RSA_{TT}$, $RSA_{MAX}$, and $RSA_{IF}$ obtained scores were respectively: 48, 15$\pm$ 2,7 ; 8,52 $\pm$ 0,5 ; 3,09 $\pm$ 0,1. The statistics analysis revealed a very significant correlation between the $RSA_{TT}$ is and to the self-esteem ($r = 0.58$, $p < 0.001$). A significant correlation ($p< 0, 05$) was equally observed between the self-esteem (pre, post test) and $RSA_{Max}$ ($r = 0.50$, $p < 0, 01$). In contrast no correlation has been observed between the esteem of oneself and $RSA_{IF}$ (Table 2).

Table 1: The all measured performance parameters

|  | $RSA_{TT}$ (s) | $RSA_{Max}$ (s) | $RSA_{IF}$ (s) | The esteem of oneself (pre) | The esteem of oneself (post) |
|---|---|---|---|---|---|
| Mean | 48.15 | 8.52 | 3.90 | 31.19 | 32.95 |
| $\pm$ SD | 2.7 | 0.53 | 0.17 | 3.39 | 5.27 |

Table 2: Correlation between the performances of RSA test and the esteem of oneself

|  | $RSA_{TT}$ (s) | $RSA_{Max}$ (s) | $RSA_{IF}$ (s) |
|---|---|---|---|
| Score estimates of oneself Pre | 0.65** | 0.56** | 0.31 |
| Score estimates of oneself Post | 0.60** | 0.51* | 0.61** |

**p<0.01; *p<0.05

## IV. DISCUSSION

In adolescents, the physical activity is considered as a way to fight against the academic and social disinvestment. It would, moreover, channel aggression, master concentration, develop a cognitive and physical cleverness, adapt to new situations and gain self-esteem. This benefit exists regardless of practicing the discipline (Harter, 1998). In this case, the 21 subjects tested have seen their level of self-esteem raised significantly after the 6 repeated sprints of series have been done in one side ($r = 0.58$, p <0.001) very significant between the total time of the execution and rehearsal $RSA_{TT}$ and self-esteem, on the other side ($r = 0.50$, p < 0, 01) significant between the best rehearsal $RSA_{Max}$ and the self-esteem. As a conclusion achieving good performances in the repeated sprints will increase noticeably the degree of the self-esteem degree in the adolescent. In the same way Bandura and Harter have developed the concept of « feeling of competence », that is « the evaluation done by the subject and its competences in different domains ». If the person has the feeling of competent in the area that seems important to him, self-esteem will be all improved.

One Success could be also added to what he learned; in addition the adolescent would feel effective and proud of himself that we could meet with success any challenges if positive attitudes and good strategies have been adopted. This feeling gives the adolescent hope and gives access to multiple learning (Duclos, Laporte et Ross, 1995). By cons, and on a second component, the results between the fatigue indexes of the test  subjects while the repeated sprints and the degree of self-esteem noted and founded doesn't show a signification. This could be explained that the discontent of some of the subjects compared to the temporal cart performance between trials (1st to 6th), fatigue sets in a test and another performance has been declined increasingly. To explain this phenomenon, the idea of André and Lelord (2002) should be involved which posits that self-esteem are more regulators, and that are important success and low pretentions. Then this could raise the habit of the necessity of repetition to not provide the same pleasure of intensity the first time and boost more our self-esteem. The self-esteem not achieved one time; they need to be constantly including new success. After an initial success, our self-esteem increases significantly and we feel a great pleasure. Then we get used to the necessity of the repetition that we do not provide the same pleasure of intensity the first time and boost more our self-esteem. This will appear to us almost normal. To progress it again, then we need to raise our pretentions looking for sharper success in other areas (Duclos, Laporte et Ross, 1995).

From now on the research has successfully proved that the body area involved in the construction and structure of global self-esteem (Biddle & Goudas, 1994; Harter, 1988), and more precisely with the adolescents (Bruchon-Schweitzer, 1990; Harter, 1990). A satisfactory perception of the body promotes the well-being of adolescents (Bandura, 1982), as much as it facilitates relationships with others (Harter, 1990). According to Sonstroem (1984), involving a physical exercise helps improve the self-esteem but also the physical value perceived (Baumeister, 1993; McAuley, Mihalko & Bane, 1997). The physical value perceived plays the role of the mediator between the felt from the physical activity and the psychological dimensions while facilitating tolerance effort, maintaining the activity and maintain it in an activity where health body is accessible (Fox, 2000). The body has been apprehended like a central element of self-identity because it is the interface between the perceptions that the individual has of himself and the physical and social environment in which evolves (Fox, 2000; Messer & Harter, 1986). It requires a particular interest in the field of STAPS or predominate the bodies transformations as well as the self-esteem.

## V. CONCLUSION

All the pupils have seen their self-esteem degree increasing considerably after taking the RSA. This has been explained by the Success of the subjects who carried out the resistance test speed. In the context of defeat, the level of personal efficiency of an individual is to believe in his own capacities and produce or not the task requested, turns closely to influence their self-esteem and strategies planned for success.

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# A Study of Cytological Evaluation of Bronchial Washing and Brushing In Bronchogenic Carcinoma

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*Abstract-* Bronchogenic carcinoma is undoubtedly one of the major killer diseases worldwide. Pulmonary cytology is a simple and resourceful method of early diagnosis of bronchogenic carcinoma. The use of bronchoscope has increased the variety of diagnostic specimen obtainable and extended the scope of cyto-pathology. We carried out a study to demonstrate the value of cytological examination of bronchial brushing and washing in diagnosis of bronchogenic carcinoma in our settings. 69 patients of clinically and radiologically suspected brochogenic carcinoma attending the Dr. B. Borooah Cancer Institute (Guwahati) as well as in Dept. of Pathology, Gauhati Medical College and hospital were selected for one year. Out of total 69 cases bronchial brushing carried out in 42 cases and bronchial washing carried out in 27 cases. In bronchial brushing cytology a positive diagnosis of malignancy was established in 30 cases (71.43%) and in bronchial washing diagnosis of malignancy was found in 8 cases. Bronchoscopic biopsy was successfully done in 40 cases and histopathological diagnosis of malignancy was made in 29 cases. Out of 29 cases of carcinoma confirmed by histology, cytology was consistent in 26 cases. The bronchial cytology revealed sensitivity (89.96%), specificity (90.9%), positive predictive rate (96.3%), accuracy (90%), false negative rate (10.34%) and false positive rate (9.1%). During the bronchoscopic procedure there was no major complication or fatality. Thus bronchial brushing and washing has firmly established its role in the early diagnosis of brochogenic carcinoma because it is safe, rapid and cost –effective and importantly gives a higher rate of sensitivity and accuracy.

*Index Terms*- Bronchogenic carcinoma, bronchial brushing, bronchial washing, cytology, histopathology

## I. INTRODUCTION

The technique of diagnostic cytology has now been widely accepted as a reliable laboratory procedure. Bronchial cytology is a simple and resourceful method of early diagnosis of lung cancer and has evoked a lot of interest. The wide use of sophisticated interventional radiology and flexible fiber-optic bronchoscope, which allows examination of bronchial tree as far as pulmonary parenchyma, has increased the variety of diagnostic specimen obtainable and extended the scope of cyto-pathology. The diagnosis of bronchogenic carcinoma is often obvious from clinical features and radiological examinations. But the final diagnosis should be established by cyto-pathological or histopathological examination of the specimens.

Bronchogenic carcinoma is undoubtedly one of the major killer diseases worldwide. It is number one killer cancer in Industrialized Countries. By far the biggest causal factor in lung cancer is smoking. Links between disease and smoking have been recorded for hundreds of years and link with lung cancer has been reported since Franz Hermann Muller in 1939. A landmark study in U.K was carried by Doll and Hill, reported in the British Medical Journal. This study was repeated once again after 40 years in 1994, estimating the link was in fact even stronger than initially suggested. [1]

Bronchoscopy is the examination of airways under direct visualization. It is used primarily as a valuable tool in the diagnosis of lung diseases.The value of bronchial washings and brushings under bronchscopic control for the cytological diagnosis of lung cancer has been demonstrated by various studies. Cytologic diagnosis is possible in the majority of the patients. At present bronchial washing and brushing are routinely employed to detect pulmonary neoplasm in different parts of the globe as well as in India.

## II. RESEARCH CONCERN

Despite the universal recognition of the relationship of cigarette smoking with lung cancer and attempts to limit tobacco use the incidence of this malignancy continues to rise particularly in the third world countries. Thus with failure of general population to take advantage of preventive measures, methods of early detection and treatment of bronchogenic carcinoma continue to be the major consideration.

The value of bronchial washings and brushings under bronchscopic control for the cytological diagnosis of lung cancer has been demonstrated by various studies. Bedrossion and Rybka compared the different bronchoscopic techniques and found bronchial brushing and washing cytology to be equally rewarding as diagnostic modalities in the case of bronchogenic carcinoma.[2] Conducting retrospective study of bronchogenic carcinoma Mak et al (1990) concluded that for the maximum diagnostic yield of bronchial biopsy should be combining with cytology using both washings and brushings. [3] Subsequently Flint (1992) reinforced the conclusion of Clerf & Herbut and refined the techniques of the cell collection by the use of fibre-optic bronchoscopes. [4]

This study has therefore been under taken with the following aims and objectives in mind.
1. To ascertain the overall diagnostic yield of bronchial washing and brushing cytology in bronchogenic carcinoma in our setting.
2. To determine the relative incidence of various cytological types of brochogenic carcinoma diagnosed by these procedures in our populations.
3. To establish the co-relationship among cytological, hstopathological and clinical findings.
4. To ascertain the complications associated with the procedure.

### III. METHODOLOGY

This study carried out on 69 patients of clinically and radiologically suspected Brochogenic Carcinoma attending the Dr. B. Borooah Cancer Institute (Guwahati), a regional institute for treatment and research as well as in Dept. of Pathology, Gauhati Medical College and hospital for one year. All the patients included in this study were subjected to thorough interrogation, clinical examination and investigations. Investigations comprised of routine examination of blood, blood Biochemistry, Chest X-ray & Bronchoscopy. Bronchoscopic procedures included bronchial washing/ brushing & Biopsies.

The skill and experience of the bronchoscopist the material and proper handling of the specimen are the keys to the success of the cytological techniques. Similar to the other forms of cytology, the entire procedure of cytological study of bronchial washings and bronchial brushings consisted of following steps:

1. Collection of materials.
2. Preparation of smears.
3. Fixatives and fixation.
4. Staining.
5. Mounting.
6. Examination of smears.
7. Interpretation and diagnosis.

Bronchial washing was collected at bronchoscopy under general or local anesthesia in the operation theatre with skillful hand under strict aseptic and antiseptic measures. In bronchial washing sterile isotonic saline introduced into the bronchi bronchoscopically and washings from different broncho-pulmonary segments are reaspirated than smears are made from centrifuged deposits. Bronchial brushings can be done following washings. The flexible fiber optic bronchoscope (FFB) is inserted through the mouth or nostril and slowly passed down into the trachea and bronchi. The nylon brushes extended beyond the tip of the bronchoscope and material obtained from lesion not easily visualized or biopsied. Most studies concerning the brush procedure for cyto-diagnosis of bronchogenic carcinoma have emphasized its high accuracy rates and its value in the evaluation of peripheral lung lesions.


Figure 1: Flexible fibre-optic bronchoscope.

Few slides were air dried and fixed in 100% methanol for May-Grunwald Giemsa (MGG) staining. Few slides were immediately fixed in a mixture of equal parts of 95% ethyl alcohol and anesthetics ether for at least 30 min. for Papanicolaou's method of staining (PAP staining) as described by George N. Papanicolaou in 1942. In all ulcerative and necrotic lesions, which are suspected to be inflammatory origin, smears were kept air dried for further Ziehl Neelson staining for AFB. The slides were examined under the microscope first with low power objectives (10X) and then the areas in the slides having cells were focused under the high power objectives (40X) to confirm the cytological features. Interpretation and diagnosis is done according to the new WHO/IASLC, classification of epithelial tumors of the lung, published in 1999 (Travis et al, 1999). [5]

## IV.   RESULTS

Samples from 69 patients were evaluated. The age of the cases ranged from 36 years to 78 years. The average age being 58.72 yrs and majority of cases belonged to 60-69 yrs age group. 57 (82.61%) were males and 12 (17.39%) were females, the M: F ratio being 4.75:1. In this study, 48 cases of the patients were smokers and 21 cases were non-smokers. The highest incidence was found among the cultivators and most of them were smokers. Cough and expectoration were the most common presenting symptoms of the patients. The most prominent physical finding on general examination was pallor (69.57%). All the patients in the study had definite localized radio opacities (Figure 1). Most prominent findings of bronchoscopic examination were endobronchial growth and narrowing of bronchial lumen.
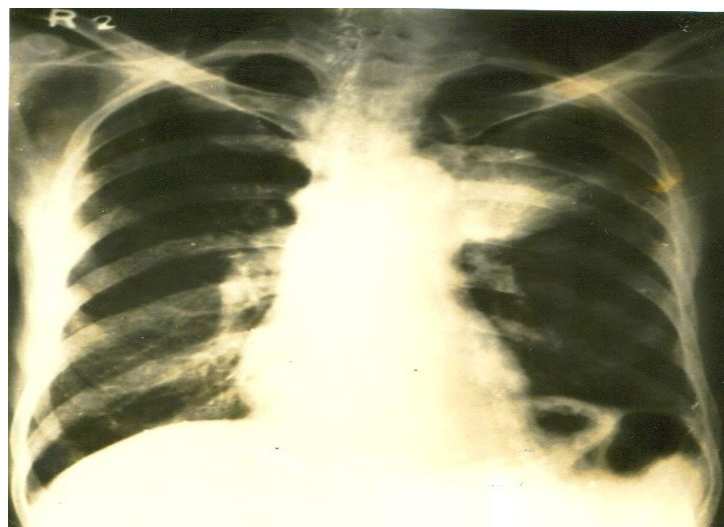


Figure 1: P/A view Chest X-Ray showing left sided radio opacities of bronchogenic carcinoma.

Out of total 69 cases bronchial brushing carried out in 42 cases and bronchial washing carried out in 27 cases. In bronchial brushing cytology a positive diagnosis of malignancy was established in 30 cases (71.43%), out of 42 cases. Out of 30 positive cases of malignancy 11 cases were Squamous cell carcinoma, 12 cases were Adeno carcinoma, 4 cases were small cell carcinoma and 3 cases were large cell undifferentiated carcinoma. Bronchial washing was carried out in 27 cases and diagnosis of malignancy was found in 8 cases. Out of 8 positive cases of malignancy 5 cases were Squamous cell carcinoma, 2 cases were Adeno carcinoma and 1 case was small cell carcinoma. Bronchoscopic biopsy was successfully done in 40 cases and histopathological diagnosis of malignancy was made in 29 cases. Out of 29 cases of carcinoma confirmed by histology, cytology was consistent in 26 cases. The results of cytological examination of total bronchial cytology material shown that out of total 69 cases a diagnosis of malignancy was possible in 38 cases (55.07%), which were all bronchogenic carcinoma(**Table1**). 19 cases (27.54%), were diagnosed as inflammatory origin which include tuberculosis 12 cases (14.49%) and non specific inflammatory 7 cases (10.15%). In remaining 12 cases (17.39%) diagnosis was inconclusive.

**Table I**: Cytological diagnosis of all 38 cases of bronchogenic carcinoma

| Cytological diagnosis | No. of cases | Percentage (%) |
|---|---|---|
| Squamous cell carcinoma | 16 | 42.11 |
| Adeno- carcinoma | 14 | 36.84 |
| Small cell carcinoma | 05 | 13.16 |
| Large cell carcinoma | 03 | 07.89 |
| Total | 38 | 100.00 |
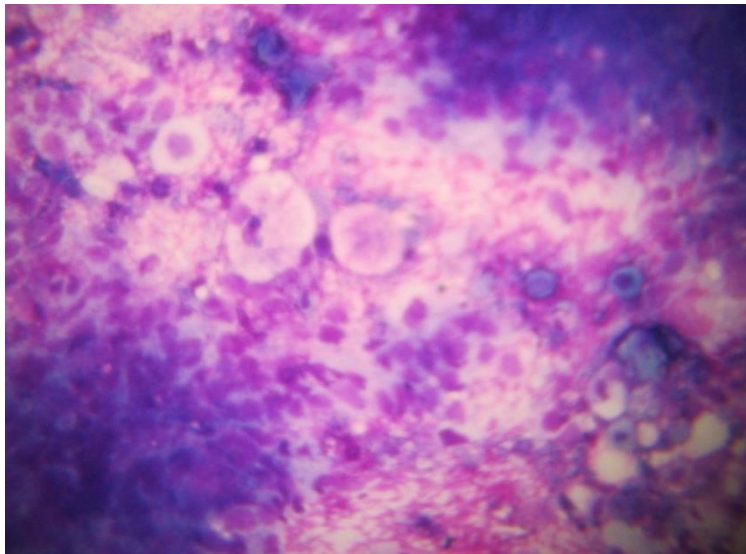
Figure 1: Photomicrograph of bronchial washing showing squamous cell carcinoma (400X)
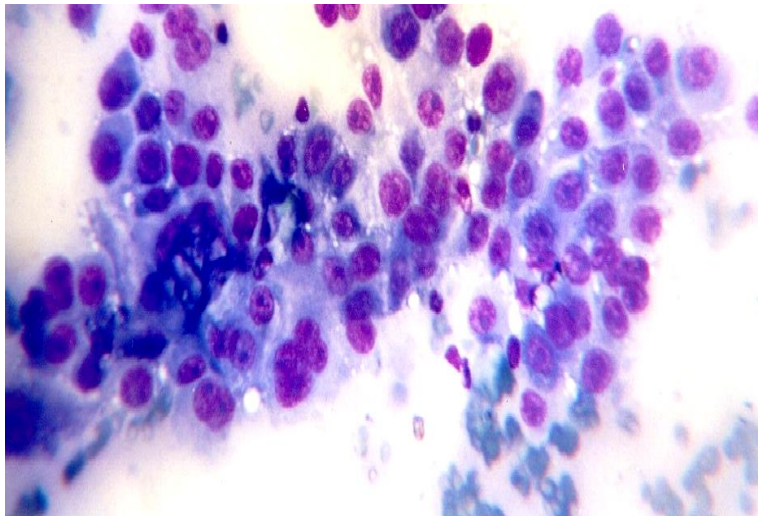


Figure 2: Photomicrograph of bronchial brushing showing adeno-carcinoma. (400X)
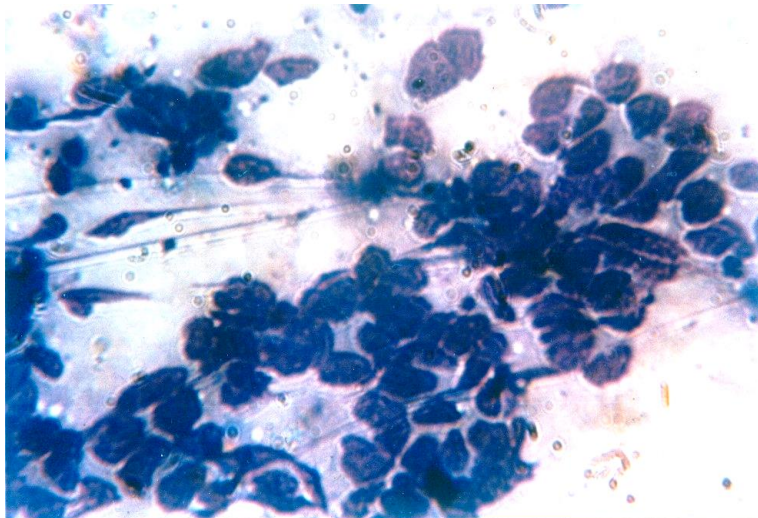


Figure 3: Photomicrograph of bronchial brushing showing small cell carcinoma. (400X)
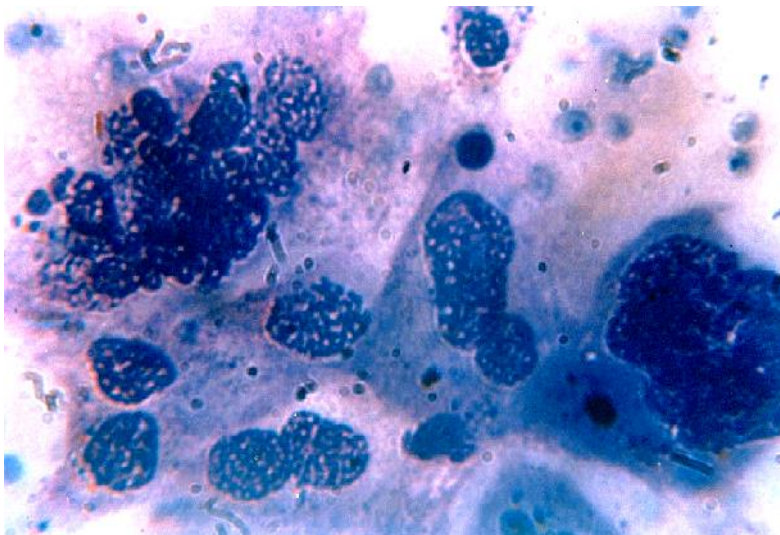
Figure 4: Photomicrograph of bronchial brushing showing Large cell undifferentiated carcinoma. (400X)

Correlation with sex has shown that out of 38 cases of bronchogenic carcinoma diagnosed in bronchial cytology 31 cases were male and 7 cases were female.(**Fig.5**) Out of 31 cases of male patients majority had Squamous cell carcinoma (13) and out of 7 cases of female patients majority had Adeno carcinoma (4).
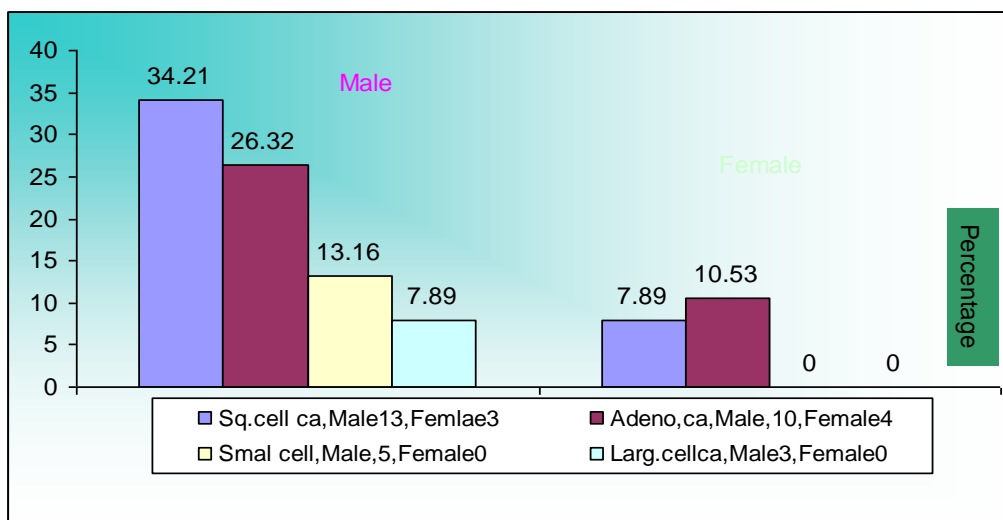


Figure 5: Sex incidence of various cytological types of bronchogenic carcinoma.

Age distribution of 38 cases of bronchogenic carcinoma diagnosed by bronchial cytology has shown the maximum numbers of patients belong to the 6th followed by 5th decades of life.In the study among the smokers, squamous cell carcinoma was found in majority (55.56 %) and adeno carcinoma was the highest (90.91 %) in non-smokers.
The bronchial cytology revealed sensitivity (89.96%), specificity (90.9%), positive predictive rate (96.3%), accuracy (90%), false negative rate (10.34%) and false positive rate (9.1%). During the bronchoscopic procedure patients were closely observed for any complications. Out of total 69 cases minor complications occurred in 5 cases (7.25%) which include 3 cases of broncho spasm with respiratory distress and 2 cases of respiratory tract infection. There was no major complication or fatality.

## V.    DISCUSSION

In the present study the average age being 58.72 yrs and majority of cases belonged to 60-69 yrs age group. Vital statistics of the United States (1997) reported that majority of bronchogenic carcinoma from the age group of 55-74 years of age. Kakha Vacharadze and associates (1999-2003) in a study recorded the average age being 65.3 years. [6]

In this study 57 (82.61%) were males and 12 (17.39%) were females, the M: F ratio being 4.75:1 and majority of the patients 48 (69.57%) was smokers. A. Vigg and associates of Apollo Hospital Hyderabad during the period 1989-2000, reported out of confirmed

cases of lung cancer 439 were males and 73 females with male to female ratio of about 6:1 and 62% ex-smokers, 10% current smokers and 28% non-smokers amongst males. [7]

In our study the most common symptoms were cough (95.65%), expectoration (91.3%), chest pain (56.52%), hemoptysis (52.17%) and most common physical findings were pallor (69.57%), clubbing (52.17%), lymphadenopathy (26.09%). Arora et al (1990) reported the common symptoms cough (92%), hemoptysis (29%), chest pain (52%), breathlessness (40%) and common physical findings were clubbing (35%), lymphadenopathy (26%). [8]

In general, epidermoid carcinomas have a central location and are characterized by atelectasis, pnemonitis, hilar adenopathy and a tendency to cavitate. Adenocarcinoma gives rise to a well-defined nodule in a peripheral location with pleural and chest involvement. Large cell carcinomas have a large mass in a peripheral location with hilar adenopathy and small cell carcinoma present as a central lesion with atelectatis, pneumonitis and medistinal adenopathy (Minna et al, 1985). [9]

A study evaluated the diagnostic yield of cytologic analysis of bronchial washing in addition to forceps biopsy on the basis of bronchoscopic appearance and histologic type in lung cancer. The forceps biopsy were positive in 492 cases (80.5%), and the diagnostic yield of the combination of forceps biopsy with cytological analysis of bronchial washing was 84.1% (514/611 cases), that is, a statistically significant increase of 3.6% (P<0.001).It was concluded that the combination of forceps biopsy and washing cytologic analysis offers a better diagnostic yield than biopsy alone in diagnosing lung cancer. Both procedures should be performed during bronchoscopy even if no endobronchial lesion is present. [10]

Karahali et al (2001), in a study evaluated the value of various diagnostic techniques following fibre-optic bronchoscopy in the diagnosis of in the diagnosis of endoscopically visible lung cancer. They found the addition of brushing increased the diagnostic yield of bronchoscopy from 80.8% to 85.3% and concluded that combination of forceps biopsy and brushing is the best strategy. [11]

In a study to evaluate bronchial wash cytology with histology, 73 specimens were obtained by flexible fiberoptic bronchoscope at pulmonology department of Military Hospital Rawalpindi. The bronchial wash cytology revealed sensitivity (80.5%), specificity (96.6%) and accuracy (87.3%). As far as malignant and benign lesions are concerned, complete cytological and histological concordance was observed in 55 cases (77.4%). True positive along with suspicious/atypical were 33 and true negative cases were 29. False positive was one case only whereas false negative cases were eight. The bronchial wash cytology showed sensitivity (80.5%), specificity (96.6%) and accuracy (87.3%). Positive predictive value and negative predictive value were 97% and 78.4% respectively. It was concluded that bronchial wash cytology is a valuable tool and yields almost same information as biopsy. [12]

Tamboli P and Ro. J.Y (Lung cancers, M.D. Anderson Cancer care series, 2003) stated squamous cell carcinoma used to be the most common type of lung cancer accounting for 25-45% of all lung tumors but the incidence of adeno-carcinoma has significantly has increased in the last two decades; 25-40% of lung carcinoma are now classified as adeno-carcinoma and this tumor is now the most common form of lung cancer in women and in many studies, in men as well. [13]

From management point of view, lung tumours are generally separated into small cell carcinomas and non small cell carcinomas. For small cell carcinomas intensive chemotherapy is advised whereas the non-small cell carcinomas are better treated surgically. More than 80% cases have been correctly typed by Truong and co-workers with sputum, washing or brushing cytology. [14]

## VI.   CONCLUSION

From the present study it can be inferred that bronchoscopy is an important diagnostic modality in the early diagnosis of bronchogenic carcinoma. In addition to direct visualization of the lesion, brushing and washing of the bronchial secretion for cytological examination and tissue for histopathological examination can be obtained. Thus bronchial brushing and washing has firmly established its role in the early diagnosis of brochogenic carcinoma because it is safe, rapid and cost –effective and importantly gives a higher rate of sensitivity and accuracy.

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# Single Unreliable Server Interdependent Loss and Delay Queueing Model with Controllable Arrival Rate under N-Policy

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*Abstract-* This paper studies a loss and delay queueing model under the restriction of N-policy for the situations where arrival and service of customers are correlated and follows a bivariate Poisson process. When there is no customer present in the system then the server goes on vacation and returns back in the system whenever the specified N (>1) or more customers are accumulated. The server may breakdown only if it is working and is immediately sent to a repair facility to restore its capability as before failure. For steady state various operational characteristics have been derived. Sensitivity analysis has also been made to examine the effect of different parameters so as to facilitate optimal control policy.

*Index Terms-* N-Policy, Interdependent, Unreliable server, Loss and delay, Controllable, Bivariate Poisson process.

## I. INTRODUCTION

Present investigation deals with a single unreliable server queue having interdependent and controllable rates. Such congestion situations arise in production and manufacturing processes, computer communication system, distribution and service sectors, etc. A queueing model in which arrivals and services are correlated is known as interdependent queueing model. A few works have been reported in literature regarding interdependent queueing models. Borst and Combe (1992) analysed the busy period of a correlated queue with exponential demand and service. Gray et al. have studied an M/G/1 type queueing model with service times depending on queue length. The M/M/1 interdependent queueing model with controllable arrival rates was studied by Rao et al. (2000). They observed that the mean dependence rate between the arrival and service processes can reduce the congestion in queues and delays in transmission. Begum and Maheswari (2002) developed the M/M/c interdependent queueing model with controllable arrival rates, which was the extended work of Rao et al. (2000). Jain and Sharma (2004 a) considered the controllable queue with balking and reneging. To reduce the balking behavior of the customers, the provision of additional removable servers was made by Jain and Sharma (2004 b) while studying controllable queue. The M/M$^{a,b}$/C interdependent queueing model with controllable arrival rates was discussed by Sitrarasu et al. (2007). Estimation comparison on busy period for a controllable M/G/1 system with bicriterion policy was analysed by Ke et al. (2008). Yang et al. (2010) developed optimization and sensitivity analysis of

controlling arrivals in the queueing system with single working vacation.

The loss and delay phenomena of the customers in the system is likely to bring about the understanding, that either the customers may like to wait in the queue to get service or may be lost when all the servers are busy. Jain et al. (2002) developed loss and delay queueing model for time-shared system with additional service positions and no passing. Performance indices of Markovian loss and delay queueing model with no passing and removable additional servers was studied by Jain and Singh (2003). User optimal state dependent routing in parallel tandom queues with loss was made by Spicer and Ziedins (2006). Fan (2007) developed a queueing model for mixed loss-delay systems with general inter arrival processes for wide-band calls. Kim et al. (2009) considered erlang loss queueing system with batch arrivals operating in a random environment. Network queue and loss analysis using histogram-based traffic models was analysed by Orallo and Carbo (2010).

In real time system, the server is unreliable and may breakdown when it is working; and is sent to be repaired at a repair facility of the system. It is therefore desirable to have information about the fact that in which manner server breakdown affects the performance of the system. A single server queue with arrival rate dependent on server breakdown was studied by Shogan (1979). Grey et al. (2000) considered a multiple vacation queueing model with breakdown. In his investigation, queue length distribution was obtained by using probability generating function method. Ke (2003) and Wang et al. (2005) have developed the models in different framework in this regards. An M/M/1 retrial queue with unreliable server was investigated by Serman and Kharoufeh (2006). A discrete-time retrial queue with negative customers and unreliable server was obtained by Wang and Zhang (2009). Wu and Ke (2010) developed computational algorithm and parameter optimization for a multi-server system with unreliable servers and impatient customers.

In N-policy system, the server turns on only when there are N (>1) or more customers present in the system, otherwise the server goes on vacation. Modified N-policy for M/G/1 queue was studied by Krishnamorthy and Deepak (2002). Jau (2003) considered the operating characteristic analysis on a general input queue with N-policy and a start up time. Optimal management of the N-policy M/ $E_k$/1 queueing system with a removable service station was investigated by Pearn and Chang (2004). Chaudhary and Paul (2004) analysed a batch arrival queue with additional service channel under N-policy. The

balking behavior of the customers has also been considered in this investigation according to which the customers may not like to join the system due to impatience. Optimal NT policies for M/G/1 system with a startup and unreliable server was analysed by Ke (2006). The N-policy for an unreliable server with delaying repair and two phases of service was obtaine by Choudhury et al. (2009). Comparison of two randomized policy M/G/1 queues with second optional service, server breakdown and startup was studied by Wang et al. (2010).

This paper studies optimal N-policy for a single server interdependent loss and delay queueing model with breakdowns, repairs and controllable arrival rate. The remaining part of the paper is organized as follows. Section 2 is devoted for the model description. Queue size distribution for different states has been obtained by using generating function method in section 3. Performance measures and optimal N-policy are given in sections 4 and 5, respectively. Special cases are deduced in section 6. Sensitivity analysis is carried out to explore the effect of different parameters on performance indices in section 7. The conclusion is drawn in section 8.

## II. MODEL DESCRIPTIONS

Consider a single unreliable server model wherein service time of customers, and life time and repair time of the server are assumed to be exponentially distributed with parameter $\mu$, $\alpha$ and $\beta$ respectively. There are two types of the customers in the system (i) loss customers (ii) delay customers. The customers who depart from the system, on finding the server busy on their arrival, are called the loss customers. On the other hand the customers who have patience to wait for their service if the server is busy with other customers are called the delay customers. Balking behavior of the customers is also considered due to which the customers may not like to join the queue on seeing it very long. The server starts service, whenever the specified N ($>1$) or more customers are accumulated in the system. Once the server is busy, he renders service till system becomes empty and after that he goes on vacation. The server may breakdown only when it is in working state. Let "i" denotes the status of server defined as follows:

$$i = \begin{cases} 0, & \text{server is idle.} \\ 1, & \text{server is turned on and in operation.} \\ 2, & \text{server is turned on and under repair.} \end{cases}$$

We also assume that the arrival and the service processes of system are correlated and follow a bivariate Poisson process having the joint probability mass function of the form:

$$P(X_1 = x_1, X_2 = x_2; t) = e^{-(\lambda + \mu - e)t} \sum_{j=0}^{\min(x_1, x_2)} \frac{(et)^j [(\lambda_i - e)t]^{(x_1 - j)} [(\mu - e)t]^{(x_2 - j)}}{j!(x_1 - j)!(x_2 - j)!}; \quad \lambda > 0, \mu > 0.$$

where $x_1, x_2 = 0, 1, 2, \dots$ and $0 < e < \min(\lambda, \mu)$

The service is given to the customers in FIFO order with the same efficiency as before breakdown. The mean arrival rate of the customers depends upon the server's status and are given as follows:

$$\lambda = \begin{cases} \lambda_1 + \lambda_2, & i = 0 \\ \lambda_1 b_1 + \lambda_2 b_2, & i = 1 \\ \lambda_1 b_1, & i = 2 \end{cases}$$

where $\lambda_1$ and $\lambda_2$ are the arrival rates of the delay and loss customers, respectively. Here $b_1$ and $b_2$ are the joining probabilities of the delay (i.e type-1) and loss (i.e type-2) customers in the system when server is busy. Thus the balking probabilities of type 1 and 2 customers are $\bar{b}_1 = 1 - b_1$ and $\bar{b}_2 = 1 - b_2$, respectively.

Let $P_i(n)$ denote the probability that there are n customers present in the system when server is in state 'i', and let

E (I)    the expected length of idle period.
E (B)    the expected length of busy period.
E (D)    the expected length of breakdown (i.e. under repair) period.
E (C)    the expected cycle period.
$P_I$    the long run fraction of time for which server is idle.
$P_B$    the long run fraction of time for which server is busy.
$P_D$    the long run fraction of time for which server is broken down and under repair.

The steady state equations governing the model are given as follows:

$$(\lambda_1 + \lambda_2 - e)P_0(0) = (\mu - e)P_1(1) \qquad \dots (1)$$

$$(\lambda_1 + \lambda_2 - e)P_0(n) = (\lambda_1 + \lambda_2 - e)P_0(n-1), \qquad 1 \le n \le N-1 \qquad \dots (2)$$

$$\{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\}P_1(1) = (\mu - e)P_1(2) + \beta P_2(1) \qquad \dots (3)$$

$$\{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\}P_1(n) = (\lambda_1 b_1 + \lambda_2 b_2 - e)P_1(n-1)$$
$$+ (\mu - e)P_1(n+1) + \beta P_2(n), \quad 2 \leq n \leq N-1$$

.... (4)

$$\{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\}P_1(N) = (\lambda_1 b_1 + \lambda_2 b_2 - e)P_0(N-1) + (\lambda_1 b_1 + \lambda_2 b_2 - e)P_1(N-1)$$
$$+ (\mu - e)P_1(N+1) + \beta P_2(N)$$

.... (5)

$$\{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\}P_1(n) = (\lambda_1 b_1 + \lambda_2 b_2 - e)P_1(n-1) + (\mu - e)P_1(n+1)$$
$$+ \beta P_2(n), \quad n \geq N+1$$

.... (6)

$$\{(\lambda_1 b_1 - e) + \beta\}P_2(1) = \alpha P_1(1)$$

.... (7)

$$\{(\lambda_1 b_1 - e) + \beta\}P_2(n) = (\lambda_1 b_1 - e)P_2(n-1) + \alpha P_1(n), \quad n \geq 2$$

.... (8)

From eqs. (1) and (2), we get

$$P_1(1) = \left(\frac{\lambda_1 + \lambda_2 - e}{\mu - e}\right)P_0(0)$$

.... (9)

$$P_0(n) = P_0(0), \quad 1 \leq n \leq N-1$$

.... (10)

Using eqs. (7) and (8), we obtain $P_2(n)$ as

$$P_2(n) = \frac{\alpha}{\{(\lambda_1 b_1 - e) + \beta\}}\left[\sum_{k=1}^{n-1} B^{n-k} P_1(k) + P_1(n)\right], \quad n \geq 2$$

.... (11)

where

$$B = \frac{(\lambda_1 b_1 - e)}{(\lambda_1 b_1 - e) + \beta}$$

Eqs. (3) and (4) are used to get the value of $P_1(n)$, $(2 \leq n \leq N)$ as follows:

$$P_1(n) = P_1(1) + AP_1(n-1) + \frac{\alpha}{(\mu - e)}\sum_{k=1}^{n-2} B^{n-k} P_1(k), \quad 2 \leq n \leq N$$

.... (12)

where

$$A = \frac{(\lambda_1 b_1 + \lambda_2 b_2 - e)(\lambda_1 b_1 - e) + \alpha(\lambda_1 b_1 - e) + \beta(\lambda_1 b_1 + \lambda_2 b_2 - e)}{(\mu - e)\{(\lambda_1 b_1 - e) + \beta\}}$$

Using eqs. (5) and (6), we get the value of $P_1(n)$, for $n \geq N+1$ as

$$P_1(n) = AP_1(n-1) + \frac{\alpha}{(\mu - e)}\sum_{k=1}^{n-2} B^{n-k} P_1(k)$$

.... (13)

It is not easy to use the recursive technique to obtain the expression for $P_0(0)$. We obtain the value of $P_0(0)$ by using the generating function approach in the next section.

<div align="center">III.    THE GENERATING FUNCTION</div>

Define the following generating functions:

$$G_0(z) = \sum_{n=0}^{N-1} P_0(n)z^n \qquad \qquad \dots (14)$$

$$G_1(z) = \sum_{n=1}^{\infty} P_1(n)z^n \qquad \qquad \dots (15)$$

$$G_2(z) = \sum_{n=1}^{\infty} P_2(n)z^n \qquad \qquad \dots (16)$$

Using eq. (10) in eq. (14), we get

$$G_0(z) = \frac{1-z^N}{1-z} P_0(0) \qquad \qquad \dots (17)$$

On multiplying (1) and (3)-(6) with appropriate powers of z and summing over n, we find

$$\begin{aligned}
&\left[(\lambda_1 b_1 + \lambda_2 b_2 - e)z^2 - \{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\}z + (\mu - e)\right]G_1(z) \\
&\qquad + \beta z\, G_2(z) = (\lambda_1 + \lambda_2 - e)z(1 - z^N)P_0(0)
\end{aligned} \qquad \dots (18)$$

Similarly multiplying eqs. (7) and (8) by appropriate powers of z and summing, we have

$$\alpha G_1(z) + \left[(\lambda_1 b_1 - e)z - \{(\lambda_1 b_1 - e) + \beta\}\right]G_2(z) = 0 \qquad \dots (19)$$

From eqs. (18) and (19), we get

$$G_2(z) = \frac{\alpha\,(\lambda_1 + \lambda_2 - e)z(z^n - 1)P_0(0)}{\left[(\lambda_1 b_1 + \lambda_2 b_2 - e)z^2 - \{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\} + (\mu - e)\right]\left[(\lambda_1 b_1 - e)z - (\lambda_1 b_1 - e) - \beta\right] - \alpha\beta\ z} \qquad \dots (20)$$

$$G_1(z) = \frac{(\lambda_1 + \lambda_2 - e)z(1 - z^n)\left[(\lambda_1 b_1 - e)z - (\lambda_1 b_1 - e) - \beta\right]P_0(0)}{\left[(\lambda_1 b_1 + \lambda_2 b_2 - e)z^2 - \{(\lambda_1 b_1 + \lambda_2 b_2 - e) + \alpha + (\mu - e)\}z + (\mu - e)\right]\left[(\lambda_1 b_1 - e)z - (\lambda_1 b_1 - e) - \beta\right] - \alpha\beta\ z} \qquad \dots (21)$$

The normalizing condition is given by
$G(1) = G_0(1) + G_1(1) + G_2(1) = 1 \qquad \dots (22)$

Using eqs. (17), (20) and (21) in eq. (22) and applying the L-Hospital rule to get the limiting values when z→1, we obtain $P_0(0)$ as:

$$P_0(0) = \frac{\nu}{N\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}} \qquad \qquad \dots (23)$$

where $\nu = (\mu - e)\beta - (\lambda_1 b_1 + \lambda_2 b_2 - e)\beta - (\lambda_1 b_1 - e)\alpha$

<div align="center">IV.    PERFORMANCE MEASURES</div>

In order to derive expressions for various performance measures, we explore the complete cycle duration which is made of (i) idle period (ii) busy period (iii) down period, defined as follows. When the server is turned off, the corresponding length of time is called the idle period. The busy period (repair period) is the length of time when the server is turned on and in operation (under repair) and the customers are being served (waiting in queue to get service).

By using the value of $P_0(n)$, $P_1(n)$ and $P_2(n)$, we compute the probabilities $P_I$, $P_B$ and $P_D$ respectively in the following manner:

$$P_I = \sum_{n=0}^{N-1} P_0(n) = G_0(1) \qquad \dots (24)$$

$$P_B = \sum_{n=1}^{\infty} P_1(n) = G_1(1) \qquad \dots (25)$$

$$P_D = \sum_{n=0}^{\infty} P_2(n) = G_2(1) \qquad \dots (26)$$

Using eq. (10) in eqs. (24)-(26), we have

$$P_I = N P_0(0) = \frac{\nu}{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu} \qquad \dots (27)$$

$$P_B = \frac{(\lambda_1 + \lambda_2 - e)\beta}{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu} \qquad \dots (28)$$

$$P_D = \frac{(\lambda_1 + \lambda_2 - e)\alpha}{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu} \qquad \dots (29)$$

The expected number of customers in the system when the server is turn off, turn on and operating and broken down state, respectively are as follows:

$$E(N_0) = G_0'(1) = \frac{(N-1)}{2} - \frac{(\lambda_1 + \lambda_2 - e)(N-1)(\alpha + \beta)}{2\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}} \qquad \dots (30)$$

$$E(N_1) = G_1'(1) = \frac{(\lambda_1 + \lambda_2 - e)(N+1)\beta}{2\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}}$$
$$+ \frac{(\lambda_1 + \lambda_2 - e)\{(\lambda_1 b_1 - e)^2 \alpha + (\lambda_1 b_1 - e)\alpha\beta + (\lambda_1 b_1 + \lambda_2 b_2 - e)\beta^2\}}{\nu\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}} \qquad \dots (31)$$

$$E(N_2) = G_2'(1) = \frac{(\lambda_1 + \lambda_2 - e)(N+1)\alpha}{2\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}}$$
$$+ \frac{(\lambda_1 + \lambda_2 - e)\alpha[(\lambda_1 b_1 - e)\{(\lambda_1 b_1 + \lambda_2 b_2 - e) - \alpha - (\mu - e)\} - (\lambda_1 b_1 - e)\beta]}{\nu\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}} \qquad \dots (32)$$

Now the expected number of customers in the system is:

$$E(N_s) = E(N_0) + E(N_1) + E(N_2)$$
$$= \frac{(N-1)}{2}$$
$$+ \frac{(\lambda_1 + \lambda_2 - e)[\beta(\mu - e)(\alpha + \beta) + \alpha(\lambda_1 b_1 - e)\{(\lambda_1 b_1 - e) - (\lambda_1 b_1 + \lambda_2 b_2 - e) + (\mu - e)\}]}{\nu\{(\lambda_1 b_1 + \lambda_2 b_2 - e)(\alpha + \beta) + \iota\}} \qquad \dots (33)$$

<div align="center">V.   COST ANALYSIS</div>

The expected idle period can be find using:

$$E(I) = \frac{N}{\lambda_1 + \lambda_2}$$

…. (34)

Also E(C)=E(I)+E(B)+E(D) so that

$P_I$=E(I) / E(C), $P_B$=E(B) / E(C) and $P_D$=E(D) / E(C)
Thus,

$$E(B) = P_B E(C) = \frac{N\beta}{v}$$

…. (35)

$$E(D) = P_D E(C) = \frac{N\alpha}{v}$$

…. (36)

$$E(C) = P_C E(C) = \frac{N\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + v\}}{(\lambda_1 + \lambda_2 - e)v}$$

…. (37)

To provide the optimal N-policy, we calculate the minimum expected total cost per unit time by considering the following cost elements:

$C_u(C_d)$     start up (shut down) cost for turning the server on (off)
$C_o(C_f)$     cost per unit time for keeping server on (off)
$C_b$           cost per unit time for a break down server
$C_h$     holding cost per customer per unit time present in the system

The expected total cost per unit time is given by:

$$E\{C(N)\} = (C_u + C_d)\frac{1}{E(C)} + C_b P_D + C_o P_B + C_f P_I + C_h E(N_S)$$

…. (38)

$$= (C_u + C_d)\frac{(\lambda_1 + \lambda_2 - e)v}{N\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + v\}} + \frac{(\lambda_1 + \lambda_2 - e)(C_b\alpha + C_o\beta) + vC_f}{(\lambda_1 + \lambda_2 - e)(\alpha + \beta + v)}$$
$$+ C_h\left[\frac{(N-1)}{2} + \frac{(\lambda_1 + \lambda_2 - e)[\beta(\mu - e)(\alpha + \beta) + \alpha(\lambda_1 b_1 - e)\{(\lambda_1 b_1 - e) - (\lambda_1 b_1 + \lambda_2 b_2 - e) + (\mu - e)\}]}{v\{(\lambda_1 b_1 + \lambda_2 b_2 - e)(\alpha + \beta) + v\}}\right]$$

…. (39)

The following inequality is used to obtain the optimal value of N so that the total expected cost could be minimized:

$$E\{C(N^* + 1)\} > E\{C(N^*)\} < E\{C(N^* - 1)\}$$

…. (40)

This provides

$$N^*(N^* - 1) < \frac{2(\lambda_1 + \lambda_2 - e)v(C_u + C_d)}{C_h\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + v\}} < N^*(N^* + 1)$$

…. (41)

By considering the discrete parameter N as continuous one, an approximate optimal value of N can be obtained. So that using

$$\frac{dE\{C(N)\}}{dN} = 0$$

,

we have

$$N^* = \left[ \frac{2(\lambda_1 + \lambda_2 - e)\nu(C_u + C_d)}{C_h\{(\lambda_1 + \lambda_2 - e)(\alpha + \beta) + \nu\}} \right]^{\frac{1}{2}}$$

.... (42)

## VI. Special Cases

In this section, we deduce some special cases by setting appropriate parameters as follows:

**Case I: Interdependent queueing model with balking and delay customers.**

In this case, there is no loss customers in the system so that $\lambda_2 = 0$.

**(a)** When $b_1 = b_2 = 1$, this case provides results for model without balking.

**(b)** Again setting $b_1 = b_2 = 1$ and e = 0, we get results which tally with those obtained by Jain (1997) for homogeneous arrival rate.

**Case II: Queueing model without balking, constant arrival rates and delay customers.**

In this case we substitute $b_1 = b_2 = 1$, $\lambda_1 = \lambda$, $\lambda_2 = 0$ and e = 0, so that our results coincide with that of Wang (1995).

**Case III:** On considering N=1, we get results for a single server controllable queue, with loss and delay.

## VII. Sensitivity Analysis

In this section, sensitivity analysis is carried out to demonstrate the effect of different parameters on various performance indices. The graphs for the expected queue lengths are shown in figures 1 to 5. The default values of parameters are fixed as $\mu$=1, $\alpha$=0.1, $\beta$=5, e=0.6, $b_1$=0.5, $b_2$=0.8, $\lambda_1$=0.9, $\lambda_2$=0.6 and N=5.

Figures 1(a-c) shows the effects of N, $\alpha$ and $\beta$ respectively on $E(N_s)$ by varying the arrival rate $\lambda_1$. From fig. 1(a), we examine that $E(N_s)$ increases slowly for increasing values of $\lambda_1$, upto $\lambda_1$=0.5, and then moderately upto $\lambda_1$=0.9; but beyond that it increases very sharply. By increasing the value of N, $E(N_s)$ also increases. The effect of $\alpha$ on $E(N_s)$ is shown in figure 1(b) where it is noted that as $\lambda_1$ increases, $E(N_s)$ increases slightly for lower values, but it increases sharply after $\lambda_1$=0.9. Also $E(N_s)$ decreases for increasing value of $\alpha$. In figure 1(c), $E(N_s)$ has same trends with respect to $\lambda_1$ as observed in fig. 1(b). The increasing values of $\beta$ do not show significant effect on $E(N_s)$ for lower values of $\lambda_1$ but as $\lambda_1$ grows, there appears visible increasing trends with respect to $\beta$. Concludingly lower arrival rate does not effect the queue length but it does have remarkable effect for higher rate, as we expect in real life situations. The failure rate $\alpha$ and repair rate $\beta$ also do not affect queue length in the beginning but its affect is seen distinctly later.

Figures 2(a-c) depict $E(N_s)$ vs. $\lambda_2$ for different values of N, $\alpha$ and $\beta$ respectively. We see that $E(N_s)$ increases initially gradually and then remarkably for higher value of $\lambda_2$ by increasing $\lambda_2$. In figure 2(a), $E(N_s)$ also increases as N increases. In figure 2(b) we observe that $E(N_s)$ decreases with the increasing values of $\alpha$. Figure 2(c) demonstrates the effect of $\beta$ on $E(N_s)$ and we notice that $E(N_s)$ increases with the increasing values of $\beta$.

Figures 3(a-c) visualize the effect of N on $E(N_s)$ by varying $\alpha$, $\beta$ and $\mu$, respectively. In figure 3(a), it is observed that as $\alpha$ increases, $E(N_s)$ decreases, but $E(N_s)$ increases with N. In figure 3 (b), $E(N_s)$ increases significantly in initial stage with the increasing values of $\beta$, but tends to be constant value as $\beta$ grows. If we increase the service rate, $E(N_s)$ decreases sharply upto $\mu$=2 and then after tends to a constant value as shown in figure 3(c). In figures 2(b) and 2(c), we observe the similar increasing effect of N as noted in fig. 3(a).

In figures 4(a-d), we examine the effect of parameter 'e' on $E(N_s)$ by varying different parameters. Initially $E(N_s)$ increases slowly for lower value of $\lambda_1$ and $\lambda_2$ and later on increases significantly for higher values, which is clear from figures 4(a) and 4(b), respectively. $E(N_s)$ decreases with the increasing value of 'e' in both the figures 4(a) and 4(b). It is noted that interdependence of rates affects the queue length reasonably. $E(N_s)$ increases with the increasing values of both $\alpha$ and $\beta$ and decreases with the increasing value of 'e', as noticed from figures 4(c) and 4(d).

In figures 5(a-d), $E(N_s)$ is shown for different values of $b_1$. It is seen that $E(N_s)$ increases as $b_1$ increases. It is observed from figures 5(a) and 5(b) that as arrival rates $\lambda_1$ and $\lambda_2$ increase, the value of $E(N_s)$ slightly increases for lower rate but sharply for higher values of $\lambda_1$ and $\lambda_2$ as well as $b_1$. In figures 5(c) and 5(d), we notice that $E(N_s)$ decreases (increases) as $\alpha$ ($\beta$) increases; the effect of $b_1$ on $E(N_s)$ is more prevalent for lower (higher) value of $\alpha$ ($\beta$).

From the above sensitivity analysis, we conclude that by improving the grade of service, we can reduce the expected queue length to a certain extent as the service rate does not affect the expected queue length after a certain threshold value. The dependence parameter 'e' and balking parameter of delay customers also increase the expected queue length. The effect of higher arrival rate is more prevalent on queue length in comparison to lower rate.

## VIII. Conclusion

The main purpose of this study is to obtain the optimal N-policy of a single unreliable server interdependent loss and delay queueing model with controllable arrival rate. Queue size distribution, the expected number of customers in the system and optimal N-policy are established by using the generating function

method. The expected queue length can be reduced by increasing the service rate up to a certain level. The optimal control policy for the queue length by selecting suitable parameters examined by sensitivity analysis, may be helpful to decision makers in designing appropriate service facility while reducing loss and delay of customers.

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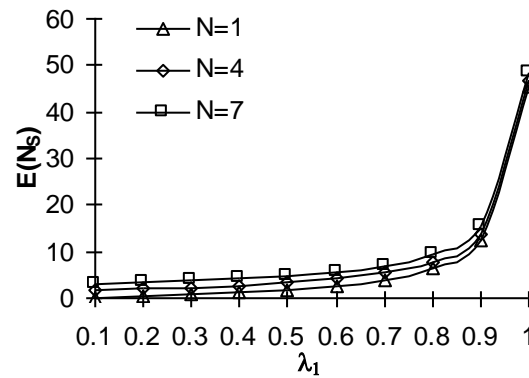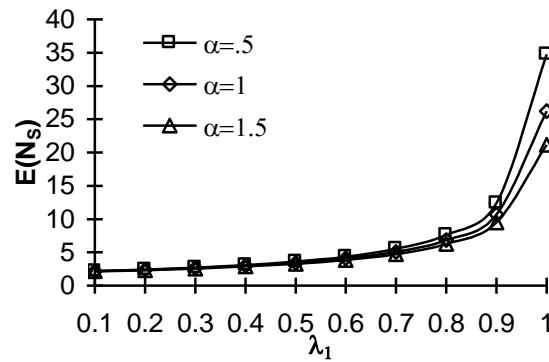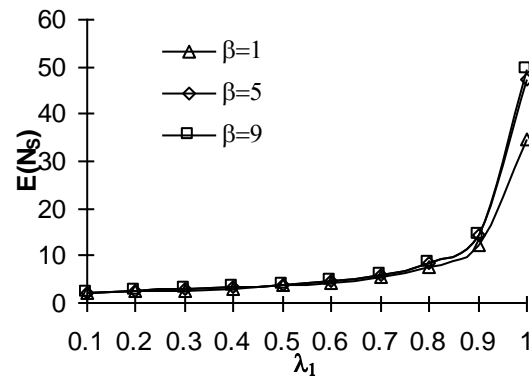
**Fig. 1:** Expected number of customers in the system E(Nₛ) by varying $\lambda_1$ for different value of
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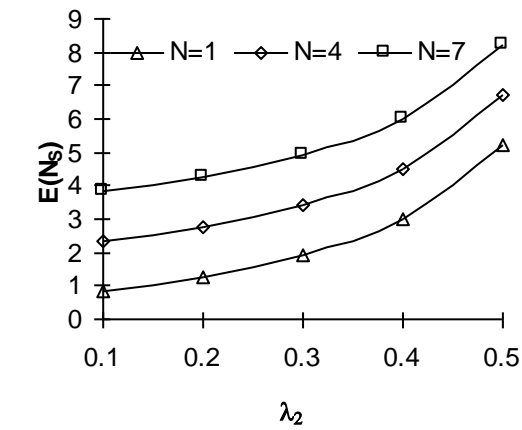
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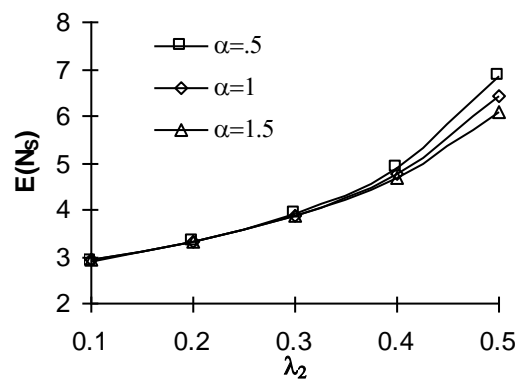


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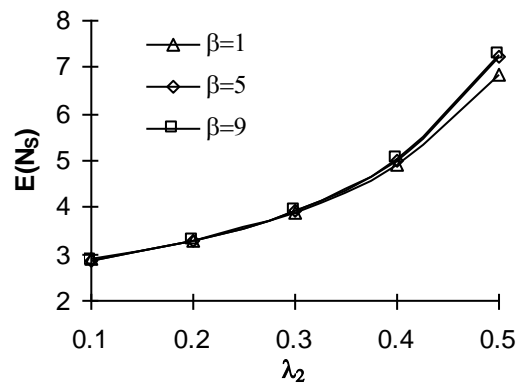


(c)

**Fig. 2:** Expected number of customers in the system E(N$_s$) by varying $\lambda_2$ for different value of
(a) N (b) $\alpha$, and (c) $\beta$
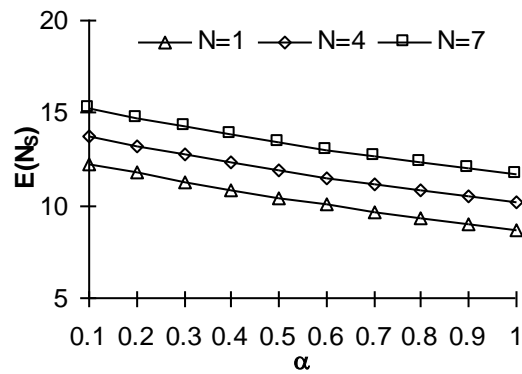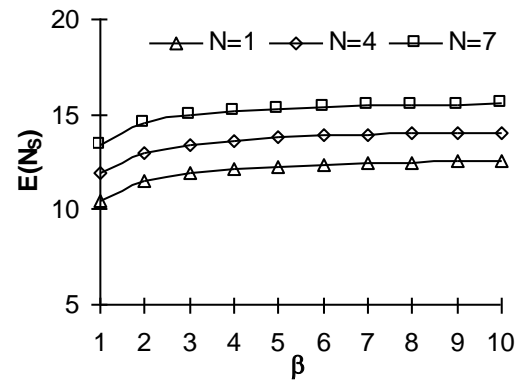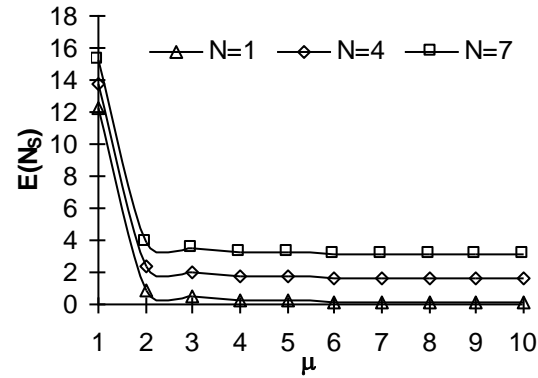
**Fig. 3:** Expected number of customers in the system E(N$_s$) by varying (a) α (b) β and (c) μ for different values of N.
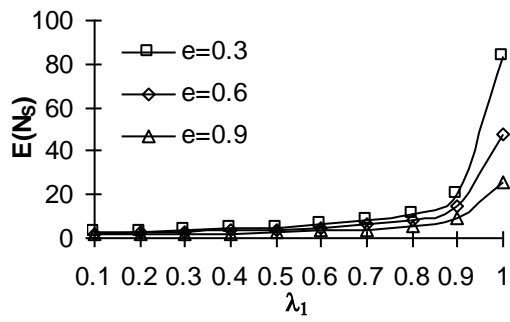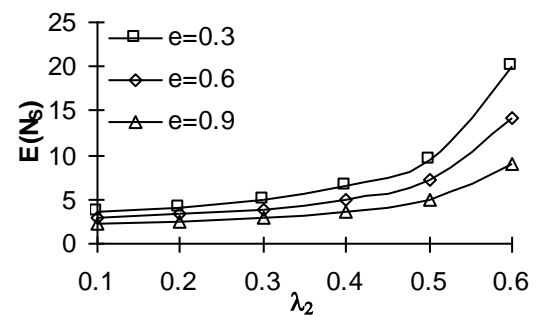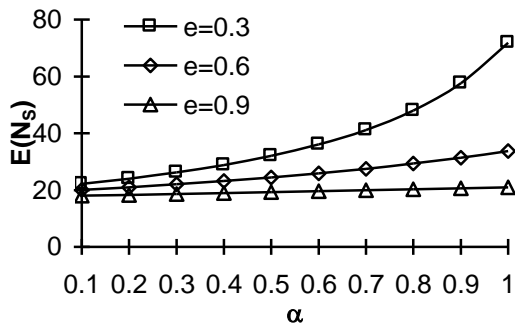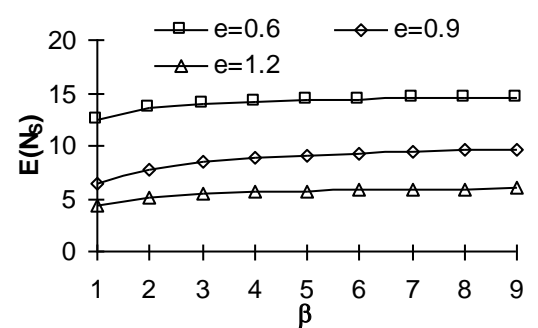
**Fig. 4:** E(N$_s$) by varying (a) $\lambda_1$ (b) $\lambda_2$ (c) $\alpha$ and (d) $\beta$ for the different values of 'e'.
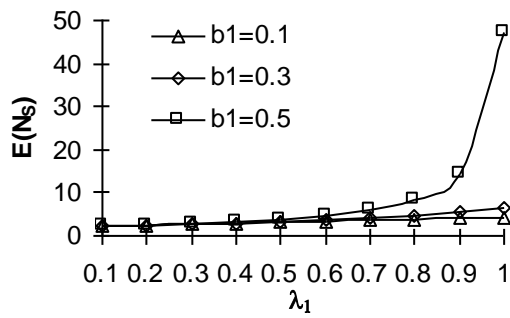
(a)
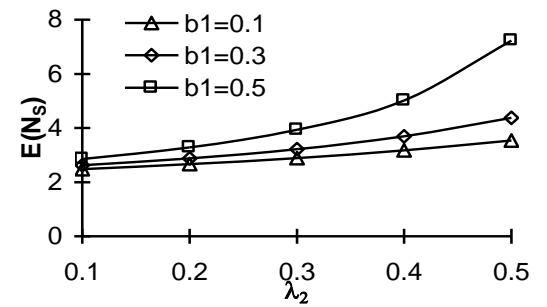


(b)
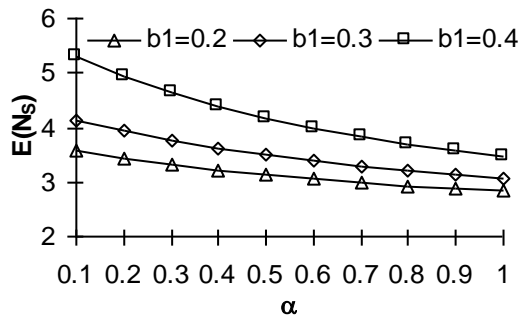


(c)
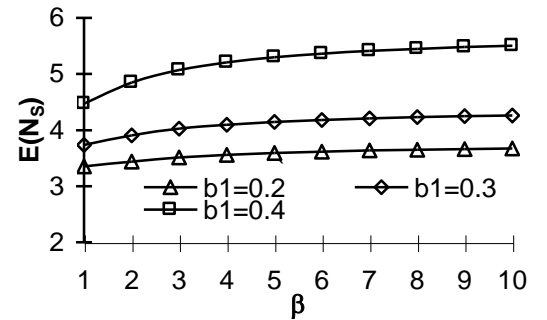


(d)

**Fig. 5:** Expected number of customers in the system $E(N_s)$ by varying (a) $\lambda_1$ (b) $\lambda_2$ (c) $\alpha$ and (d) $\beta$ for the different values of 'b$_1$'.

# Low-Power and High Speed Carry Select Adder

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*Abstract-* Adders are the basic building blocks of any processor or data path application. In adder design carry generation is the critical path. To reduce the power consumption of data path we need to reduce number of transistors of the adder. Carry Select Adder is one of the fast adder used in many data path applications. There is a chance to reduce the area, power and delay in the CSLA structure. The proposed design is implemented by using D-latch instead of using RCA cascade structure for Cin=0 or Cin=1. In this proposed design power and delay is reduced to 10.8% and 4.6% for 8bit, 17.73% and 49.3% for 16bit, 20% and 44.5% for 32bit, 21.9% and 59.8% for 64bit when compared to the Regular Carry Select Adder (CSLA). Power and delay is reduced to 4.43% and 37.23% for 8bit, 12.37% and 37.8% for 16bit, 14.06% and 45.68% for 32bit, 14.43% and 50.57% for 64bit when compared to the modified CSL adders (BEC). The delay is reduced 37.24% for 8bit, 60.4% for 16bit, 61.6% for 32bit, 14.43% and 56.74% for 64bit when compared to the modified CSL adder (WITHOUT USING MULTIPLEXER).

*Index Terms*- CSLA, D-Latch, BEC, LOW POWER AND HIGH SPEED.

## I. INTRODUCTION

Design of area- and power-efficient high-speed data path logic systems are one of the most substantial areas of research in VLSI system design. In digital adders, the speed of addition is limited by the time required to propagate a carry through the adder. The sum for each bit position in an elementary adder is generated sequentially only after the previous bit position has been summed and a carry propagated into the next position. The CSLA is used in many computational systems to alleviate the problem of carry propagation delay by independently generating multiple carries and then select a carry to generate the sum [1]. However, the CSLA is not area efficient because it uses multiple pairs of Ripple Carry Adders (RCA) to generate partial sum and carry by considering carry input Cin = 0 and Cin = 1, then the final sum and carry are selected by the multiplexers (mux).

The basic idea of this work is to use D-Latch instead of RCA with Cin = 0 or cin = 1 anyone in the regular CSLA to achieve High speed, lower area and power consumption [2]–[4]. The main advantage of this D-Latch logic comes from High Speed than the n-bit Full Adder (FA) structure. The details of the D-Latch logic are discussed in Section VI. This brief is structured as follows. The SQRT CSLA has been developed by using D-latch and compared with regular SQRT CSLA and ref[4-5].
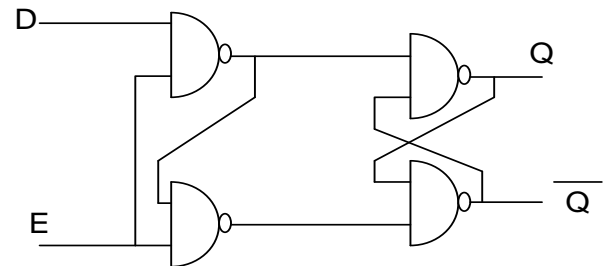


**Fig.1 D-Latch**
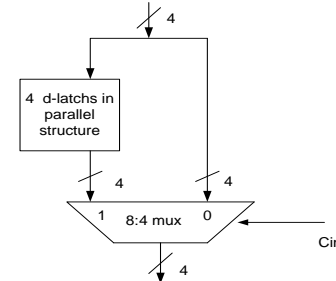


**Fig.2 4-bit D-Latch with multiplexer.**

Fig.1 shows the internal structure of D-Latch when D-Latch en=1 the input to the d-latch pass transistor should be D and when en=0 the input to the pass transistor should be value of D just before the transition of clock from 1 to 0.To obtain the value of D just before transition a buffer is needed.

Fig.2 shows the internal structure of 4-bit D-Latch circuit. When en=1 then the RCA structure will calculate the output for cin=1 and that will be stored in D-Latch. When en=0 then the RCA structure will calculate the output for cin=0 and the D-Latch out will not change that will stores previous value of RCA when en=1. And that D-latch, RCA structure outputs are given to the multiplexer by using selection line(cin) it will gives the proper output.

## II. LITERATURE REVIEW

Bedriji 1962 proposes that the problem of carry propagation delay is overcome by independently generating multiple radix carries and using these carries to select between simultaneously generated sums.

AkhilashTyagi 1993 introduces a scheme to generate carry bits with block carryin 1 from the carries of a block with block carryin 0.

Chang and Hsiao 1998 propose that instead of using dual carry ripple adder a carry select adder scheme using an add one circuit to replace one carry ripple adder.

Youngwood Kim and Lee Sup Kim 2001 introduces a multiplexer based add one circuit is proposed to reduce the area with negligible speed penalty.

Yajuan He et al 2005 proposed an area efficient square root carry select adder scheme based on a new first zero detection logic.

Ramkumar and Harish 2012 propose BEC technique which is a simple and efficient gate level modification to significantly reduce the area and power of square root CSLA.

Sajesh Kumar U, Mohamed Salih K. and Sajith K 2012 propose carry select adder without using multiplexer which reduce area and power consumption.

## III.    REGULAR 16-B SQRT CSLA

CSLA compromise between ripple carry adder and carry look ahead adder. When compared to RCA CSLA is high speed and when compared to carry look ahead adder hardware complexity less. The main disadvantage of regular CSLA is the large area due to the multiple pairs of ripple carry adder. The Fig.5 shows the regular 16-bit carry select adder. It is divided into five groups with different bit size RCA. From the structure of CSLA, it is evident that there is scope for reducing area, power and delay in CSLA.

The carry out calculated from the last stage i.e. least significant bit stage is used to select the actual calculated values of the output carry and sum. The selection is done by using a multiplexer. Internal structure of the group 2 to 5 of regular 16-bit CSLA is shown Fig.3. One input to the multiplexer goes from the RCA with Cin=0 and other input from the RCA with Cin=1.
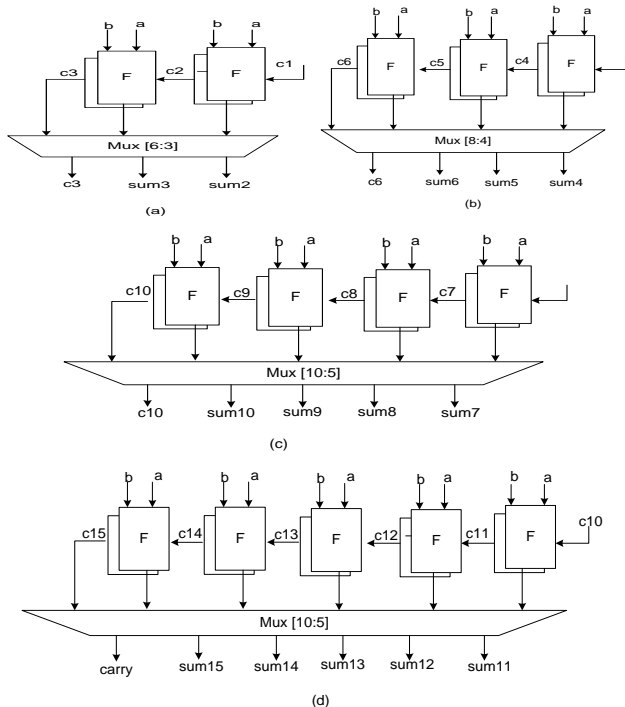


**Fig .3  internal structure of Regular CSLA  group  A to D**

There is a chance to reduce the area, power and delay in the CSLA structure.

## IV.    MODIFIED 16-B SQRT CSLA (BEC)

The Binary to excess one Converter (BEC) replaces the ripple carry adder with Cin=1, in order to reduce the area and power consumption of the regular CSLA. The modified16-bit CSLA using BEC is shown in Fig.6 [4]. The structure is again divided into five groups with different bit size RCA and BEC. The group 2 to 5 of the modified 16-bit CSLA is shown Fig. 4.

One input to the mux goes from the RCA with Cin=0 and other input from the BEC. Comparing the group 2 to 5 of both regular and modified CSLA, it is clear that BEC structure reduces the area and power.
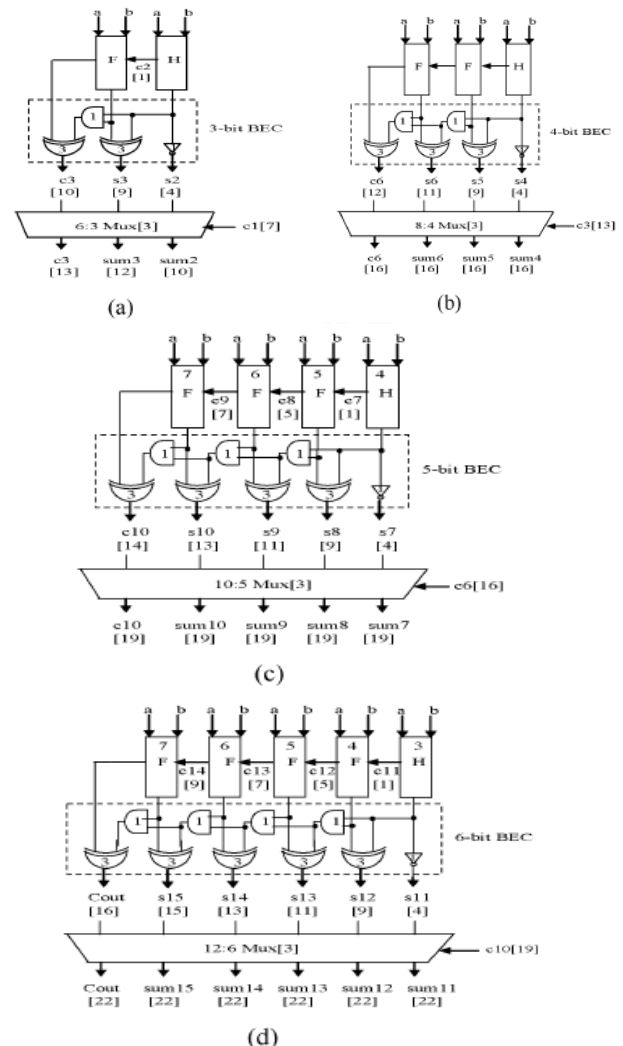


**Fig.4 internal structure of Modified  CSLA(BEC) group A to D**

But the disadvantage of BEC method is that the delay is increasing than the regular CSLA.
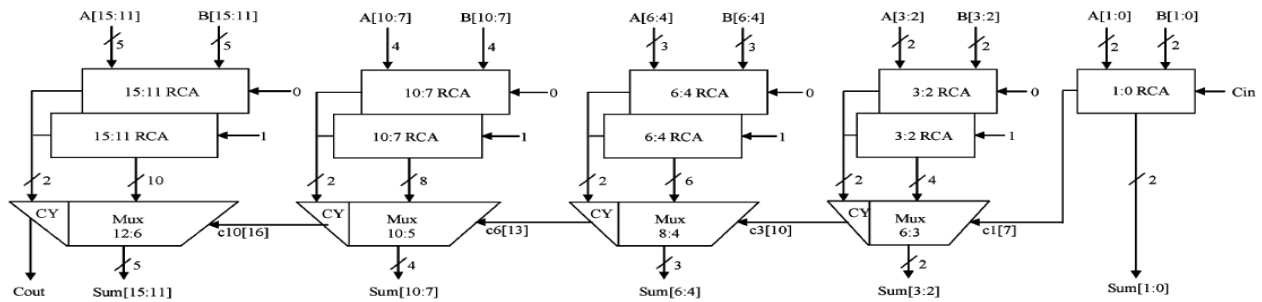
**Fig .5 16bit regular CSA**
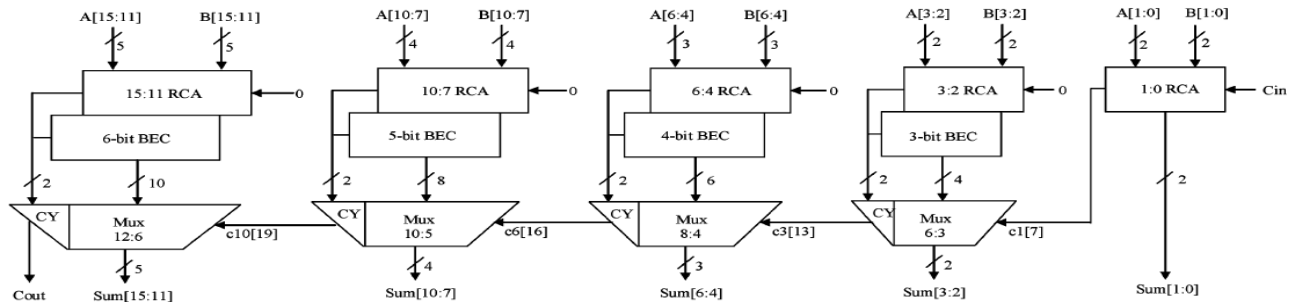


**Fig.6 CSLA by using BEC          [4]**
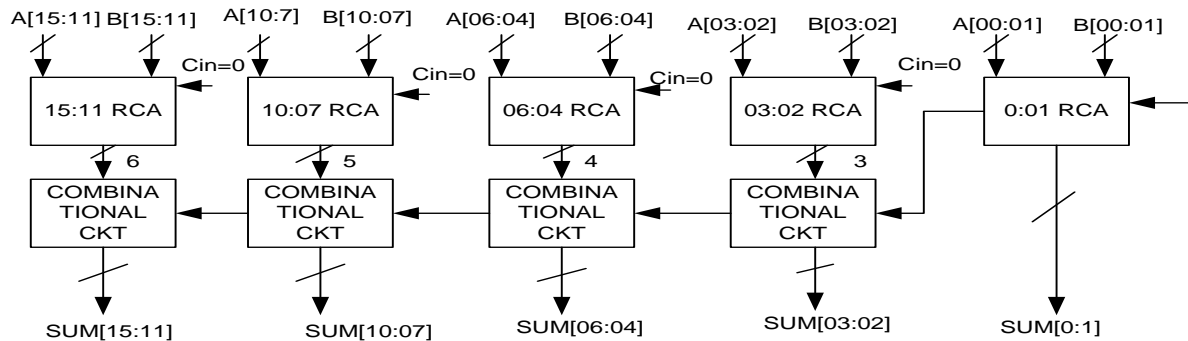


**Fig .7   CSLA without using multiplexer          [5]**

WITHOUT MUX  CSLA, it is clear that in this structure area and power is reduced.

### V.   MODIFIED 16-B SQRT CSLA (WITHOUT USING MUX)

In this method CSLA with cin=1 and multiplexer is replaced by the simple combinational circuit which consists of XOR and AND gates.  By using this method area and power is reduced when compared to regular CSLA and modified CSAL(BEC). The modified 16-bit CSLA without using mux is shown in fig.7 REF[5]. The structure is again divided into five groups with different bit size RCA and Combinational.

Initially RCA structure is calculate for cin =0 the output of full adder is given to the combinational circuit and one of the input of that combinational circuit is previous stage carry then it will provide the proper output by using Xor and And gates structure. The group 2to 5 of the modified 16-bit CSLA is shown Fig. 8.Comparing the group 2 to 5 of  regular, modified BEC and

(b)



(c)



(d)
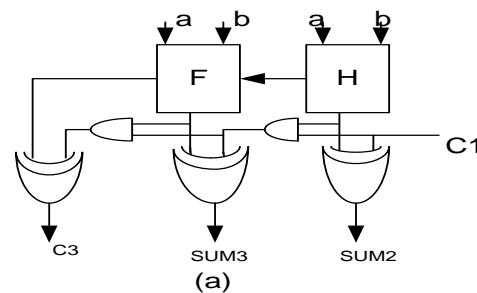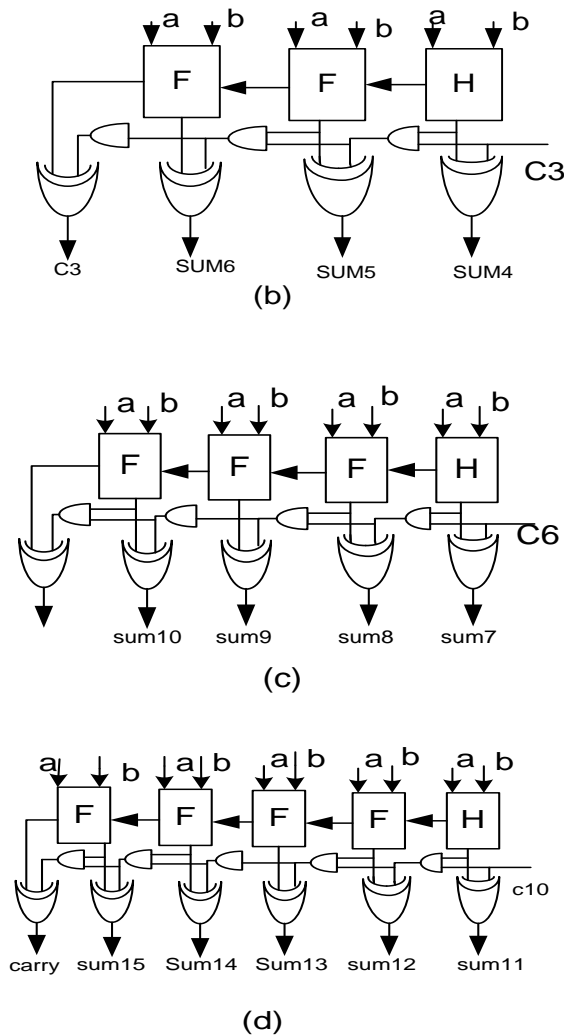
**Fig .8 internal structure of Modified CSLA
(Without using Multiplexer) group A to D**

But the disadvantage of WITHOUT MUX method is that the delay is increasing than the regular CSLA and modified BEC.

## VI.  PROPOSED CSLA USING D-LATCH

In this method replace any one of the RCA structure ( i.e. cin =1 or cin =0) by parallel structure of D-latches. For n bit RCA structure it required n D-latches with enable pin as a clk. Latches are used to store one bit information. The RCA structure cin is replace by enable pin , where enable signal is clk signal. When enable pin en =1 then the RCA structure is calculate for cin=1 that result is stored in D-latch. When en =0 then it will calculate for cin =0 and the D-latch output and full adder output is given to the mux. By using selection line it will gives the proper output.

Where the enable time period for '1' is very less when compared to the enable pin '0'. Initially RCA stracture will calculate for en=1 and then en =0. The architecture of proposed 16-b CSLA is shown in Fig. 10. It has different five groups of different bit size RCA and D-Latch. Instead of using two separate adders in the regular CSLA, in this method only one adder is used to reduce the area, power consumption and delay. Each of the two additions is performed in one clock cycle. This is 16-bit adder in which least significant bit (LSB) adder is ripple carry adder, which is 2 bit wide. The upper half of the adder i.e., most significant part is 14-bit wide which works according to the clock. Whenever clock goes high addition for carry input one is performed. When clock goes low then carry input is assumed as zero and sum is stored in adder itself. From the Fig. 9, it can understand that latch is used to store the sum and carry for Cin=1.

Carry out from the previous stage i.e., least significant bit adder is used as control signal for multiplexer to select final output carry and sum of the 16-bit adder. If the actual carry input is one, then computed sum and carry latch is accessed and for carry input zero MSB adder is accessed. Cout is the output carry. The Fig.9 shows the internal structure of group 2 to 5 of the proposed 16-bit CSLA.
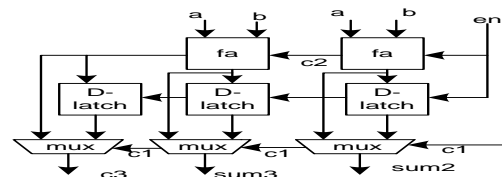


**(a) Internal structure of 3 D-latchs in parallel block of Fig.10**



**(b)**
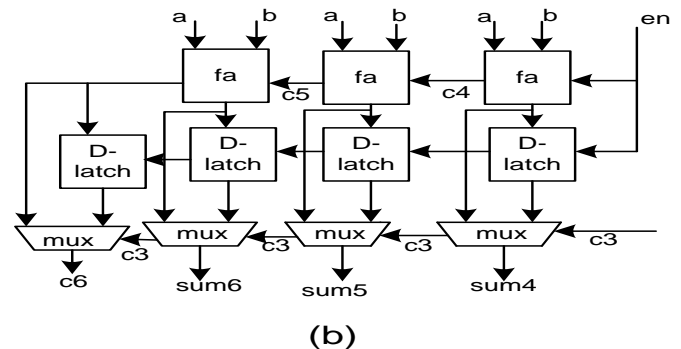
**Internal structure of 4 D-latchs in parallel block of Fig.10**



(c)
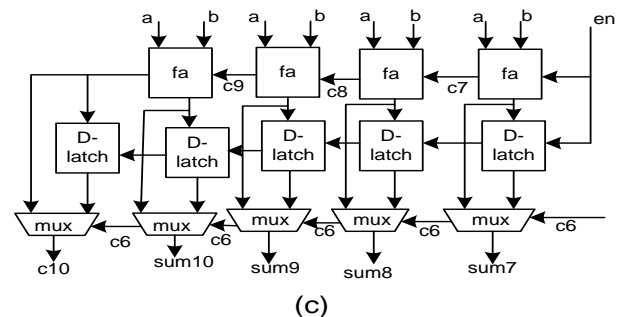
**Internal structure of 5 D-latchs in parallel block of Fig.10**
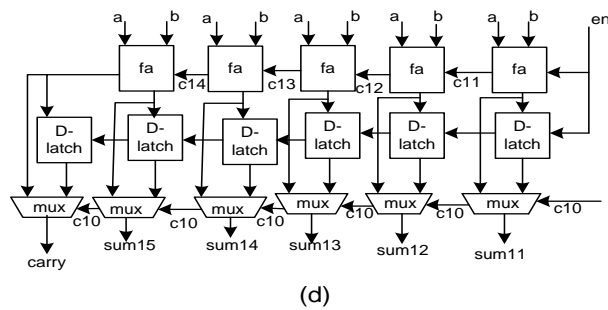
**Internal structure of 6 D-latchs in parallel block of Fig.10**

**Fig.9 internal structures of Proposed CSLA by using D-Latch**



(d)
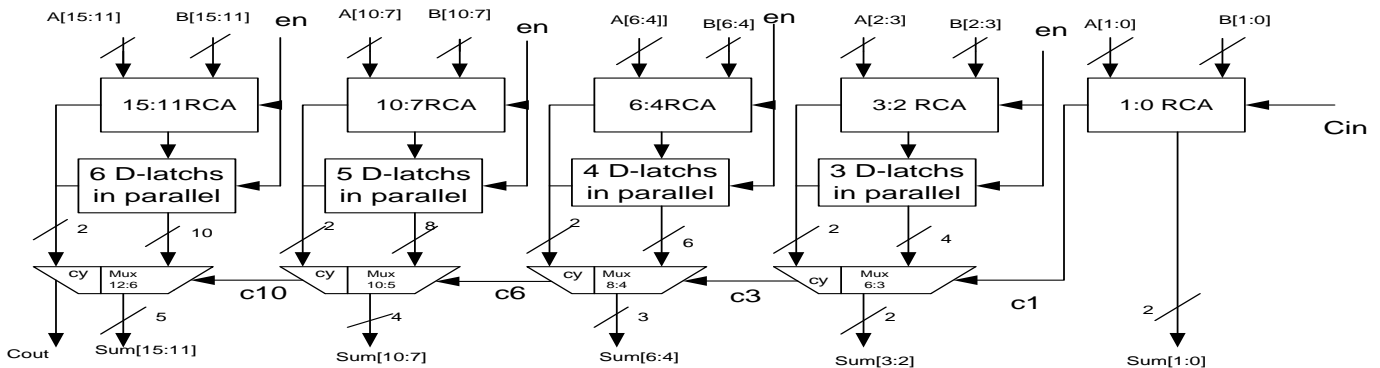


**Fig.10  Proposed Paper by using D-Latch**

## VII.   SIMMULATION RESULTS

The design proposed in this paper has been developed using Verilog-HDL and synthesized in Synopsys RTL design compiler. The similar design followed for all regular, modified and Proposed SQRT CSLAs.  Table  1 to 4 exhibits the simulation results of all the CSLA structures in terms of delay, area and power. The area indicates the total cell area of the design and the total power is sum of the leakage power, internal power and switching power. The percentage reduction in the cell area, total power, total delay, power-delay product and the area–delay product as function of the bit size are shown in below Table. Also plotted is the percentage delay and power  reduced in Fig. 11 It is clear that the delay of the 8-, 16-, 32-, and 64-b proposed SQRT CSLA is reduced by 4.6%, 49.3%, 44.5%, and 59.08%, respectively when compared to regular SQRT CSLA. Power reduction of the proposed paper when compared to regular SQRT CSLA 8, 16, 32 and 64-b is 10.8%, 17.73%,  20.01% and 21.9%, respectively.

**COMPARISON OF REGULAR AND MODIFIED SQRT CSLA WITH PROPOSED PAPER**:

**Table 1: 8-bit results comparison**

| Bit size | Type of adder | Delay(ns) | Area(nm) | Power(mw) | Power delay product(10^ -12) |
|---|---|---|---|---|---|
| 8 bit | Regular CSLA | 2.195 | 955.937 | 15.241 | 33.45 |
| | BEC CSLA | 3.336 | 628.906 | 14.229 | 47.46 |
| | Without Using MUX | 3.337 | 434.843 | 7.956 | 26.55 |
| | Using D-latch | 2.094 | 952.343 | 13.598 | 28.47 |

When compared to regular and modified circuit delay is reduced but power and area is increased negligibly when compared to modified CSLA without using mux only.

**Table 2: 16-bit results comparison**

| Bit size | Type of adder | Delay(ns) | Area(nm) | Power(mw) | Power delay product(10^ -12) |
|---|---|---|---|---|---|
| 16 bit | Regular CSLA | 4.848 | 2016.093 | 35.631 | 172.73 |
| | BEC CSLA | 3.941 | 1362.031 | 33.458 | 131.793 |
| | Without Using MUX | 6.201 | 952.343 | 18.413 | 114.14 |
| | Using D-latch | 2.450 | 1901.093 | 29.311 | 71.80 |

When compared to regular and modified circuit delay is reduced but power is increased when compared to modified CSLA without using mux. But here the power delay product and area delay product is reduced when compared to regular and modified circuit.

**Table 3: 32-bit results comparison**

| Bit size | Type of adder | Delay(ns) | Area(nm) | Power(mw) | Power delay product(10^ -12) |
|---|---|---|---|---|---|
| 32bit | Regular CSLA | 6.587 | 4161.562 | 77.499 | 510.48 |
| | BEC CSLA | 6.729 | 2813.906 | 71.450 | 480.78 |
| | Without Using MUX | 9.539 | 1958.593 | 39.0177 | 372.18 |
| | Using D-latch | 3.655 | 3856.093 | 61.409 | 224.41 |

When compared to regular and modified circuit delay is reduced but power is increased when compared to modified CSLA without using mux. But here the power delay product and area delay product is reduced when compared to regular and modified circuit.

**Table 4: 64-bit results comparison**

| Bit size | Type of adder | Delay(ns) | Area(nm) | Power(mw) | Power delay product(10^ -12) |
|---|---|---|---|---|---|
| 64 bit | Regular CSLA | 11.169 | 8377.031 | 161.870 | 1807.92 |
| | BEC CSLA | 11.181 | 5760.7812 | 147.69 | 1651.17 |
| | Without Using MUX | 15.542 | 4057.3437 | 81.304 | 1263.40 |
| | Using D-latch | 4.566 | 7593.593 | 126.371 | 577.0 |

When compared to regular and modified circuit delay is reduced but power is increased when compared to modified CSLA without using mux. But here the power delay product and area delay product is reduced when compared to regular and modified circuit.

The design proposed in this paper has been developed using Verilog-HDL and synthesized in Synopsys RTL compiler.The similar design followed for all regular, modified and Proposed SQRT CSLAs. Table exhibits the simulation results of all the CSLA structures in terms of delay, area and power. The area indicates the total cell area of the design and the total power is sum of the leakage power, internal power and switching power. The percentage reduction in the cell area, total power, total delay and power-delay product as function of the bit size are shown in above Table[1-4]. Also plotted the percentage reduction in delay and power is shown in Fig. 11(a),Fig.11(b) respectively. It is clear that the delay of the 8-, 16-, 32-, and 64-b proposed SQRT CSLA is reduced by 4.6%, 49.3%, 44.5%, and 59.08%, respectively when compared to regular SQRT CSLA. Power reduction of the proposed paper when compared to regular SQRT CSLA 8, 16, 32 and 64-b is 10.8%, 17.73%, 20.01% and 21.9%, respectively.

Fig.12 shows the Simulation results of 64-bit CSLA using D-Latch. And Fig13 shows the power and delay calculation results by using synopsys of 64-bit CSLA using D-Latch.
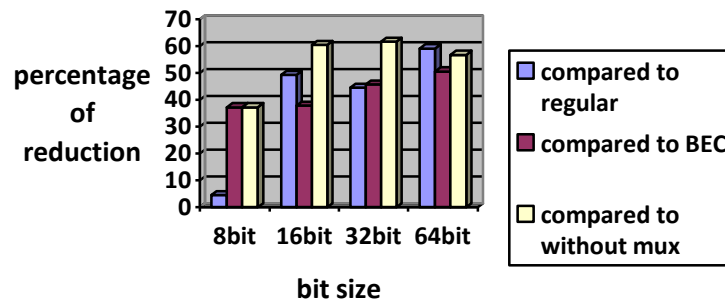


Fig .11(a) percentage in delay reduction
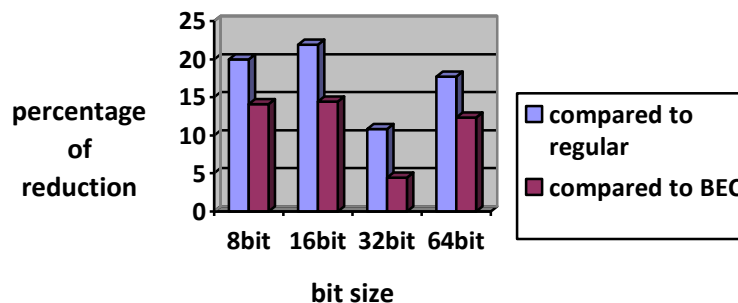


Fig.11 (b) percentage in power reduction
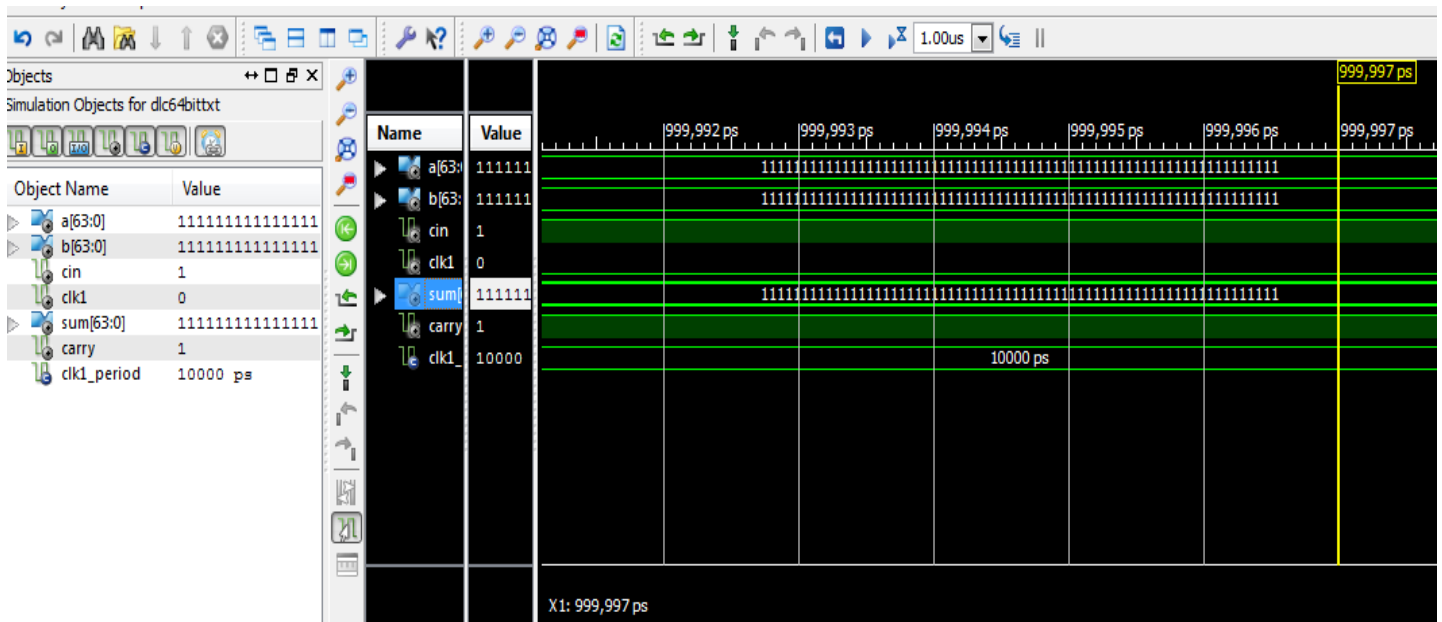
**Fig.12 Simulation result of CSA using D-Latch**
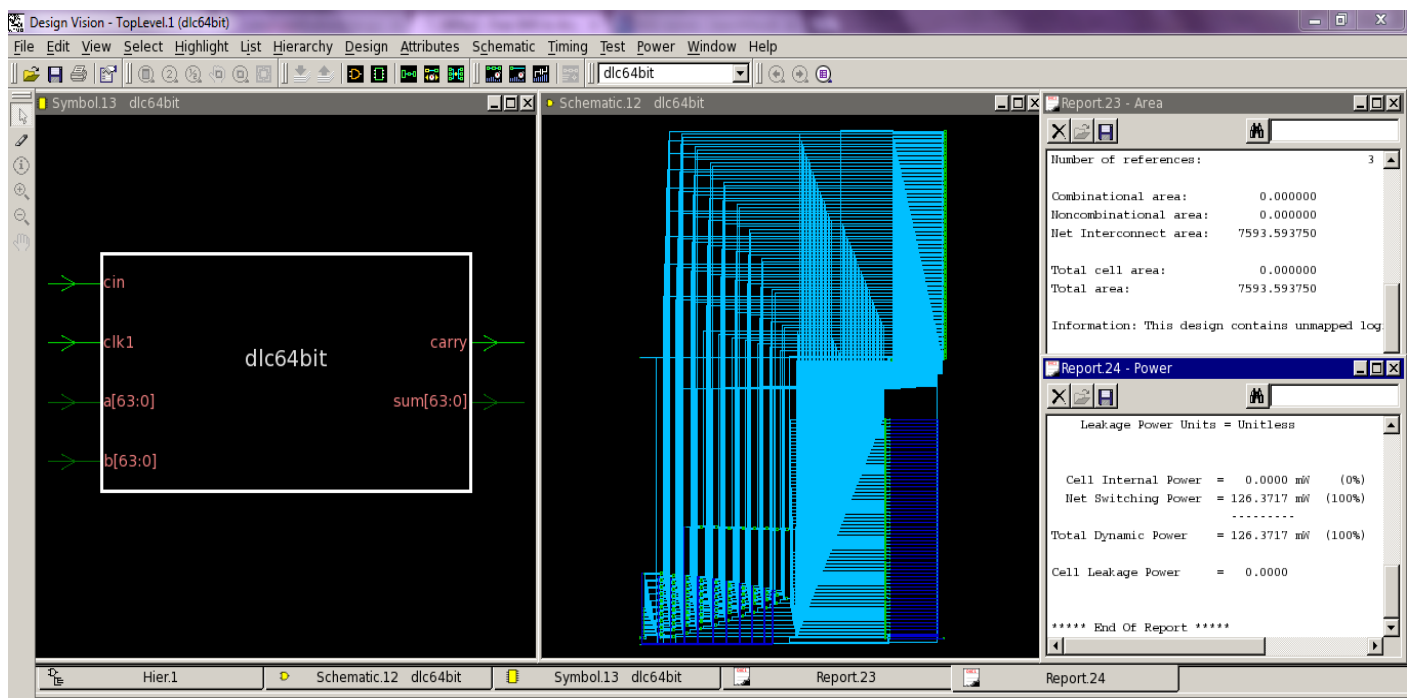


**Fig.13 Power and Delay calculation of proposed circuit by using synopsys tool**

## VIII.   CONCLUSION

A uique approach is proposed in this paper to reduce the area, power and delay of SQRT CSLA architecture. This paper shows the design of carry select adder implemented by using D-Latch and compared with regular CSA and modified CSA(BEC and Without using Multiplexer). All  these adders are implemented on Spartan XC3S500E FPGA device and the performance is compared. Power and Area is calculated by using synopsys RTL tool. This paper having better results when compared to CSA and modified techniques.

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# A Study of Students' Attitude towards Physics Practical at Senior Secondary Level

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*Abstract-* The paper attempts to study the attitude of students towards physics practical at senior secondary level in government senior secondary schools of Udaipur city which had science stream. It also attempts to compare the attitude of boys and girls. 80 senior secondary students (40 girls and 40 boys) were taken as sample of study. Data collection tool was an opinionnaire ( questionnaire). The data was analyzed by using mean, percentage, standard deviation and t- test.

## I. INTRODUCTION

Today we are living in the age of science and technology .Scientific inventions and discoveries have revolutionized our lives.

Science is nothing but knowledge so obtained by observation, reading, experimentation and realization. Knowledge so obtained is systematic and channelized. A careful analysis of the history of the progress of science reveals that theory and experiment forms the foundation of growth and development of science.

National Curriculum framework 2005 (N C F) gives the criterion for an ideal science curriculum for different stages viz. primary, upper primary, secondary and higher secondary.

**Primary level:**

At this stage the basic objective of science teaching is to arouse curiosity and exploring the world around using cognitive and psychomotor skills. At this stage science and social science should be integrated as environment studies.

**Upper Primary Level:**

N C F 2005 suggests child at this stage should be engaged in learning principles of science through familiar experiences working with hands to design simple technological units and modules.

**Secondary Level:**

At this stage the students must be engaged in learning science as a composite discipline. Systematic experimentation as a tool to discover / verify theoretical principles.

**Senior Secondary Level**

At this stage science should be introduced as a separate discipline with emphasis on experiments / technology and problem solving. The student may be given free option to choose the subject of their own interest. The curriculum load should be rationalized to avoid steep gradient between the secondary and senior secondary levels. Core topics of a discipline should be carefully identified and treated with appropriate rigor and depth.

The chief aim of physics is to discover the law which governs certain phenomenon or to verify a given law which has been derived from a theory.

Physics, like religion is a search for truth. Hence to a student physics should be as sacred and as pious as the place of worship to a devotee. In fact this study enables young minds to equip themselves for something higher and noble as search for truth and unrevealing the mysteries of nature. Demonstration of experiment is important for understanding the principles of physics. However, performing experiments by one's own hand is far more important because it involves learning by doing. It is necessary to emphasize that for a systematic and scientific training of young minds, a genuine laboratory practice is a must. According to educational psychologists the attitude of the student plays an important role in his systematic and scientific training. Science is a great human expertise. Open mindedness, curiosity, collection of data, demand for verification and proofs statistical reasoning, suspended judgments, acceptance of warranted conclusion and willingness to change over opinion in the light of new evidence are the ferments which characterize the scientific enterprise.

It is a general observation that the students and teachers have to spend large amount of time in physics laboratory performing experiments. Practical work brings in behavior changes in the students. The scientific temperament, curiosity, interest and creativity form the basis of this change. Practical attempts to provide a body of knowledge through procedures that are demonstrated objective but today they are often done in a subjective context.

Today the students perform experiments for the sake of marks. The researcher herself is a teacher and student of physics. She has taught for more than 8 years at senior secondary level in public schools of Udaipur. On the basis of her observation she felt the need to work upon the same and following research questions aroused in her mind:

## II. RESEARCH QUESTIONS

1 What is the status of physics practical at the senior secondary level?

2 What are the problems faced by the students at senior secondary level regarding:

    Physical resources

    Human resources

    Procedure

3 What is the attitude of students towards practical work?

With this background and the urge to know the answers of the above questions the need to work upon this area was felt.

## III. STATEMENT OF THE PROBLEM

A study of students' attitude towards physics practical at senior secondary level.

### Objectives

1 To study the attitude of girls towards practical work at senior secondary level.

2 To study the attitude of boys towards practical work at senior secondary level.

3 To compare the attitude of boys and girls towards physics practical work.

4 To study the status of practical work carried out at senior secondary level.

5 To find out the gaps between the prescribed and present practical work done.

### Hypotheses

The researcher had relatively no idea regarding the outcomes of this research. Thus null hypotheses was designed

1 There is no significant difference in the attitude of boys and girls at senior secondary level.

2 There is no significant gap between the prescribed and present practical done at senior secondary level.

### Significance of study

The researcher has stern belief that for effective physics teaching / learning proper theoretical and experimentation facilities should be provided to the students by the administrators , curriculum framework personnel's and teachers

The present research work may determine whether the present status is enough to develop a sense of enquiry, spirit of enthusiasm to investigate and to create favorable conditions for efficient teaching learning experience.

The study may also focus on the problems faced by students of the state board at senior secondary level.

### Delimitation

Considering the time and resources availability the study was restricted to government senior secondary schools of Udaipur city only.

### Sample

The unit of sample had students. All the four government senior secondary schools of Udaipur city which had science stream were included in the study. Among these 2 were girls school and 2 were boys school. The sample includes 80 students (20 from each school) . The sample was chosen by random sample method.

### Method

Keeping in mind the nature of the problem descriptive survey method was suited for the study.

### Tool

The tools used were

Questionnaire for students

### Statistical technique

The statistical techniques employed were mean, percentage, standard deviation and t-test.

## IV. RELATED STUDIES

The following are some of the related studies conducted in India from 2001 to 2010

1. Khriesamhalie Pienyu, 2005, University of Nagaland, Kohima . " A study of the status and development of science education at high and higher secondary school level in Nagaland since its statehood".

This research tried to trace the historical development of science education at school level in Nagaland. It also tried to find relevancy of curriculum in science education at school level, assess school infrastructure and lab to assess science education in state.

2. Henige, Kimberly Ann(2005): "Students attitude related responses to inquiry learning in undergraduate kinesiology laboratory instruction."

The objective was to determine whether the student attitudes are impacted when teaching method shift from traditional to an investigative high inquiry level approach. The tickler scale survey was administered to students before and after five week period.

Most students reported enjoying the higher level of inquiry more while most students felt they learned more during low inquiry level activities. In general the effect of high inquiry was not negative and in fact was found to have some desirable effects on students.

3.Cook, Melissa Rene (2005) : "Examined students attitude toward science and scientific literacy in non science major, interdisciplinary course."

This inductive qualitative study examined students' attitudes towards science and their scientific literacy in a course designed on science education for new civil engagement and responsibility ideals.

A biology concepts exam showed a significant increase in scores from pre test to post test on biological concepts i.e. scientific literacy. The study revealed no significant change in confidence and interest.

4. Khan, Z. (1996): " Attitude of class XII students towards chemistry curriculum."

The above study was conducted in order to determine students attitude towards chemistry curriculum and to compare the attitude of Rajasthan state board students with central schools. The findings revealed that the students of both schools had favorable attitude towards curriculum. The attitude of students from central school had high positive attitude towards teachers and teaching aids.

5.Sharma A.K., 2002. "Status and use of chemistry laboratory at senior secondary level."

The study examined the status of chemistry lab of government and private senior secondary school .It was also conducted to know the use of labs and to compare the status of labs of these schools."

## V. DATA ANALYSIS

The data gathered through questionnaire have been analyzed and interpreted from various angles.

Students' attitude towards physics practical work:

In this study the attitude of senior secondary students towards physics practical work was to be determined. The study is interpreted in terms of percentage. The students attitude is classified into various categories namely negative, positive and average. The attitude in positive and negative category is further categorized into 3 sub categories namely high, good and low. Thus attitude range is divided into 7 categories, 3 above average range and 3 below average range. The range is 0 to 108.

The categories are as follows:

| | |
|---|---|
| 0-71 | negative attitude range |
| 72 | average |
| 73-83 | low positive attitude range |
| 84-95 | good positive attitude range |
| 96-108 | high positive attitude range |

The table illustrates the classification of students high positive attitude range according to their attitudes.

### Table no. 1
### % of students in different attitude categories

| Category | Range | No.of students | % |
|---|---|---|---|
| high positive attitude | 96-108 | 50 | 62.5 |
| Good positive attitude | 84-95 | 22 | 27.5 |
| Low positive attitude | 73-83 | 8 | 10 |
| Average | 72 | 0 | - |
| Negative attitude | 0-71 | 0 | - |
| | | | |

The table makes clear that the number of students with negative attitude towards practical work is zero. The students having high positive attitude is maximum and it is 62.5% of the sample. 27.5%of students have good positive attitude where as only 10% of students have low positive attitude.

The following table presents classification of boys and girls in different attitude ranges.

### Table No.2
### Classification of Boys and Girls in different attitude ranges.

| category | Attitude range | Girls no. | % | Boys no. | % |
|---|---|---|---|---|---|
| High positive attitude | 96-108 | 32 | 80 | 18 | 45 |
| Good positive attitude | 84-95 | 6 | 15 | 16 | 40 |
| Low | 73-83 | 2 | 5 | 6 | 15 |
| positive attitude | | | | | |
| Average | 72 | - | - | - | - |
| Negative attitude | 0-71 | - | - | - | - |

The above table reveals girls have high positive attitude than boys .it also makes very clear that no boy or girl lie in average or negative attitude category.

The attitude of boys and girls are compared in the following table on the basis of mean, standard deviation and t score.

### Table No. 3

| S no. | category | No. | Mean | S.D. | t-value |
|---|---|---|---|---|---|
| 1 | Girls | 40 | 99.35 | 6.81 | 4.22 |
| 2 | Boys | 40 | 92.55 | 7.58 | |

From the above table it is clear mean attitude score of girls is 99.35 which is quite higher than the mean attitude scores of boys i.e. 92.55.

It was hypothesized that there is no significant difference in the attitude of boys and girls towards practical work at senior secondary level in the government schools. The t-scores from the standard table on 0.01 and 0.05 level are 2.64 and 1.99 resp. It means that the t-score calculated from the data i.e. 4.55 is greater than t table value. Therefore the above hypothesis is rejected.

## VI. CONCLUSION

Hence it can be concluded that there is significant difference in the attitude of boys and girls towards practical work at senior secondary level and that the attitude of girls is significantly more positive than that of boys.

**Interpretation**

The major findings of the study can be interpreted as:

The value of mean of girls school were higher than those of boys schools. This means the present status of practical working and attitude of girls school is far better than that in boys school. This is due to better physical conditions of the labs, efficient teaching staff and good positive attitude of students. The study revealed that the physical condition of girl school was better than the rest of the schools. The teachers were efficient to make optimum use of the limited resources.

**Educational Implications and Suggestions**

For Teachers: The teachers should make optimum use of apparatus as the study shows there is lack of adequate apparatus in government schools. Basic training should be given to the teachers to repair non working apparatus to avoid inconvenience to students.

For students: As the number of working apparatus are not adequate, the students work in groups hence learn co operative team spirit. The study involves learning by doing. Hence the students can co relate theory with practical.

For the administration: They can use the study in guiding the teachers to use different strategies to make the subject

interesting. They can administer the status of physics lab from time to time to visualize the condition of the materials and apparatus. To provide new technology based literature, research journals periodically.

For curriculum developers: They can introduce more topics which can be taught by experimental method. More weight age should be laid on learning by doing philosophy by emphasizing more on project work and seminars.

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# In Vitro Study on α -Amylase Inhibitory Activity and Phytochemical Screening of Few Indian Medicinal Plant Having Anti-Diabetic Properties

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*Abstract-* The aqueous extract of Withania somnifera leaf (92.7%) and the Methanolic extract of Ocimum Sanctum (92.6%) showed higher inhibition against porcine pancreatic α-amylase among the medicinal plants studied. Pancreatic α-amylase inhibitors offer an effective strategy to lower the levels of post prandial hyperglycemia via control of starch breakdown. Six different ayurvedic Indian medicinal plants were subjected to sequential solvent extraction, phytochemical analysis, compound identification and tested for α-amylase inhibition. Phytochemical analysis revealed the presence of Alkaloids, Flavonoids, Reducing sugar, Tannins, Anthraquinone and Saponin as probable inhibitory compounds.

*Index Terms-* α-amylase inhibition, Diabetes mellitus, *ocimum sanctum*, *curcuma longa*, *azadirachta indica*, *withania somnifera*, *tinospora cardifolia*, *brassica oleracea*, anti-diabetic activity, Phytochemical analysis ,TLC, Herbal formulation.

## I.   INTRODUCTION

A large number of medicinal plants are used in the treatment of diabetes. Medicinal plants have curative properties due to the presence of various complex chemical substance of different composition, which are found as secondary plant metabolites in one or more parts of these plants. WHO report 80% of the world population relies on the drug from natural origin.

Diabetes mellitus (DM) is a chronic disorder characterized by both postprandial and fasting hyperglycemia with disturbances in carbohydrate, fat and protein metabolism Diabetic hyperglycemia results either from an absolute deficiency in insulin secretion (type 1 diabetes mellitus) or insulin action (type 2 diabetes mellitus) or both. One therapeutic approach to prevent postprandial hyperglycemia is to retard the digestion and absorption of carbohydrates in the gastrointestinal tract through inhibition of enzymes such as α-amylase and α-glycosidase. Alpha amylases hydrolyze complex polysaccharides to produce oligosaccharides and disaccharides which are then hydrolyzed by α-glycosidase to monosaccharide which are absorbed through the small intestines into the hepatic portal vein. Inhibitors of both α-amylase and α-glycosidase delay digestion and subsequent absorption of carbohydrates thereby lowering postprandial glucose levels.

The aim of the current study was to study the in vitro inhibitory effects of various leaf extracts on the activities of selected diabetic related carbohydrates metabolizing enzymes (α-amylase).

## II.   MATERIALS AND METHODS

The plant materials were collected from botanical garden and nurseries present in Noida regions and used for the study. The selection of plant material for the screening of anti diabetic properties can be based on a random selection. The whole plant or a particular part can be collected depending on where the metabolites of interest (if they are known) accumulate.

**Table 1- List of medicinal plants.**

| S.No. | Medicinal Plant | Plants part used |
|-------|-----------------|------------------|
| 1. | *Ocimum tenuifloirum* | Leaves |
| 2. | *Curcuma longa* | Rhizome |
| 3. | *Brassica oleracea* | Floret |
| 4. | *Azadiracta indica* | Leaves, Bark |
| 5. | *Tinospora cordifolia* | Stem |
| 6. | *Withania somnifera* | Leaves |

**Preparation of extracts**

The medicinal plant parts (shown in table 1) were sun dried and ground to a fine powder and stored at room temperature.

**Aqueous extraction: -** Dry powder of each plant is allowed for Soxhlet's extraction in sterile distilled water. Extracts were collected in test tubes. The test tubes are allowed to cool and then filtered. The filtrate was used as the aqueous plant extract.

**Methanolic extraction: -** Dry powder of each six medicinal plants are packed in a filter paper and placed in a thimble or extracted in a Soxhlet's extractor using solvent at 60ºC-80ºC for 36 hours in Soxhlet's apparatus. The thimble is placed in an extraction chamber, which is suspended above a flask containing the solvent (methanol) and below a condenser. The flask is heated and the solvent evaporates and moves up into the condenser where it is converted into a liquid that trickles into the extraction chamber containing the sample.

**Phytochemical Screening:**

The aqueous and Methanolic extract was subjected to preliminary Phytochemical analysis (Table 2)  in order to detect the presence of various groups of Phytoconstituents by carrying out the following chemical analysis i.e. Alkaloids, Flavonoids, Glycosides, Anthraquinone, Tannin, Saponin, Reducing sugar are identified using various reagents. Knowledge of the chemical constituents of plants is desirable, not only for the discovery **of**

therapeutic agents, but also because such information may be of value in disclosing new sources for the synthesis of complex chemical substances. Chemically constituents may be therapeutically active or inactive. The ones which are active are called active constituents and the inactive ones are called inert chemical constituents.The preliminary phytochemical screening revealed the presence of chemical constituents present in plants.

**Table 2- Preliminary Screening of secondary metabolites**

| S. No | Test | Process | Results | References |
|---|---|---|---|---|
| 1. | Alkaloid (Mayer`s test) | 0.5ml extract + treated with few drops of 1ml 2N Hcl +Mayer's reagent / Dragandorf reagent | White pale precipitate | Suddha punnos amy et al. |
| 2. | Glycosides (Keller kilani test) | 0.5ml extract + 1ml water + aqueous solution NaoH some drops for color | Yellow color | Yaseer bustanji et al. |
| 3. | Flavanoids (shinodaw`s test) | 0.5ml extract + 5-10 drops of dilute Hcl + small amount / pieces + then boiled for few min. | Reddish pink or dirty brown | Hoswse in fallah et al. |
| 4. | Reducing Sugars (Fehling`s test) | 0.5ml extract was dissolved in 5ml of water and filter it + boiled with Fehling's solution A & B for few min. | Orange red precipitate | N.V.L. S.Reddy et al. |
| 5. | Tannine (Lead Acetate Test ) | 0.5ml of aqueous extract + 10% lead acetate few drops | White precipitate | Punnos amy et al. |
| 6. | Anthraquinones (Borntrager`s test) | Few drops of extract was boiled with 10% Hcl for few minutes & cool + CHcl$_3$ (Chloroform)to filtrate & few drops of NH$_3$ added and heated | Rose pink color | B.dinesh kumar et al. |
| 7. | Saponin (Frothing test) | Extract + 20ml distilled water agitated in graduated cylinder for 15 min. | foam formed . | B.dinesh kumar et al. |

**Separation of compound-**The Methanolic extract was subjected to thin layer chromatography using silica gel. Different solvent systems were employed for separation of compound in the extract. Identification of alkaloids, Flavonoids and phenol was done by spraying with dragendroff' reagent, under UV lamp and folin reagent respectively. The preparative TLC plate was allowed to run with the solvent system Methanol: conc.NH4OH (200:3), Chloroform: methanol (19:1) and Chloroform: methanol (27:0.3) respectively. Where Rf value can be calculated by:

Rf value of compound = Distance traveled by compound

------------------------------------

Distance traveled by solvent

**In vitro study α- amylase inhibition activity (Spectrophotometric method)**

α- amylase enzyme is responsible for the metabolism of polysaccharides such as starch carbohydrate, etc. The Aim behind present experiment is to study the effect of α-Amylase concentration on the rate of reaction and Inhibition activity of aqueous and Methanolic extracts of six different plants.

**Procedure:**
1. Take 1ml of alpha amylase and 1 ml of plant extract in a test tube and incubated at 37∘C for 10 min.
2. After pre-incubation, 1ml of 1% (v/v) starch solution was added to each tube and incubated at 37∘C for 15min.

3. The reaction was terminated with 2 mL DNSA reagent, placed in boiling water bath for 5min, cool to room temperature, diluted, and the absorbance measured at 546 nm.
4. The control reaction representing 100% enzyme activity did not contain any plant extract. To eliminate the absorbance produced by plant extract, appropriate extract controls were also including.
5.

% inhibition of alpha amylase by each plant extract can be calculated-

% inhibition = (Enzyme activity of control – Enzyme activity of extract)

$$\frac{\text{(Enzyme activity of control – Enzyme activity of extract)}}{\text{Enzyme activity of control}} \times 100$$

## III. RESULTS & DISSCUSION

Anti diabetic plants has an important role in inhibiting the Glucose level thus providing protection to human against hyperglycemia. Realizing the fact this research was carried out to evaluate the anti diabetic activity of aqueous and Methanolic extract of six different plants.

**Phytochemical screening:**

The preliminary Phytochemical screening tests for Methanolic and aqueous plant extract (Table 1) revealed the presence of Alkaloids and Tannins in all plant samples. Where Anthraquinone were absent in all plant samples. Other Phytochemical such as Flavonoids, Glycosides, Reducing Sugar, Saponin were present in most of the plant samples.

**Table 2-** Phytochemical analysis of Methanolic and aqueous extract of plant samples

| Test | Azadirachta indica Leaf Met. | Azadirachta indica Leaf Aq. | Azadirachta indica Bark Met. | Azadirachta indica Bark Aq. | Tinospora cardifolia Met. | Tinospora cardifolia Aq. | Ocimum Sanctum Met. | Ocimum Sanctum Aq. | Curcuma longa Met. | Curcuma longa Aq. | Withania somnifera Met. | Withania somnifera Aq. | Brassica Met. | Brassica Aq. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alkaloids | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Glycosides | - | + | - | - | + | + | - | + | - | + | - | + | + | + |
| Flavonoid | - | - | - | + | - | + | - | + | + | + | + | - | + | + |
| Reducing Sugar | + | - | + | + | - | - | + | - | - | - | + | - | - | - |
| Tannins | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Anthraquinone | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Saponin | - | + | + | + | + | + | + | + | - | - | - | + | - | + |

Where Met. - Methanolic and Aq. - Aqueous.
+ indicate the presence of constituents and ─ indicate the absence of constituents.

Thin layer chromatography was able to separate different Chemical compound having different retention factor (Rf value) present in plant extracts. In the majority of the plants alkaloids and phenoilc compounds are present with single or double spots

While Flavonoids were present in few plants with one or two spots. The Rf values for different spots for different plants extract were determined and results have been tabulated in Table3

Table 3. Chromatography analysis (Rf values) of effective Methanolic plant extracts in selected thin layer chromatography solvent systems.

| Sr. No | Plant Sample (Methanolic) | Alkaloids | | Flavonoids | | Phenol | |
|---|---|---|---|---|---|---|---|
| | | Rf valve | Compound identification | Rf value | Compound identification | Rf value | Compound identification |
| 1. | *Curcuma longa* | 0.81 | Thalictricavine | 0.48,0.47 | Isoflavones,Flavones | 0.36 | Phenolic acid |
| 2N. | *Ocimum Sanctum* | 0.57 | Nantenine | 0.20 | Chalcones | 0.24 | Flavonols |
| 3. | *Azadirachta indica* Leaf | 0.81 | Thalictricavine | Absent | | 0.45 | Flavonols |
| 4. | *Azadirachta indica* Bark | 0.71 | Corydaline | Absent | | 0.534 | Isoquercitrin |
| 5. | *Withania somnifera* | 1 | Not Determined | Absent | | 0.57, 0.61 | Phenolic acid, Flavonols |
| 6. | *Tinospora cardifolia* | 0.27 | Scoulerine | Absent | | Absent | |
| 7. | *Brassica oleracea* | 0.42 | Corydine | 0.57 | Flavonones | Absent | |

**In vitro Alpha Amylase Inhibitory Activity-**

There are many enzymes in the human digestive system that help in the digestion of food. α- Amylase catalyses the breakdown of polysaccharide in to monosaccharide and only monosaccharide form of food only can absorbed in the stomach. It is known that the degradation of starch to glucose in the alimentary canal proceeds rapidly. A few minutes after the ingestion of starch a marked hyperglycemia leading to hyperinsulinaemia is observed. As the concentration of α-Amylase increases the rate of reaction is also increases but the time of reaction decreases because of high concentration of α-Amylase will digest the starch rapidly.

Different plants extract (aqueous and methanol) were prepared using a Soxhlet's apparatus. These extracts were tested for their α-amylase inhibitory activity against porcine pancreatic amylase. Where the aqueous extract of *Withania somnifera* leaf (92.7%) *and* the Methanolic extract of *Ocimum Sanctum* (92.6%) showed higher inhibition against porcine pancreatic α-amylase among the medicinal plants studied followed by *Azadirachta indica* Leaf (90%)and *Azadirachta indica* bark Methanolic (91%) and *Ocimum Sanctum* (90.3%), *Curcuma longa* (90.9%) aqueous. The lowest % alpha amylase inhibition was found in *Withania somnifera* Methanolic (65.1%) and *Azadirachta indica* bark aqueous (77%). [Table 4]

**Table. 4 - % alpha amylase inhibition by different plant extract.**

| S no. | Plant Samples | O.D (Methanolic) | %inhibition of alpha amylase | O.D (aqueous) | %inhibition of alpha amylase |
|---|---|---|---|---|---|
| 1. | *Curcuma longa* | 0.378 | 81.98% | 0.189 | 90.99% |
| 2. | *Ocimum Sanctum* | 0.154 | 92.61% | 0.202 | 90.3% |
| 3. | *Azadirachta indica* leaf | 0.189 | 90% | 0.309 | 85.27% |

| 4. | *Azadirachta indica* bark | 0.183 | 91% | 0.471 | 77% |
| 5. | *Withania somnifera* | 0.732 | 65.1% | 0.153 | 92.7% |
| 6. | *Tinospora cardifolia* | 0.593 | 71% | 0.392 | 81% |
| 7. | *Brassica oleracea* | 0.268 | 87.22% | 0.286 | 86.36% |

**Table. 5 -** % alpha amylase inhibition by Methanolic plant extract.
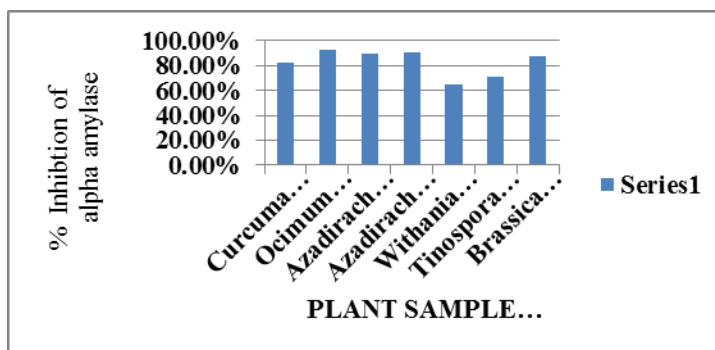


**Table. 6 -** % alpha amylase inhibition by **aqueous** plant extract.
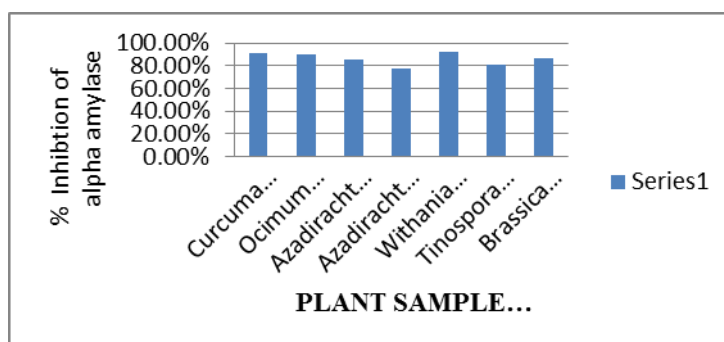


Thus, data presented here indicate that Methanolic extract of *Ocimum Sanctum* and aqueous extract of *Withania somnifera* possesses significant in vitro antidiabetic activity among all other plants. The mechanism by which the plants exerted action may be due to its action on carbohydrate binding regions of α-glucosidase enzyme, α- amylase, endoglucanases that catalyse hydrolysis of the internal α-1, 4 glucosidic linkages in starch and other related polysaccharides have also been targets for the Suppression of postprandial hyperglycemia. This enzyme is responsible in hydrolyzing dietary starch into maltose which then breaks down to glucose prior to absorption. Since α-amylases play an important role in starch break down in human beings and animals, the presence of such inhibitors in food stuffs may be responsible for impaired starch digestion13, 14.

## IV. SUMMARY & CONCLUSION

Herbal products may contain a single herb or combinations of several different herbs believed to have complementary and/ or synergistic effects. Some herbal products, including many traditional medicine formulations, also include animal products and minerals. Herbal products are sold as either raw plants or extracts of portions of the plant. Present study shows that the plants *withania somnifera*, *azadirachta indica*, *curcuma longa, brassica oleracea, tinospora cardifolia, ocimum sanctum* inhibits the activity of alpha amylase (enzyme that breakdown sugar).Since alpha amylase is the enzyme responsible for hyperglycemia by inhibiting its activity the above mentioned plants are having anti diabetic properties. A drug-development programme should be undertaken to develop modern drugs with the compounds isolated from above plants. Although crude extracts from various parts of these plants have medicinal applications. Immemorial, modern drugs can be developed after extensive investigation on bioactivity, mechanism of action, pharmacotherapeutics, and toxicity and after proper standardization and clinical trials. As the global scenario is now changing towards the use of nontoxic plant products having traditional medicinal use, development of modern drugs from these plants should be emphasized for the control of various diseases. In fact, time has come to make good use of centuries-

old knowledge on plants through modern approaches of drug development. An extensive research and development work should be undertaken on these plants and its products for their better economic and therapeutic utilization.

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# Energy Conservation and Audit

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*Abstract*- Energy is one of the major inputs for the economic development of any country. In the case of the developing countries, the energy sector assumes a critical importance in view of the ever-increasing energy needs requiring huge investments to meet them. For reducing cost and increasing efficiency, then use energy conservation, management and audit. The objective of Energy Management is to achieve and maintain optimum energy procurement and utilization, throughout the organization as To minimize energy costs / waste without affecting production and quality. To minimize environmental effects. Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility.

## I. INTRODUCTION

Energy is the ability to do work and work is the transfer of energy from one form to another. Energy comes in different forms - heat (thermal), light (radiant), mechanical, electrical, chemical, and nuclear energy. Coal and other fossil fuels, which have taken three million years to form, are likely to deplete soon. In the last two hundred years, we have consumed 60% of all resources. For sustainable development, we need to adopt energy efficiency measures. Today, 85% of primary energy comes from non-renewable and fossil sources (coal, oil, etc.). These reserves are continually diminishing with increasing consumption and will not exist for future generations In this paper we study energy conservation and energy efficiency by how to reduce energy demand to reasonable minimum Cost, recover and re-use heat where possible and also study use of energy efficient equipment to supply remaining energy demand, and provide a means to manage use of energy and also study energy and environment and study how to carry out energy audit.

### 1. Energy Scenario and energy sources:

Energy can be classified into various types based on following criteria..

- Primary and Secondary energy
- Commercial and Noncommercial energy
- Renewable and Non-Renewable energy

**Primary energy sources** are those that are either found or stored in nature. Common primary energy sources are coal, oil, natural gas, and biomass (such as wood). Other primary energy sources available include nuclear energy from radioactive substances, thermal energy stored in earth's interior, and potential energy due to earth's gravity.

**Secondary energy sources** like steam, electricity are derived from primary energy sources like coal, oil & gases & are suitable for transportation, distribution and control.

**Commercial Energy sources** that are available in the market for a definite price are known as commercial sources that are available in the market for a definite price are known as commercial energy. Commercial energy forms the basis of industrial, agricultural, transport and commercial development in the modern world.

**Non-commercial energy sources** that are not available in the commercial market for a price are classified as Non-commercial energy. Example: Firewood, agro waste in rural areas; solar energy, animal power, wind energy.

**Renewable energy** sources are those that are essentially inexhaustible, like wind power, solar power, geothermal energy, tidal power and hydroelectric power

**Non-renewable energy** is the conventional fossil fuels such as coal, oil and gas, which are likely to deplete with time.

## II. ENERGY CONSERVATION AND EFFICIENCY

### 2.1 Energy conservation:

Energy is defined as the ability to do a work and work is transformation of energy from one form to another and also the energy can neither be created nor destroyed. It includes any behavior that results in the use of less energy.

**Examples** Shut lights off , Don't leave water running, Recycle (bottles, can, papers, glass, etc.) ,Walk or ride a bike ,Open a window in the summer instead of turning on the air conditioning ,use public transportation.

### 2.2 Energy efficiency:

It involves the use of technology that requires less energy to perform the same function. A compact fluorescent light bulb that uses less energy to produce the same amount of light as an incandescent light bulb is an example of energy efficiency. The decision to replace an incandescent light bulb with a compact fluorescent is an example of energy conservation. Driving the same amount with a higher mileage vehicle is an example of energy efficiency.

### 2.3. Need of Energy Conservation:

Fossil fuels like coal, oil that has taken years to form is on the verge of depleting soon. In last 200 years we have consumed 60% of all resources. For sustainable development we need to adopt energy efficiency measures. Today 85% of primary energy sources come from non-renewable and fossil sources. These reserves increasing consumption and will exist for future generations.

Energy survey conducted by **Ministry of Power** in 1992 reveled that there is requirement of improvement in energy generation efficiency, improvement in energy transportation (transmission & distribution systems) and enhancing the performance efficiency of use end apparatus. Study of **'Energy strategies for Future'** evolved two things - efficient use of energy, energy conservation and use of Renewable Energy. Energy conservation emerges out to be the first and least cost option.

### III. Area of application of Energy Conservation

Electrical system is a network in which power is generated using non-renewable sources by conventional method and then transmitted over longer distances at high voltage levels to load centers where it is used for various energy conversion processes. End user sector are identified as three major areas -Power Generating station, Transmission & Distribution systems, and Energy consumers. Consumers are further classified as Domestic, commercial and Industrial consumers.

#### 3.1.EC in Power generating station:

**To** generate 1MW power generation cost is Rs 4.5 to 5.25 cores and T& D cost is Rs.2 cores .But cost of saved power is Rs.1Crores/MW important note is time period to set a power plant is 5 years; to set up transmission line 1 year and to plan energy conservation is only 1 month. We have less opportunity for EC in generating area but we can improve the performance efficiency of generators by optimization of load, optimal distribution of load among different units, periodical maintenance and also increasing the capacity by adopting advanced technology using renewable energy sources.

#### 3.2.EC in Transmission & Distribution:

In India the power transmission and distribution (T&D) system is a three tire structure comprising of state grids, regional grids and distribution network. To meet the energy demand power system networks are interconnected through INTRA-REGIONAL LINK. The inter-regional power transmission capacity of India at end of 2007 was 14000 MW. T&D system in India is characterized by heavy losses of about 34.54% according to statistics of 2005-06, as compared to 10-15% in developed countries Power losses in T&D system can be classified as Technical losses and Commercial losses**.**

#### 3.2.1Technical Losses In T&D System:

Power losses occurring in T&D sector due to imperfection in technical aspect which indirectly cause loss of investment in this sector, are technical losses. These technical losses are due to inadequate system planning, improper voltage and also due to poor power factor etc.

#### 3.2.2Commercial Losses:

Commercial losses are those, which are directly responsible for wastage of money invested in transmission and distribution system. These losses are effects of inefficient management, improper maintenance etc. Corruption is also the main reason contributing to the Commercial losses. Metering losses includes loss due to inadequate billings, faulty metering, overuse, because of meters not working properly and outright theft. Many of the domestic energy meters fail because of poor quality of the equipment.

### IV. Energy conservation techniques

**4.1.1 EC Techniques in Transformers:**
   **i) Optimization of loading of transformer:**
By proper Location of Transformer preferably close to the load center, considering other features like centralized control, operational flexibility etc. This will bring down the distribution loss in cables**.**

   Maintaining maximum efficiency to occur at 38% loading (as recommended by REC), the overall efficiency of transformer can be increased and its losses can be reduced

   Under fluctuating load condition more than one transformer is used in Parallel Operation of Transformers to share the load & can be operated close to the maximum efficiency range

**ii) By Improvisation in Design and Material of Transformer:**
   To reduce load losses in Transformer, use thicker conductors so that resistance of conductor reduces and load loss also reduces.

   To reduce Core losses use superior quality or improved grades of Cold Rolled Grain Oriented (CRGO) laminations.

**iii) Replacing By Energy Efficient Transformers:**
   By using energy efficient transformers efficiency improves to 95 % to 97%.

   By using Amorphous transformers efficiency improves to 97 % to 98.5%.

   By using Epoxy Resin cast/ Encapsulated Dry type transformer- efficiency improves to 93 % to 97%.

**4.1.2Energy Conservation in Transmission Line:**
   To reduce line resistance-„R" solid conductors are replaced by stranded conductors (ACSR or AAC) and by bundled conductors in HT line.

   High Voltage Direct Current (HVDC) is used to transmit large amount of power over long distances or for interconnections between asynchronous grids By transmitting energy at high voltage level reduces the fraction of energy lost due to Joule Heating. (V α1/I so I 2 R losses reduces). As load on system increases terminal voltage decreases. Voltage level can be controlled by using voltage controllers and by using voltage stabilizer if required reactive power transmitted through Transmission lines, it causes more voltage drop in the line. To control receiving end voltage, reactive power Controllers or reactive power compensating equipment's such as Static VAR controllers are used.

**4.1.3. Energy Conservation In Distribution Line:**
   **a) Optimization of distribution system:** The optimum distribution system is the economical combination of primary line (HT), distribution transformer and secondary line (LT), to reduce this loss and improve voltage HT/LT line length ratio should be optimized.

   **b) Balancing of phase load-** As a result of unequal loads on individual phase sequence, components causes over heating of transformers, cables, conductors, motors. Thus, increasing losses

and resulting in the motor malfunctioning under unbalanced voltage conditions.

**c) Harmonics:** With increase in use of non-linear devices, distortion of the voltage and current waveforms **occurs**, known as Harmonics. Due to presence of harmonic currents excessive voltage and current in transformers terminals, malfunctioning of control equipment's and Energy meter, over effect of power factor correction apparatus, interference with telephone circuits and broad casting occurs. Distribution Static Compensator (DASTACOM) and Harmonic filters can reduce this harmonics.

**d) Energy Conservation by using power factor controller:**

Low power factor will lead to increased current and hence increase losses and will affect the voltage. We can use Power Factor Controller or Automatic Power.

**4.1.4 Energy Conservation In Lighting system:**

Good lighting is required to improve the quality of work, to reduce human's / worker's fatigue, to reduce accidents, to protect his eyes and nervous system. In industry it improves production, and quality of products / work.

**a) Optimum use of natural light:** Whenever the orientation of a building permits, day lighting has to be used in combination with electric lighting. The maxim use of sunlight can be get by means of transparent roof sheets, north light roof, etc.

**b) Replacing incandescent lamps by Compact Fluorescent Lamps (CFL's):** CFL's are highly suitable for places such as Living rooms, Hotel lounges, Bars, Restaurants, Pathways, Building entrances, Corridors, etc.

**c) Replacing conventional fluorescent lamp by energy efficient fluorescent lamp:** Energy efficient lamps are based on the highly sophisticated technology. They offer excellent color rendering properties in addition to the very high luminous efficacy.

**d) Replacement of conventional ballast by Electronic ballast:** Installation of high frequency (28 –32Mhz) electronic ballast in place of conventional ballasts helps to reduce power consumption up to 35%.

**e) Installation of separate transformer for lighting:** In most of the industries, the net lighting load varies between 2 to 10%. If power load and lighting load fed by same transformer, switching operation and load variation causes voltage fluctuations. This also affects the performance of neighboring power load apparatus; lighting load equipment's and also reduces lamps. Hence, the lighting equipment has to be isolated from the power feeders. This will reduce the voltage related problems, which in turn provides a better voltage regulation for the lighting this also increases the efficiency of the lighting system.

**f) Installation of servo stabilizer for lighting feeder:** Wherever, installation of separate transformer for lighting is not economically attractive and then servo stabilizer can be installed for the lighting feeders.

**g) Control over energy consumption pattern:** Occupancy Sensors, Daylight inked Control are commonly used in commercial buildings, malls, offices, where more no. Of lights are to be controlled as per operational hours microprocessor based Light control circuits are used. As a single control unit it can be programmed to switch on /off as per the month wise, year wise and even season wise working schedule.

**4.1.5 Energy Conservation in Motors:**

Considering all industrial applications 70% of total electrical energy consumed by only electric motors driven equipment's.

**a. Improving power supply quality:** Maintaining the voltage level within the BIS standards i.e. with tolerance of +/- 6%and frequency with tolerance of +/-3% motor performance improves and also life.

**b. Optimum loading:** Proper selection of the rating of the motor will reduce the power consumption. If the motor is operating at less than 50% of loading ($\eta < 50\%$) significant power saving can be obtained by replacing with properly sized high efficiency motors. If the motor is operating at loads below 40% of it's capacity, an inexpensive and effective measure might be to operate in star mode.

**c. Improving transmission efficiency:** Proper selection of power transmission means (belts, gears) will reduces transmission losses.

**d.** Stopping idle or redundant running of motors or lights will save 100% power.

**e. By use of Soft Starter:** Soft starters are essentially stator voltage controllers; helps to overcome above problem. It helps to **restrict** starting current and also provide smooth start and stop operation.

**f.By improving power factor:** For improving p.f.connect the capacitor bank, which will improve the p.f. of the system from installation to generating station. Maximum improvement in overall system efficiency is achieved, which also reduces Max. Demand of the system and that will reflect in energy bill.

**g. Use of high efficiency or Energy efficient motors**
The energy efficient motors have reduced losses through improved design, better materials and improved manufacturing techniques. Generally motor life doubles for each 10 0C reduction in operating temperature. While selecting EEM, select with 1.15service factor, design for operation at 85% of rated load.

## V. ENERGY AND ENVIRONMENT

The usage of energy resources in industry leads to environmental damages by polluting the atmosphere. Few of examples of air pollution are sulphur dioxide (SO2), nitrous oxide (NOX) and carbon monoxide (CO) emissions from boilers and furnaces, chloro-fluro carbons (CFC) emissions from refrigerants use, etc.

**5.1 Evolutionary Trends in Pollution Problems**

In both developed and rapidly industrializing countries, the major historic air pollution problem has typically been high levels of smoke and SO2 arising from the combustion of sulphur-containing fossil fuels such as coal for domestic and industrial purposes.

Smog's resulting from the combined effects of black smoke, sulphate / acid aerosol and fog have been seen in European cities until few decades ago and still occur in many cities in developing world. In developed countries, this problem has significantly

reduced over recent decades as a result of changing fuel-use patterns; the increasing use of cleaner fuels such as natural gas, and the implementation of effective smoke and emission control policies. Traffic pollution problems are worsening world-wide. The problem may be particularly severe in developing countries with dramatically increasing vehicle population, infrastructural limitations, and poor engine/emission control technologies and limited provision for maintenance or vehicle regulation.

## 5. Energy Management:

The fundamental goal of energy management is to produce goods and provide services with the Least cost and least environmental effect.

Or "The strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems"

**5.1 The objective of Energy Management** is to achieve and maintain optimum energy procurement and utilization, throughout the organization and:

• To minimize energy costs / waste without affecting production & quality

• To minimize environmental effects.

## VI. ENERGY AUDIT

As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption".

## 6.1 Aim of Energy audit (need)

- to minimize costs for energy
- to minimize operational costs
- to minimize costs for repairs and reconstruction
- to increase quality of environment that contributes to increased work productivity

## 6.2 Ten Steps Methodology for Detailed Energy Audit

### Phase I –Pre Audit Phase

| Step No | Plan of action | Purpose/Results | |
|---------|----------------|-----------------|---|
| Step 1 | • Plan and organize<br>•Walk through Audit<br>•Informal Interview with Energy Manager, Production / Plant Manager | •Resource planning, Establish/organize a Energy audit team<br>• Organize Instruments & time frame<br>• Macro Data collection<br>• First hand observation & Assessment of current level operation and | |

| | | practices | |
|---|---|---|---|
| Step2 | •Conduct of brief meeting / awareness programme with all divisional heads and persons concerned (2-3 hrs.) | •Building up cooperation<br>• Issue questionnaire for each department<br>• Orientation, awareness creation | |

### Phase II –Audit Phase

| Step 3 | •Primary data gathering, Process Flow Diagram, & Energy Utility Diagram | •Historic data analysis, Baseline data collection<br>• Prepare process flow charts<br>• All service utilities system diagram<br>•Design, operating data and schedule of operation<br>• Annual Energy Bill and energy consumption pattern (Refer manual, log sheet, name plate, interview) |
|---|---|---|
| Step 4 | •Conduct survey and monitoring | •Measurements : Motor survey, Insulation, and Lighting survey with portable instruments for collection of more and accurate data. Confirm and compare operating data with design data |
| Step 5 | •Conduct of detailed trials /experiments for selected energy guzzlers | •Trials/Experiments: 24 hours power monitoring (MD, PF, kWh etc.).<br>•Load variations trends in pumps, compressors etc.<br>•Boiler/Efficiency trials for (4 – 8 hours) |

| Step 6 | •Analysis of Energy Use | •Energy and Material balance & energy loss/waste analysis |
|---|---|---|
| Step 7 | •Identification and development of Energy Conservation (ENCON) opportunities | •Identification & Consolidation ENCON measures •Conceive, develop, and refine ideas Review the previous ideas suggested by energy audit if any •Use brainstorming and value analysis s •Contact vendors for new/efficient technology |
| Step 8 | •Cost benefit analysis | •Assess technical feasibility, economic viability and prioritization of ENCON options for implementation •Select the most promising projects |
| Step 9 | •Reporting & Presentation to top management | •Documentation, Report Presentation to the top management |

**Phase III** –Post Audit phase

| Step 10 | •Implementation and Follow-up | Assistant implement ENCON recommendation measures and Monitor the performance •Action plan, Schedule for implementation •Follow-up and periodic review | |
|---|---|---|---|

## VII. CONCLUSION

Everything what happens in the world is the expression of flow of energy (Electrical) in one of its forms. In development process to cope with increasing energy demands, conservation and energy efficiency measures are two parallel paths.

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# Study of Activity of Some Medicinal Ferns of Darjeeling

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**Abstract:** The present aim is to study of some medicinal ferns having antimicrobial activity and commonly found around the area of district Darjeeling of West Bengal, India. Common medicinal ferns from several areas of Darjeeling district are collected and tested against Gram +ve and Gram –ve bacteria for their antimicrobial activity. Collected plant materials are dried and the soluble extracts are made using organic solvent like ethanol . Antimicrobial activities are measured using agar cup diffusion method. Greater the area of inhibition zone indicates the presence of good potentiality of antimicrobial activity. Antimicrobial activity of three plant parts like rhizome, rachis and frond extracts of *Athhyrium filix-femina*(L.)Roth*., Dicranopteris linearis(*Burm.f.)Underw*., Pleopeltis macromarpa* (Bory ex Willd.)Kaulf. are tested. Frond and rhizome extracts of these species show good antimicrobial activity than rachis. .

**Key words**- Antimicrobial, rachis, rhizome, frond, extract, gram(+)ve and gram(-)ve.

## I. INTRODUCTION

In Darjeeling district of West Bengal, a large number of tribals are inhabiting and they use folk medicines to cure their ailments. They provide a good traditional knowledge regarding the use of folk medicine of Darjeeling district having a rich biodiversity. Present aim is to study and gain knowledge of medicinal ferns used by these tribals for treatment of their various ailments. For my present work three common ferns such as *Athhyrium filix-femina., Dicranopteris linearis* and *Pleopeltis macromarpa,* are collected based on the ethnomedicinal knowledge of tribals of Darjeeling district and tested against the antimicrobial activities. It needs to study the various parameters like climatic condition, plant parts for use, processing of materials having therapeutic activity as well as their chemical nature . The voucher specimens are verified from the specimens present in the herbarium of Lloyd Botanic Garden of Darjeeling.

In ancient Indian medicine several ferns were used. A systematic survey of antimicrobial activity of ferns has been made by Banerjee & Sen (1980), Sen & Nandi (1981). They found that the fern extracts are effective against both gram +ve and gram –ve bacteria. Glands of superficial hairs on leaves and rhizome contain chemicals that are found to have antimicrobial activity.

Medicinal ferns of India are studied and listed by Nayer (1959), Josh (1997), Dhiman(1998), Singh et al(2001). Kirtikar et al(1935) have described 27 species of ferns having varied medicinal uses. Nayar(1959) recorded 29 medicinal ferns. May(1978) published a detailed review the uses of ferns and listed 105 medicinal ferns. The antimicrobial potential of some ferns has also been studied by Kumar and Kuushik(1999),Parihar and Bohar(2002&2003).

## II. MATERIAL AND METHODS

Fresh specimens of ferns rhizome rachis and frond are collected from different places of Darjeeling district, W.B. The specimens are then dried at $40^0$ C in Hot-air-oven for 3-5 days. The dried specimens are powdered. Rhizome, rachis and frond extracts are made from powdered specimens in organic solvent ethanol. For each specimen and for each extraction 5 gm. powder is taken in three conical flasks(100ml) to which 20 ml solvent is poured respectively. The mouth of flasks are tightly plugged with non-absorbent cotton and sealed with grease to prevent evaporation. Then the flasks are placed in a shaker for about 24 hours at room temperature$37^0$ C. After shaking for 24 hours, the extracts are filtered using Whatman No-1filter paper.

The filtered extracts are tested for antimicrobial activities against both gram +ve and gram –ve bacteria on nutrient agar plate by disc diffusion method (Baur et al 1966). The bacterium *E.coli* is taken as standard gram –ve specimen and the bacterium *Bacillus megaterium* is taken as standard gram +ve specimen for testing the antimicrobial activity.

In present experiment fresh bacterial culture solution having concentration $10^6$ cells/ml is taken and discs of 6mm in diameter are made on nutrient agar plate for diffusion assay. Sterile distilled water is used as control. After incubation for 24 hours at $37^0$ C, the diameter of inhibition zones are measured and analyzed. Three replicates are made for each set of experiment.

Protein is determined by the method of Lowry et al (1951)

### III. RESULTS

The result of antibacterial activity of three selective ferns *Athhyrium filix-femina., Dicranopteris linearis* and *Pleopeltis macromarpa,* are shown in table no.1,2and 3.The results show the well antimicrobial activity for both Gram( +)ve and gram(-)ve bacteria. The rhizome and frond extracts of these three ferns show good antibacterial activity. It indicates that the antibacterial substances present in rhizome and frond are in good amount. The best antimicrobial activity is found in frond and rhizome extracts of these species. Rachis extracts also show antimicrobial activity but in less amount than frond extracts.

In *Athyrium filix-femina,* highest activity for Gram(-)ve bacteria is found in rhizome extract. Rachis extract is less effective. A good antimicrobial activity against Gram (-)ve bacteria is also found in frond extract. All these extract are less effective for Gram(+)ve bacteria.

In *Dicranopteris linearis* highest activity for both gram(-)ve and gram (+)ve bacteria is found in rhizome extract. Rachis extract is less effective. Frond extract also shows a good effective for both gram (-)ve and gram (+)ve bacteria.

In *Pleopeltis macromarpa* the highest activity for both gram(+)ve and gram(-)ve bacteria is found in frond extract. Rachis extracts are less effective. The rhizome extract also shows good activity against both gram(+)ve and gram (-)ve bacteria.

**Table-1.Antibacterial activity of** *Athyrium filix-femina*

| Name of the test organism. | Zone of inhibition | | | | | |
|---|---|---|---|---|---|---|
| | Rhizome | Rachis | Frond | Control(mm) | | |
| *Escherichia coli* | 10.0mm | 8.2mm | 9.7mm | A | M | E |
| | | | | 6.3 | 6.2 | 6.2 |
| *Bacillus megaterium* | 8.8mm | 7.8mm | 8.5mm | 6.4 | 6.3 | 6.3 |

**Table-2. Antibacterial activity of** *Dicranopteris linearis*

| Name of the test organism | Zone of inhibition | | | | | |
|---|---|---|---|---|---|---|
| | Rhizome | Rachis | Frond | Control(mm) | | |
| *Escherichia coli* | 10.6mm | 9.6mm | 10.4mm | A | M | E |
| | | | | 6.3 | 6.2 | 6.2 |
| *Bacillus megaterium* | 10.5mm | 9.0mm | 10.2mm | 6.4 | 6.3 | 6.3 |

**Table-3.Antibacterial activity** *Pleopeltis macromarpa.*

| Name of the test organism | Zone of inhibition | | | | | |
|---|---|---|---|---|---|---|
| | Rhizome | Rachis | Frond | Control(mm) | | |
| *Escherichia coli* | 10.8mm | 10.2mm | 11.5mm | A | M | E |
| | | | | 6.3 | 6.2 | 6.2 |
| *Bacillus megaterium* | 10.4mm | 10.0mm | 11.2mm | 6.4 | 6.3 | 6.3 |

**Table-4: Study of p$^H$ value range of extracted samples:**

| Name of the specimens | P$^H$ value of the extracts | | |
|---|---|---|---|
| | Rhizome | Rachis | Frond |
| . *Athyrium filix-femina* | 7.0 | 6.8 | 6.8 |
| *Dicranopteris linearis* | 7.2 | 7.2 | 7.0 |
| *Pleopeltis macromarpa* | 7.2 | 7.0 | 7.0 |

**Table-5: Study of protein value of extracted samples**

| Name of the specimens | Protein value of the extracts(mg\ml) | | |
|---|---|---|---|
| | Rhizome | Rachis | Frond |
| *Athyrium filix-femina* | 0.066 | 0.0048 | 0.0046 |
| *Dicranopteris linearis* | 0.054 | 0.0034 | 0.0032 |
| *Pleopeltis macromarpa.* | 0.060 | 0.0038 | 0.0037 |

## IV.  DISCUSSION

The rhizome, leaf blade and rachis of ferns are covered by glands densely. These epidermal glands(Manikam,2002) contain substances like phenolic compounds, glycosides, flavonoids. and alkaloids(Alcaraz et al,2000,Cushnie and Lamb,2005, Yusuf,1994). These substances are largely responsible for the antimicrobial activity and are being soluble in organic solvents easily extracted in methanol, ethanol and acetone but less soluble in water(Adedapo et al,2009, Banerjee and sen1980)

The present results show the good antimicrobial activity of three species indicating the presence of good amount substances like phenolic compounds, glycosides, flavonoids and alkaloids. These observations are good agreement with the findings of  Sen and Nandi(1951), Banerjee and Sen(1980), Natarajan et al(2005). The antimicrobial activities of the ferns are also in agreement with the common usage of ferns in folk medicine for bacterial infection such as infection of throat, boil, ulcer and in wound healing(Banerjee and Sen 1980), tumour(Creasey 1969),dermatophytes(Davvamani et al 2005).

The antibiotic spectra of three ferns cover both gram positive and gram negative bacteria. These observations provide support that the ferns produce a variety of antimicrobial substances. It is necessary to keep in mind that the factors like climatic condition, nature of plant parts, age of plant at the time of collection etc are also responsible for the enhancement of the activity of the antimicrobial substances and it needs to be studied more in details.

The amount of protein present in the extracts show little variation though antimicrobial activities show wide variation among the specimens. It indicates that proteins may have little effect on antimicrobial activities.

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# Assessing the Effect of Implementing Mathematics History with Algebra

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**Abstract-** This paper presents the outcomes of the impact assessment of the history of Algebra over the period 2012-2013, carried out between June 2012 and March 2013. The analysis was performed using a methodology based on the triangulation of information arise from different actions: desk study, assessment of partakers and statistical data analysis.

**Index Terms**- History, History of mathematics, History of Algebra, Historiography

## I. INTRODUCTION

The purpose of this research was to assess the effect that lessons involving the history of mathematics would have been on motivating students. Research indicates that student interest in mathematics is a sign of student success. Globally, the use of history to enrich mathematics teaching has grown in popularity.

A review of literature has been included to show that algebra has grown through a motivating, interrelated history of individuals and philosophies. Some scholars sustain the stages of this history correlate with the way of students-learning. Other educationalists who have implemented history in the classroom found positive influences on student attitude.

This paper included personal ideas, were tested in various classrooms during the 2012-2013. The pre/post student surveys were given to measure any change in attitudes and to give specific feedback on student feelings about using history in Algebra. Statistical analyses show that the pupils who were viewing to the history had a more positive attitude of mathematics than those who were not given the history lessons.

## II. METHODOLOGY

### 2.1 Procedures

One hundred sixty students of a particular science college at Indore were asked if they could take fifteen minutes and complete a survey. The undergraduates were first requested to read and sign a consent form (see Appendix A). The signed consent forms were then placed into a packet so the names of each of the students would remain confidential. They were asked to read the directions and answer the questions as honestly as they possibly could. It was brought to their attention again that their answers will be kept completely confidential and their names could not be matched with their answers. All of the participants were tested under the same basic conditions. They were asked to complete the survey in their regular class rooms.

After the students finished and fill out the rest of the survey, they were all thanked for helping me with my research work.

### 2.2 Literature Review

One idea that has gained momentum in the past few decades is teaching mathematics through history. Many researchers acknowledge the importance of history of mathematics in mathematics teaching and learning.

In 1985, D' Ambrosio indicated that the study of mathematical evolutions from the peoples' and cultures' may be used to help people in their lives, and how it is or was used by different cultures. Katz (1993) pointed out that history of mathematics can help students understand the origin of this science and how it evolved. Garner (1996) concluded that "the study of history is essential for those who would attempt to teach mathematics." According to Harakbi (1994), a "retrospective look at the historical development of mathematics allows the teacher to refresh and deepen both the understanding of a specific topic and ethical ways of presenting it. Zaslavsky (1994) pointed out that the students have minimum opportunities to understand the origins of mathematics and the role of the various peoples in its creation. Ascher and D'Ambrosio (1994) indicated that the lack of any emotion in mathematics lead to the dislike of the subject on behalf of the students. Bishop (2001) indicated the explicit value teaching that is possible to take place in a mathematics classroom. Acknowledging the values that may emerge can give the mathematics teachers the chance to be mathematics educators and not just trainers. In this way they may also contribute to the moral and spiritual growth and maturation of their students. Shirley (2006) supports that it can be used to teach students the mathematics that needs to be covered according to the curricula and at the same time inform the students about the contributions and the practices of the various cultures around the world. The work of Lawrence (2006) revealed that using history when teaching mathematics to students may help in the increase of the students' motivation, initiatives for investigations and communication skills. Radford and Puig (2007) support that teachers' awareness and use of historical sources may facilitate the understanding of their students. Anderson's (2010) work revealed that using material related to the students' reality may not only introduce connections between mathematics and societal issues, but also help students achieve agency and social empowerment. Rogers and Fairchild (2010) worked with students on solving quadratic equations using the Mesopotamian and early Hindu method that later lead to the completion of the square. The students' attention and participation had increased and Rogers and Fairchild (2010) pointed out that looking at a problem from an historical

perspective, reveals aspects such as estimation, explanation and simplification.

## 2.3 Questionnaire survey and statistical data analysis

A data was collected and compiled for statistical analysis on scientific basis. The objective of the data analysis was also generating some creative and informative indicators. The purpose of the survey was to gather views on the impact of the history teaching in algebra. The data used for this purpose is a combination of data provided directly by the survey and the literature review. In the survey, almost 160 students answered, which makes a 67% gross response rate. Given the short period of time we can consider it is a very good rates of evaluation studies. After leaning the answers database, 196 answers have been taken into account for the analysis of results, which makes a fairly 63% net answer rate.
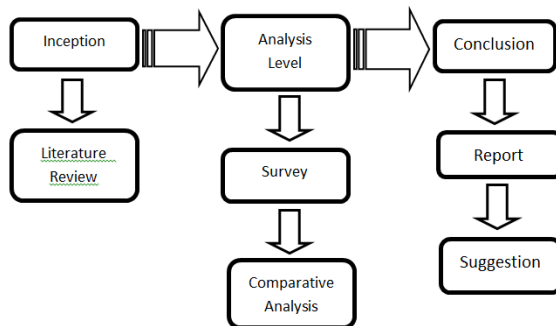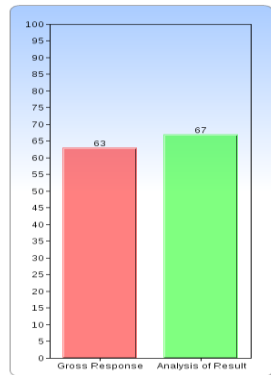




**Figure 1: Flow of the analysis**

## 2.4 Comparative analysis

The purposes of the comparative analysis were:
▪ To assess the effectiveness of the implementing mathematics history in comparison to present teaching technique.

The comparative analysis was grounded on the following:
▪ The review of the completed survey and evaluations,
▪ The review of literature and documents available online,
▪ The review of assessable data from this research work and their results.

In this section we cover the evaluation questions related to the effectiveness of implementation of history of mathematics with algebra i.e. to what extent this work contributed to reaching the overall objective of enhancing algebra teaching through research and technological development activities. We analyse the extent to which work have achieved their specific objectives and hereby contributed to reaching the objectives of these work. From our analysis, it appears that in general, this work has been effective in:
▪ Enlightening and firming up the links between the history of mathematics and algebra.

▪ Enabling and increasing mutual learning between the partakers,
▪ Effectiveness of teaching when it includes history of mathematics to algebra.
▪ And, whenever it was our objective, contributing to improve learning of algebra.

## III. CONCLUSIONS

A key result of this work is the strengthening and expansion of learning algebra. In addition, the establishment of new relationships of algebra with history of mathematics. The work has focused on supporting teaching of algebra with a pre-existing relatively strong research capacity. Most Participants are drawn notably from the graduation level. When coming to the conclusion of this work, outcomes reveal the prominence of use of history of algebra.

After the survey, we describe how including history in mathematics can be beneficial for undergraduates, instructors, prospectus makers and researchers in different ways. We give a number of logic frequently mentioned to illustrate this:

• Students can experience the subject as a human activity, discovered, invented, changed and extended under the influence of people over time. Instead of seeing mathematics as a ready-made product, they can see that mathematics is a continuously changing and growing body of knowledge to which they can contribute themselves. Learners will acquire a notion of processes and progress and learn about social and cultural influences.

• History accentuates the links between mathematical topics and the role of mathematics in other disciplines, which will help to place mathematics in a broader perspective and thus deepen students' understanding.

• History of mathematics provides opportunities for getting a better view of what mathematics is. When a teacher's own observation and understanding of mathematics changes, it affects the way mathematics is taught and consequently the way students perceive it. Teachers may find that information on the development of a mathematical topic makes it easier to explain or give an example to students. For instance, heuristic approaches provided by history can be contrasted with more formal, contemporary methods. In addition it is believed that historical knowledge gives the teacher more insight in different stages of learning and typical learning difficulties. On a more personal level, history also helps to sustain the teacher's interest in mathematics.

• Not only the mathematics teacher but also the educational developer or researcher can profit from history in studying subject matter and learning processes. It provides teachers and developers with an abundance of interesting mathematical problems, sources and methods which can be used either implicitly or explicitly. A short study of mathematical history is sufficient to conclude that its development is not as consistent as this law would require.

- In other words, we can find history helpful in designing a hypothetical learning trajectory and use parts of it as a guideline. For instance, Harper (1987) argues that algebra students pass through different stages of equation solving, using more sophisticated strategies as they become older, in a progression similar to the historical evolvement of equation solving. Harper pleads for more awareness of these levels of algebraic formality in algebra teaching.

## IV. RECOMMENDATIONS

Recommendations have been developed based on the conclusions of this research. They are presented below according to the survey:

- Use of history of mathematics is more beneficial in the study of algebra.
- It is recommended that the use of history of mathematics with algebra will improve the efficiency of teaching technique.

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# Development and Try Out of Computer Program of "Circle" in Mathematics in Class IX

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## I. INTRODUCTION

"Mankind is now in the midst of the Fourth Revolution in Education- The Age of Electronic Media, which consists of radio, television, computer and so on"

**-Eric**

The word "Computer" is derived from the word "to compute", which means 'to calculate'. Therefore, many people think that a computer is just another calculating machine- a fast calculator. But it is much more than that. It is not just a fast calculating device. It can perform a variety of different operations apart from arithmetic calculations. A computer is now regarded as a multi-purpose tool that is constantly evolving. It can be used also used for knowledge sharing. It can be used to handle audio and video information. It can also be used for communicating messages. Thus, it can be used for a variety of different purposes. Early computers were used to perform arithmetic calculations at fast speed, but now they are used in almost all to represent facts, things, concepts of our life. A computer can be defined as a machine that receives some kind of data, process it, and produces some kind of output. Computers perform data processing under the direction of instructions given by us. These instructions can be stored in a computer. A computer is a machine that can solve problems for us by executing instruction given to it. In this era of technology revolution and with a great boom in the field of information technology, knowledge of computers becomes very essential for every one. Information technologies have played a vital role in higher education for decades.

Computer is an interesting innovation in Educational Technology. Its marvels have been demonstrated and seem to revolutionize the whole spectrum of education. It has better flexibility and more versatility than any of the teaching machine. It can cater to the individual needs of many students at a time and record all the responses of all the pupils with reliability. A learner can make progress at one's pace, receive and choose the material, sequencing and level of instruction freely. The teacher can be relived from the daily routine and monotonous drilling activities. It has been experimentally proved that any lesson in any subject can be programmed and learning materials can be represented in words, visuals and experiments. The course is broken up into small elements of information which the computer presents one by one. But it has yet to be fully integrated into the learning process.

A good amount of information stored in the computer is made available to the learner more readily than by any other media. But judicious pre-planning and careful programming are essential for this. In the multimedia-based interactive learning, the media is the instructor and the emphasis is on self-learning. The study attempts to ascertain how best a teacher can use the computer to improve learning in the classroom.

## II. OBJECTIVES OF THE STUDY

The present research was carried out with the following main objectives:

3) To develop computer program on unit "CIRCLE" in the subject of Mathematics for std IX students, studying GSEB syllabus.
4) To study how far the computer helps the students to understand the basic concepts of Mathematics.
5) To study the relative effectiveness of teaching mathematics in terms of two methods of teaching Mathematics i.e. conventional method of instruction and Computer program for the students of Traditional group & Experimental group.
6) To study the opinions of the students of Experimental group regarding effectiveness of used Computer program Mathematics.

## III. HYPOTHESES OF THE STUDY

The present research was of experimental type and so the researcher had formed the following null hypotheses:

- There will be no significant difference between the mean scores of pre-test & post test of the students of Experimental group.
- There will be no significant difference between the mean pre test scores of the students of Traditional group & Experimental group.
- There will be no significant difference between the mean post-test scores of the students of Tradition group & Experimental group.
- There will be no favorable opinions of the majority of students of Experimental group about the used of Computer program in Mathematics.

## IV. IMPORTANCE OF THE STUDY

The importance of the research is as follows:

[9] Keeping in mind the more numbers of students in the classroom, it is but natural that the lecture cum narration method may not fulfill the individual needs and speeds of the students.

[10] The students will develop the confidence to learn individually.
[11] It is our common experiences that self-learning is more effective and more productive compared to any other teacher-centered method.
[12] It is very useful for slow learners as they can learn at their own speed.
[13] Even in the absence of teacher the students can learn through such computer programs.
[14] The programs which have been recorded can be stored, retrieved and used repeatedly.
[15] The researcher believes that the present study will be very useful for both the students and the teachers.

## V.  POPULATION AND SAMPLE

The present research was meant for the students of Gujarati medium schools of standard IX studying the syllabus of Gujarat State Board of School Textbooks, Gandhinagar. Therefore, for the present research, the population was all the students of standard IX of Gujarati medium schools of Gujarat state.

The main purpose of the research was to check the effectiveness of Computer program in Mathematics and to study how far this material helps the students to learn themselves. The researcher used purposive sampling technique for selecting the city and the school. For it the researcher selected the school: M.B.M Convent High School, Bardoli. Two groups, each of 32 students were formed. Thus, Total 64 students were selected from the school. Two groups were equated on the basis of I.Q. test.

## VI.  RESEARCH DESIGN

The present study was developmental cum experimental in nature and consisted of two parts. The first part consisted of development of the Computer program on one chapter: CIRCLE of Mathematics of standard IX. The second part of the study was concerned with measuring the effectiveness of the developed computer program. In order to study the effectiveness of the developed computer program the pre-test post-test control group design was employed.

**EXPERIMENTAL OUTLINE**



Experimental group → Traditional group →

Stage – I
Stage – II

Pre-test

Teaching

Experimental group

Traditional group

Teaching through Computer Program

Teaching Through Traditional method

Stage- III
Stage – IV

Post-test

Opinionnaire
(Only for experimental group)
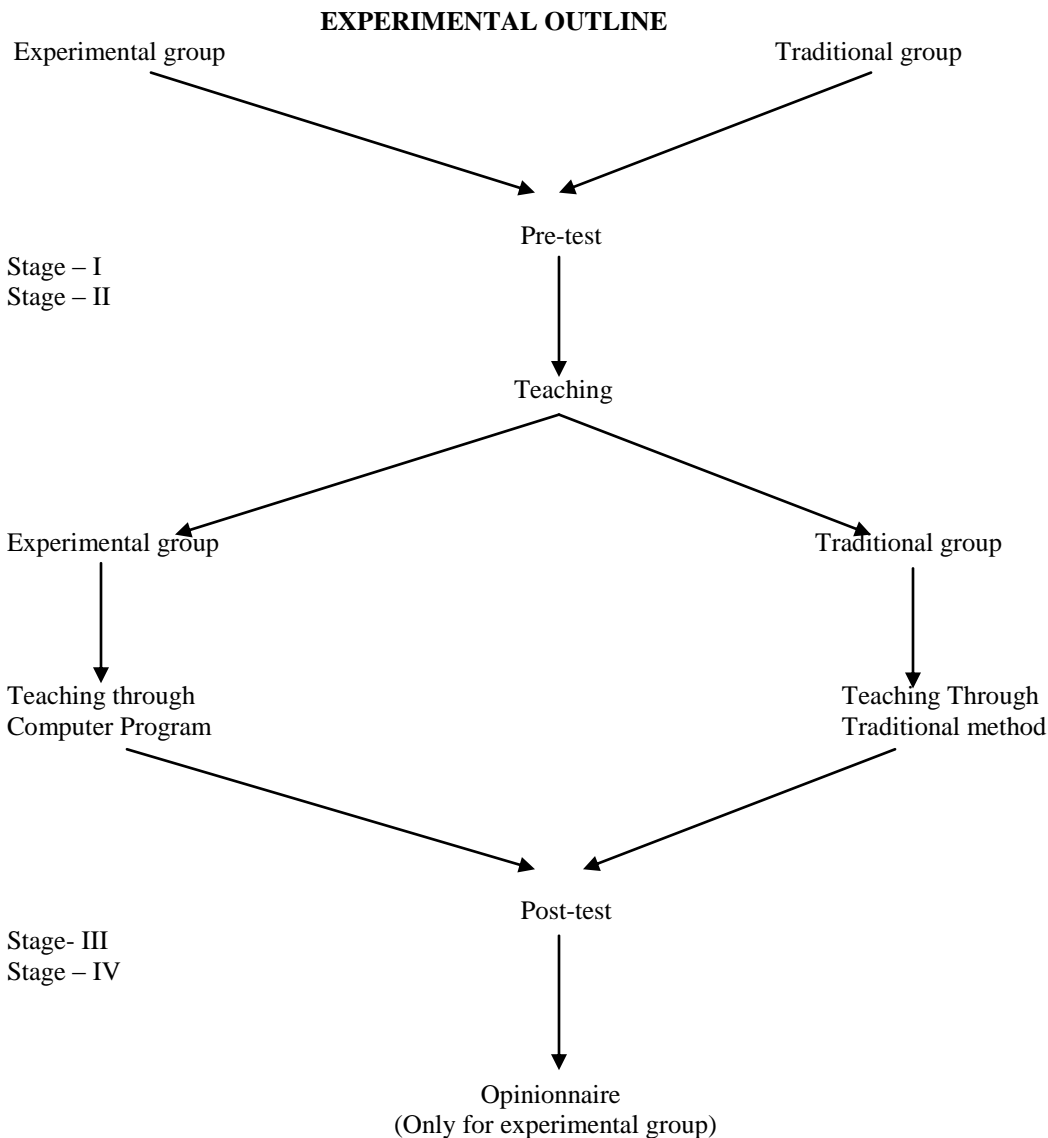
## VII.  DATA COLLECTION

The main field experiment was conducted in M.B.M Convent HighSchool of Bardoli, D- Surat. Two equivalent groups of students of standard IX were formed based on their scores of Intelligence test. The pre-test post-test control group design was used in the present study to find the effectiveness of the computer program. Total sixty-four students participated in experiment. Thirty two students in traditional group and thirty two students in experimental group. Before the Experiment was started the students were pre-tested on a criterion test to find out their knowledge about the content. The students of traditional group were taught through traditional teaching method and the students of experimental group were taught through the computer program. All the participants were post-tested on the same criterion test. For the qualitative evaluation of computer program, an opinionnaire was given to the students of experimental group.

## VIII.  STATISTICAL TECHNIQUES USED FOR DATA PROCESSING

There are various statistical techniques to analyze the data collected during research. The present study is experimental research. Hence for the analysis and interpretation of data the statistical technique 't'-test was employed. For the analysis and interpretation of data obtained from opinionnaire, chi-square test was employed.

### ANALYSIS OF DATA

**Table 1: Comparison of the Statistics for Pre-test & Post-test of Experimental Group**

| Statistics | Pre-test | Post-test | 't'-value | Level of significant |
|---|---|---|---|---|
| Number of Students | 32 | 32 | 23.683 | significant |
| Mean | 10.4375 | 27.75 | | |
| Standard Deviation | 3.22 | 5.85 | | |
| Correlation(r) | 0.7294 | | | |
| Standard Error Of Mean | 0.731 | | | |

The obtained 't' – value of the Experimental group ( M.B.M.Convent Highschool ) was 23.683 which was more than 0.05 level value 1.96 and 0.01 level value 2.58 with df = 62. Thus the null hypothesis that there is no significant difference between the pre-test and the post-test was not retained. In other words, there was a statistically significant difference between the mean scores of the pre-test and the post-test.

The significant difference between the pre-test and the post-test score was because of the Computer Assisted Instruction. From this it can be said that the learning through CAI was remarkably useful.

**Table 2**
**Comparison of Statistics for pre-test of Traditional Group & Experimental Group :**

| Statistics | Traditional Group | Experimental Group | 't'-value | Level of significance |
|---|---|---|---|---|
| Number of students | 32 | 32 | 2.8579 | significant |
| Mean | 12.625 | 10.4375 | | |
| Standard Deviation | 2.8932 | 3.2222 | | |
| Standard error of Mean | 0.7654 | | | |

The obtained 't'-value was 2.8579 which is greater than 0.05 level value 1.96 and at 0.01 level value 2.58 with df=62.

The obtained 't'-value is significant at 0.05 level and 0.01 level. Thus the null hypothesis that there is no significant difference between the pre-tests of both groups was rejected. In other words, statistically there is significant difference between mean scores of the pre-tests of Traditional Group-I & Experimental Group

Hence it can be proved that Traditional Group is statistically good than Experimental Group before treatment.

**Table 3**
**Comparison of Statistics for post-test of Traditional Group & Experimental Group:**

| Statistics | Traditional Group | Experimental Group | 't'-value | Level of significance |
|---|---|---|---|---|
| Number of students | 32 | 32 | 5.6859 | significant |
| Mean | 19.531 | 27.75 | | |
| Standard Deviation | 5.711 | 5.8530 | | |
| Standard error of Mean | 1.4455 | | | |

The obtained 't'-value is 5.6859 which is significant at 0.05 level and 0.01 level. Thus the null hypothesis that there is no significant difference between the post-tests of both groups was rejected. In other words, statistically there is significant difference between mean scores of the post-tests of Traditional Group & Experimental Group

The significant difference between the post-test score of Traditional Group and Experimental Group was because of Computer Assisted Instruction.

From the results, it is concluded that the used CAI was found effective in teaching the units-'Quadrilaterals', 'Areas of parallelograms and triangles' and 'Circle'- to the students of Experimental group of class IX of M.B.M.Convent highschool, Bardoli. In short, used CAI method was found effective than Traditional method.

## IX. MAJOR FINDINGS OF THE STUDY

The major findings of the study are as follows:

1. The study has resulted in the development of a computer program on "CIRCLE" for teaching Mathematics to the students of standard IX of Gujarati medium schools.
2. The developed Computer program on "CIRCLE" was found significantly effective for the students of std. IX of Experimental group.
3. There was no significant difference found between the mean pre-test scores of Experimental group and Traditional group.
4. There was a statistically significant difference between the mean gain scores of Experimental group and Traditional group. The significant difference found was because of computer program.
5. The computer program was qualitatively evaluated by the students of Experimental group with the help of an opinionnaire. Students revealed highly favorable opinion towards computer program. The majority of the students found the program knowledgeable, innovative and interesting. They were also ready to use such programs in future for other subjects also.

## X. SUGGESTIONS FOR FUTURE RESEARCH

1. The program can be made on other chapters of standard IX.
2. The program can be made on other subjects also.
3. It can be made for the students of English Medium also.

## XI. CONCLUSION

Present research was a modest attempt to check the effectiveness of computer program as an aid in teaching of Mathematics. It will provide inspiration and necessary guidance for carrying out further research in this field. By applying such innovative approaches students involvement in teaching & interest in learning can be increased and maintained. In conclusion, it can be said that computer could prove to be effective learning approach if it is used in classrooms.

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# Clustering and Routing Procedure for Indirect Transmission to improve the Lifetime of Wireless Sensor Network

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*Abstract-* The electricity of sensor nodes in wireless sensor networks is very limited, Sensor nodes are often scattered outdoors and their energy consumption depends heavily on the area of coverage and network topology. In the related research, LEACH routing algorithm randomly selects cluster heads in each round to form a cluster network, which may cause additional power consumption and inability to maintain the optimal routes for data transmission. The cluster allocation and routing algorithm proposed in this study is based on the cluster architecture of LEACH, and the objective is to produce clusters with more sensor nodes to balance energy consumption of cluster head and routing prevents the cluster heads from exhausting electric power by forwarding data through detoured routes. The experimental results show that the proposed algorithm can efficiently increase the coverage ratio as well as lifetime of wireless sensor networks**.**

*Index Terms*- wireless sensor networks, routing algorithms, cluster networks, network lifetime

## I. Introduction

The wireless sensor network (WSN) was initially a research project directed by UC Berkeley, where they used the micro-electro-mechanical technology to design wireless sensors about the size of a coin, also called smart dusts. A WSN consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, pollutants and motion to cooperatively pass their data through the network to the base station [1]. The WSN was first used to collect data in the battle fields. Due to its small size, low price and various functions, the WSN has now been used in daily applications, for example, taking care of elder people, vibration detection of bridge piers, detection of fire and $CO_2$ emission, and so on. When the sensor devices were first introduced, the major concerns were the cost, size, and energy consumption because of their limited computation speed, memory and power capabilities. Since the transmission distance also affects the energy consumption, it is another factor to be considered.

In the data transmission of WSN, the strength of signals is highly related to the distance, i.e., the longer the distance, the weaker the signal and the more energy consumed. When the distance is too long, it may cause the sensor nodes to exhaust energy quickly and thus affect the network lifetime. As a result, how to fully utilize the electric power of sensor nodes for continuous data transmission is an important topic of WSN research. Basically, the ways of data transmission for the WSN can be categorized as direct transmission and indirect transmission [2].

### A. Direct Transmission

Each sensor nodes transmit the collected data to the base station directly. In this approach, the data rate is higher since there is no forwarding during transmission. Although the implementation for direction transmission is easier, the data may not be sent to the destination when the application area is very large, or the sensor nodes may die quickly due to high energy consumption. Therefore, this approach is suitable only for small-area applications.[10]

### B Indirect Transmission

The sensor nodes send the collected data to the neighbor nodes, which will forward the data to the base station. This approach solves the problem of high energy consumption in long-distance transmission, but it may cause some nodes to consume more energy by forwarding data for the other nodes and thus affecting the network lifetime[10].

Usually, the deployment of a WSN is to scatter a large amount of sensor nodes over the application area randomly. Then, the sensor nodes start to collect and transmit data back to the base station via multi-hop forwarding. Since each node does not know the exact position of other nodes at the beginning, a self-organization protocol [3] is required to connect the sensor nodes to form a communication network for data transmission.

The main objective of a routing algorithm is to find a better way for data transmission to save electric power. Therefore, how to design an efficient routing algorithm to extend the lifetime of WSN has become a very important research topic.

The low-energy adaptive clustering hierarchy (LEACH) proposed by Heinzelman *et al.* [8] is a well-known hierarchical routing protocol applied in clustered wireless sensor networks because it can balance energy consumption within a cluster to extend the network lifetime. Its operation contains two stages, i.e., *initial stage* and *stable stage*. In the initial stage, the base station selects a few nodes as cluster heads based on random thresholds, and the other nodes join nearby clusters by sending out signals to discover the nearest cluster heads. When clusters are formed, the network enters a stable stage. Each node starts to sense and transmit data to its cluster head, which will then forward data to the base station along with its own data. Since

the cluster head will consume more energy, it must be replaced regularly to prevent power exhaustion. Many routing algorithms were developed based on the same approach of LEACH in creating clusters, e.g., PAGASIS [5] and TEEM [6].

PEGASIS works by connecting nodes in series, starting from the farthest node to the base station, to form a linked structure with its neighbor nodes. When all nodes are connected, the head of the linked structure will be selected. Then, every node combines both received data and its own data and sends them towards the head. When all data arrive at the head, it will be forwarded to the base station. Since the route is computed by the greedy algorithm, it is the shortest and consumes less energy than LEACH. However, the greedy algorithm is complicated and thus requires more energy in computation.

Threshold sensitive Energy Efficient sensor Network protocol (TEEN) is also based on LEACH to transmit data to the base station periodically. It sets two threshold values, i.e.,hard threshold and soft threshold, to avoid the transmission of duplicated data. This approach can save some energy by reducing the amount of data, but it is not suitable for the applications requiring periodical data since the threshold values may not be met in occasion. Therefore, a revised version of TEEN was proposed [7] to remedy the drawback of reporting data periodically by reacting to sudden events in real time. Since both algorithms are based on LEACH, the amount of energy saved is still limited.

Before going to design good protocols let us first define impotent parameters i.e, what is coverage and lifetime.

### A. Coverage Ratio

The coverage ratio of a WSN represents the percentage of area under monitoring, which is computed as the area covered by the working sensor nodes divided by the total application area ($700m \times 700m = 490000m2$). The sensor nodes can function correctly only when they have enough electricity, so the electric power is the major factor affecting coverage ratio. A WSN cannot achieve its function when the coverage ratio is too low. Besides, sensor nodes have more feasible routes for selection to reduce energy consumption when the coverage ratio is high.

### B. Network Lifetime

Network lifetime is the time span from the deployment to the instant when the network is considered nonfunctional. When a network should be considered nonfunctional is, however, application specific. It can be for example, the instant when the first sensor dies a percentage of sensor dies, the network partitions or the loss of coverage occurs [15].

These networks should function for as long as possible. It may be inconvenient or impossible to recharge node batteries. Therefore, all aspects of the node, from the hardware to the protocols, must be designed to be extremely energy efficient [14].

## II. SYSTEM MODEL AND RELATED METHODS

The cluster allocation and routing algorithm proposed in this study is based on LEACH's clustered architecture. The difference is that the cluster allocation is done only once at the beginning and remains fixed for the rest of time, and the goal is to create clusters containing more sensor nodes to share the energy consumption of their cluster head in forwarding data to the base station.
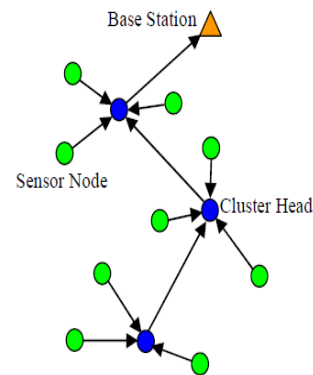


**Figure1.Data transmission in a wireless sensor network**

When the system starts its operation, regular nodes send out collected data to the cluster head, and then the cluster head forwards data to the base station through its neighbor cluster heads using the dynamic routing mechanism (Figure 1)[10].

This study achieves a higher coverage ratio and a longer lifetime as well. The methods of high-energy-first mechanism for determining the cluster heads, finding the forwarding node with the smallest angle [10],data compression [11] and sleep mode [12, 13] were also incorporated in the routing algorithm to further reduce the energy consumption and extend the lifetime of WSN. These methods are described in the following.

### A. High-energy-first Method

In LEACH, a recently retired cluster head still has a chance to be selected again according to the probability function, which may lead to fast exhaustion of its electric power. Therefore, this study adopts the high-energy-first method to select cluster heads in each round to remedy this drawback. After collecting data, each sensor node has to send out data together with the information about its remaining electric power, and then the base station can decide which nodes are to be selected as cluster heads in the next round using broadcast messages.

### B. Determining Forwarding Node
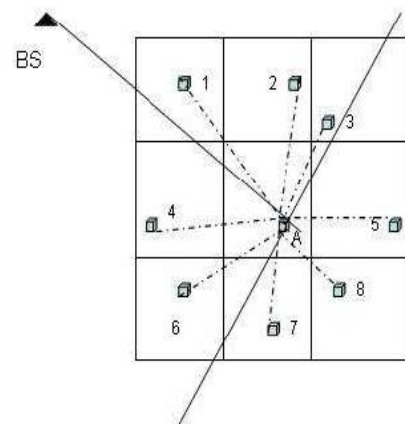
**Figure 2.Determination of the forwarding node**

In each round, a cluster head has to determine the forwarding node, which is also a cluster head in neighbor clusters. The most direct forwarding route is determined based on the angle between the directions of the base station and the candidate forwarding node. The neighbor cluster head with the smallest angle is chosen first as the forwarding node, and the goal is to use the shortest forwarding route to reduce energy consumption. For example, cluster head *A* in Figure 2 will select node 1 as the forwarding node, unless its remaining electric power is below the threshold. If node 1 is not available, node 4 will be selected next. This method can save energy by choosing the shortest route in forwarding data[10].

*C. Data Compression*

In WSN, the amount of data transmitted can also affect the energy consumption of sensor nodes. When a cluster head detects the same or similar data packets which are being transmitted, it can use the data compression method to filter out similar data packets. This method can reduce the amount of data and therefore save some energy.

*D. Sleep Mode*

When sensor nodes are scattered randomly during the deployment of a WSN, some nodes may be too close to each other and collect the same data. Therefore, using sleep mode can reduce the data amount and energy consumption. In this study, a grouping method is used to divide sensor nodes into a number of groups within a cluster. In each group, the node with more electric power is selected as the active node while the other nodes may enter sleep mode. The main objective of the grouping method is to evenly distribute active nodes in each cluster to reduce data similarity. Furthermore, the ratio of active nodes and the group size can be adjusted according to the requirement of data precision.

## III. CLUSTER ALLOCATION AND ROUTING

This study adopted a fixed cluster allocation algorithm similar to the initial stage of LEACH. At first, the base station sends a threshold value to all sensor nodes for the selection of cluster heads. Then, this study used the cluster allocation algorithm to create clusters with more sensor nodes. After that, each sensor node sends the information back to the base station for later usage, including node number, cluster number, location and remaining electricity. As soon as the initialization stage is completed, the WSN begins its operation in each round to collect and transmit data by the routing algorithm.

*A. Cluster allocation*

The concept of set operation is used in dividing the sensor nodes in a WSN into a number of clusters. At the beginning, the initial stage of LEACH is used for selecting cluster heads, and then the cluster heads create their own clusters by communicating with the sensor nodes within the sensing area. For simplicity, the created clusters are defined as the allocated sets, while the sensor nodes not invited by any cluster heads are left in the unallocated set. Then, the allocated sets are sorted by the number of their sensor nodes, and those in the intersected sets

are re-allocated to the set with more sensor nodes. The objective is to produce clusters with more sensor nodes such that they are more powerful in forwarding data for other nodes. After that, the sets with very few nodes will be deleted, and their nodes are put into the unallocated set.

When all sensor nodes in the intersected sets are reallocated, each sensor node belongs to a unique cluster. If there are still some sensor nodes in the unallocated set, the algorithm repeats the same process as described above until the remaining sensor nodes have been allocated to a certain cluster. The reason for re-allocating the sensor nodes in the intersected set is to produce clusters with more sensor nodes to compensate for the high energy consumption by cluster heads in forwarding data (Figure 3).
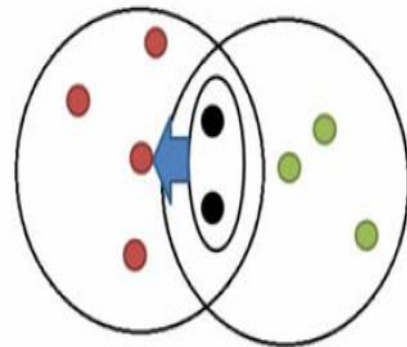


**Figure 3.Allocating the intersected set to the set with more nodes**

*B. Routing*

The routing algorithm operates by rounds. After sensor node deployment and cluster allocation, the routing algorithm uses high-energy-first method to select sensor nodes with more electric power as the cluster heads, and determines the forwarding nodes for data transmission. After that, all sensor nodes start to collect data, which are aggregated by the cluster heads and forwarded to the base station.

## IV. SIMULATION RESULTS

This study conducted several simulation experiments to analyze if the proposed algorithm could extend the lifetime of WSN. The results were compared with those of LEACH algorithm under the same conditions.

Before the simulation experiments, this study provides the following analysis about the power consumption by sensor nodes. Basically, the energy required for transmitting a signal is highly related to the distance [14]. The following equation shows the energy consumed when sending a signal to a distance *d* by an amplifier.

$$\text{Energy consumption} = \begin{cases} \varepsilon_{fs} \times d^2 \,, \text{if } d \leq d_0 \\ \varepsilon_{tr} \times d^4 \,, \text{if } d > d_0 \end{cases}$$

Using $d_0$ as a threshold, if the transmission distance is shorter than $d_0$, a free-space propagation model is used to calculate the consumed energy, which is proportional to the

square of distance. If transmission distance is longer than $d_0$, the two-ray ground propagation model is used for calculation and the consumed energy is proportional to the fourth power of distance. In that case, the consumed energy has a great influence on the wireless communication system. In the above equation, $\varepsilon_{fs}$ and $\varepsilon_{tr}$ are the parameters for the free-space propagation model and two ray ground propagation model with their values equal to 10 pJ/bit/m$^2$ and 0.0013 pJ/bit/m$^4$, respectively; Here, $d_0$ is defined as $\sqrt{\varepsilon_{fs}/\varepsilon_{tr}}$ which is the threshold of transmission distance and its value is about 87.7. To simplify the computation, it is assumed that $d_0$=100m.

For most sensor nodes in WSN, the consumed energy is proportional to the square of distance when collecting and sending data to their cluster head. The cluster allocation algorithm can increase the node density in a cluster and thus reduce the distance and consumed energy in transmitting data. As the operation continues, the sensor nodes near the base station may exhaust their electricity and thus cannot forward data for the outer sensor nodes. Consequently, the outer sensor nodes may need to transmit data directly to the base station at a longer distance, so the energy consumed is proportional to the fourth power of distance.

The parameters for the experiments are described in the following. The size of the application area is 700m×700m and there are 100 sensor nodes deployed. The longest transmission distance for a senor node is 200m. The initial energy in each sensor node equals 1J, and the energy for sending and receiving data are the same, 50nJ/bit. Each data aggregation takes 5nJ/bit with the compression rate =70%. The amplifier parameters for the two models are $\varepsilon_{fs}$=10pJ/bit/m$^2$ and $\varepsilon_{tr}$ =0.0013pJ/bit/m$^4$, respectively.

**Table 1.Simulation parameters**

| Parameter name | Value |
|---|---|
| Application area | 700m×700m |
| Initial energy of node | 1J |
| $d_0$ | 100m |
| Number of nodes | 40,60,80,100 |
| Data rate | 10,12,14,16,18,20 bit/sec |

Figure 4 shows the lifetime for leach and proposed algorithm, while keeping number of nodes and simulation time constant. It shows that the lifetime of proposed algorithm is greater than LEACH.
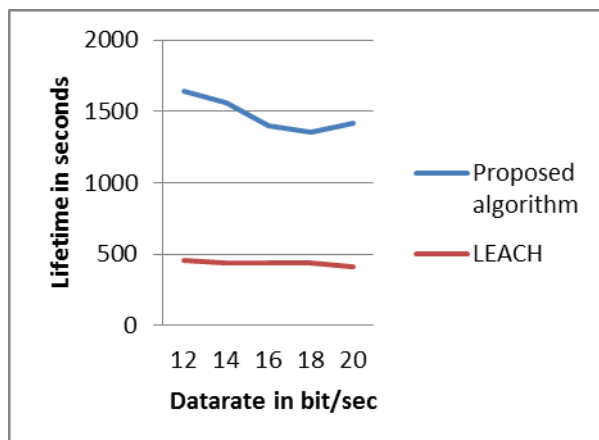


**Figure 4.Comparing the lifetime of LEACH and proposed algorithm**
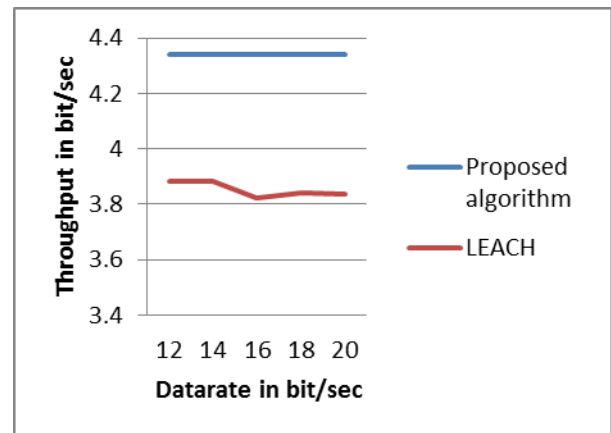


**Figure 5.Comparing the throughput of LEACH and proposed algorithm**

Similarly Figure 5 shows the comparison of throughput, Figure 6 shows the comparison of latency and Figure 7 shows the comparison of packet delivery ratio for both proposed algorithm and LEACH. And in all these cases number of nodes and simulation time kept constant for both models.

Figure 8, shows the coverage ratio of both proposed algorithm and LEACH.As shown in the graph the coverage ratio increase as the number of nodes increasing, but the coverage ratio of proposed algorithm in high compared to the LEACH. In this case the application area, data rate and simulation time kept constant for both model.
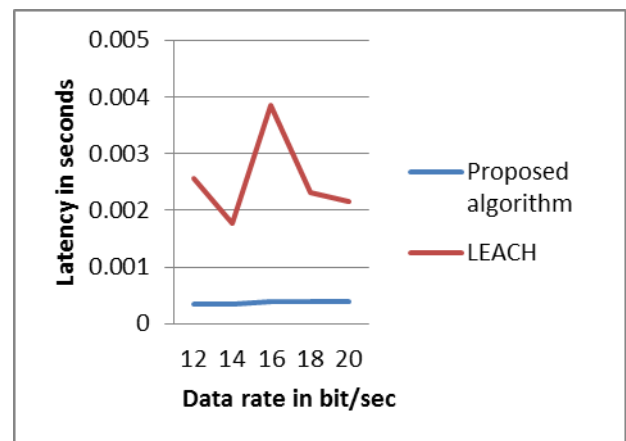


**Figure 6.Comparing the latency of LEACH and proposed algorithm**
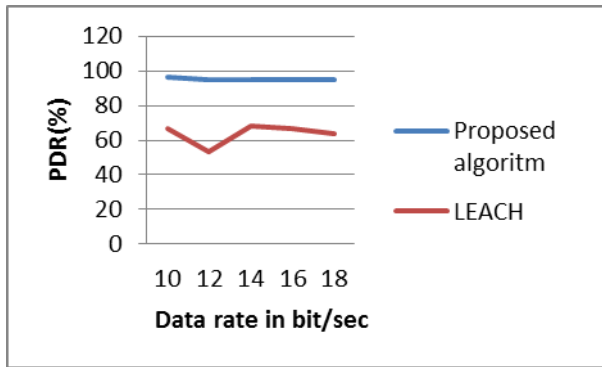
**Figure 7.Comparing the PDR of LEACH and proposed algorithm**
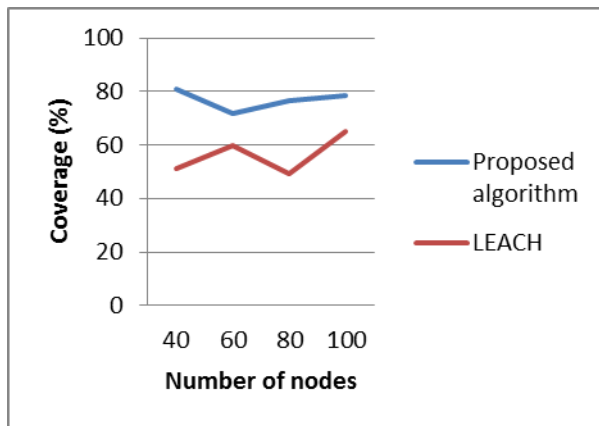


**Figure 8.Comparing the coverage ratio of LEACH and proposed algorithm**

## V.   CONCLUSION

For large-area applications, most routing algorithms adopt indirect transmission mode to solve the problem of high energy consumption due to long-distance transmission because it may cause the sensor nodes to exhaust electricity quickly. This study proposed a cluster allocation algorithm which forms clusters with more number of sensor nodes and routing algorithm which finds a better way for data transmission to save electric power, to remain a high coverage ratio and thus extend the lifetime of WSN. The simulation results show that the lifetime and coverage ratio for the proposed algorithm is higher than that of LEACH.

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# Impact of SRI technology on rice cultivation and the cost of cultivation in Mahabubnagar district of Andhra Pradesh

**Rampuram Jayapal Reddy**[*], **Dr.N.Sandhya Shenoy**[**]

*Abstract-* The System of Rice Intensification (SRI), developed in Madagascar is gaining increasing credence and momentum as the farmers are now using its methods to raise their rice production while also reducing their use of external inputs and production costs.  This paper focuses on this agronomic opportunity that can be particularly beneficial for resource-limited households. In the sample area positive impact of SRI technology was observed on sample farmers followed the suggested wider spacing of 25×25cm or 30×30cm,and by using 8-12 days seedlings, weed management, and sample farmers completely adopted the suggested water management practice, weed management practice and by applying the suggested quantity of organic manure. Saving on seed cost as the seed requirement is less,saving on water as irrigated, higher yields due to profuse tillering, increased panicle length and grain weight. However, the farmers expressed difficulty in adopting SRI on two counts, viz., labour scarcity and weed menace. These constraints have to be addressed to enable wider adoption of SRI technology by more number of rice cultivators.

*Index Terms*- Innovative alliances, labour-saving, farmer-to-farmer extension, system of rice intensification, agricultural innovations, established institutions.

## I.  INTRODUCTION

It has become difficult to increase production from traditional rice farming.  It needs extra labour and a lot of fertilizers. Farming with modern methods is also expensive using outside inputs.  It was noticed that, farmers adopting conventional methods could increase their production only by using expensive inputs such as chemical fertilizers, pesticides and hybrid seed.  It is becoming increasingly difficult for the farming community to afford these things. It is also known that using chemicals is harmful to the environment. A new method of growing rice is designed for increasing rice production which can use the organic compost, and also the local seed.  This method is called "System of Rice Intensification" (SRI).In this context, a study was undertaken in Mahabubnagar district of Andhra Pradesh to note the impact of the SRI method of rice cultivation by the farmers.

## II.  METHODOLOGY

The study was undertaken in Boothpur and Hanwada mandals in Mahabubnagar district of Andhra Pradesh as SRI method of rice cultivation was practiced. From each of the selected mandals, 6 villages were selected and, from each village,

two farmers were selected randomly for the sample. The required data were collected for the kharif season in 2011 by personal interview method with the help of pre-tested schedules.

## III.  FINDINGS

### General characteristics of sample farmers

SRI paddy farmers are found to be of younger age group. The average family size of SRI paddy farmers was medium.  All the SRI paddy respondents were found to be educated.  The average land holding of SRI paddy farmers was 6.02 hectares, respectively.

### Nursery cost for SRI paddy cultivation

The nursery cost of Rs. (178.29) per hectare was observed for SRI paddy farmers.  The farmers did not use fertilizer in SRI nursery and hence the amount spent on fertilizer in SRI nursery management was zero.  This resulted in lower cost in SRI nursery management.

### Costs and returns structure in SRI paddy production

Fixed costs like rental value of land and interest of fixed capital were found to be less for SRI paddy farmers. Depreciation cost on implements was more for SRI paddy farmers.  However, land revenue remained same for both the methods of paddy cultivation.  The share of human labour in the total cost was more in both conventional and SRI methods.  The share of variable cost in total cost was 84.89 per cent in SRI paddy, respectively.   SRI method paddy farmers harvested higher yields (8.51 tones/ha).  The return per rupee spent was around RS.2.02 for SRI method paddy cultivation.

### Adoption level of SRI paddy farmers:

The complete, partial and no adoption levels in SRI cultivation practices of the sample farmers are given in the table as shown below.

**Table: Adoption level of SRI paddy farmers**

| S.No. | Suggested practices in SRI method | Adoption level | | No Adoption level |
|---|---|---|---|---|
| | | Complete | Partial | |
| 1. | Nursery area | (81.67%) | (18.33%) | (8.09%) |
| 2. | Seed rate 5kg/ha | (43.33%) | (56.67%) | (19.23%) |
| 3. | Transplanting 8-12 days aged seedlings | (56.67%) | (43.33%) | (16.34%) |
| 4. | Careful transplanting of soil and roots intacted seedlings | (75.00%) | (25.00%) | (12.32%) |
| 5. | Wider spacing (25×25cm or 30×30cm) | (100.00%) | (0.00%) | (0.00%) |
| 6. | Weed management | (66.67%) | (33.33%) | (0.00%) |
| 7. | Water management | (41.67%) | (58.33%) | (18.67%) |
| 8. | Organic manure application (10t/ha) | (36.67%) | (63.33%) | (20.45%) |

The data indicated that all the sample farmers followed the wider spacing in SRI method of paddy cultivation. Complete adoption level was high in the case of maintaining nursery (81.67%), followed by plant spacing in transplanting (75%), weed management (66.67%) and age of plants for transplanting (56.67%).

Partial adoption level was high in the case of organic manure application (63.33%) followed by water management (58.33%) and seed rate (56.67%).Therefore, there is a need for awareness building and training programmes in the areas of partial and no adoption to increase the adoption levels to complete adoption in order to get maximum gains of SRI technology.

Major reasons for practicing SRI method by sample farmers were less water requirement and higher yield levels. Major constraints in practicing SRI method were high labour requirement and weed menace.

## IV. CONCLUSION

The (SRI) system of Rice Intensification that evolved as a resource conserving technology management system from the informal research across the world is taking roots in Andhra Pradesh. The Andhra Pradesh farmers who are known for their innovativeness in adopting new technologies and adapting technologies to meet their requirements responded with great enthusiasm when SRI was introduced by individual farmers. organizations, formal research and extension system. The study has shown positive impact of SRI technology in terms of reduction in cost of cultivation and increased yields per unit area for the rice cultivators in the study area. The constraints for adoption of SRI technology were indicated as labour scarcity and

higher weed menace. If these constraints are addressed through improvised technologies and proactive policies it will pave way for wider adoption of SRI system among the farming community.

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# Dark Image Enhancement through Intensity Channel Division and Region Channels using Savitzky-Golay Filter

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*Abstract*— Principal objective of image enhancement is to process an image so that result is more suitable than original image for specific application. Digital image enhancement techniques provide a multitude of choices for improving the visual quality of images.

The existing contrast enhancement algorithms such as local, global, partial, bright and dark contrast stretching, Adaptive HE techniques occasionally result in artifacts such as halo effects in sharp boundaries or noise effects and also over enhancement which results a spurious details of the image and unnatural effects in the processed images. These drawbacks increase for images taken under poor illumination conditions.

To overcome these drawbacks we propose an algorithm that enhances dark images, sharpens edges, reveals details in textured regions, and preserves the smoothness of flat regions. In this paper we enhance the image contrast based on Intensity Channel Division and Region Channels. We analyze the contrast of the image in the boundary and textured regions, and group the information with common characteristics. These groups model the relations within the image, from which we extract the transformation functions.

We propose to mix the channels with similar characteristics in to region channels. The proposed method is robust because it adapts its transformation function which is Savitzky Golay filtered, to the contents of the image, which avoids the introduction of errors in the image. The mixture of different region channels also increases the quality of the output because it allows a distinct enhancement for different parts of the image. This process avoids over enhancement problems in areas with normal dynamic ranges.

*Index Terms—Artifacts; Channel Division; Region Channels; Savitzky Golay filter; Curve-fitting Toolbox;*

## I. Introduction

Contrast enhancement is necessary to improve sub-standards that are captured in bright or dark environments produce low contrast images .Several algorithms have been proposed to overcome this problem. One of the widely used technique is Histogram Equalization (HE) which enhances the intensity of the image but in addition to this artifacts are produced in smooth regions and does not consider the boundaries which lowers the sharpness of the image .Another approach is Adaptive Histogram Equalization (AHE) provides the contrast enhancement of the image but over enhancement and unnatural images are produced to overcome this problems we go for enhancing the content of the image.

The first step in the proposed algorithm is the intensity pair distribution. In this algorithm the global properties of HE [3] and local properties of AHE are combined. Here the contrast pairs are formed and the transformation is generated. The obtained output image has artifacts so we go for intensity channel division and the transformation function for this is generated but channel division is not sufficient to produce the enhanced image so we group this intensity channels to region channels and the transformation function is generated to get the enhanced image.

## II. Enhancement through Channel Division Approach

Based on the information extracted from the boundaries and textured regions the proposed algorithm form the adhoc transformation. Here we form the contrast pairs using the contrast which

gives the relation between two neighboring pixels. There may be isolated pixels which does not form neighbor with the other pixel so we pileup the contrast pairs in to the Local Contrast Indicator (LCI) function and fuse such functions in to channels to minimize the artifacts. This is a process known as channel division. This channel division is used to spread the inaccurate dynamic range and it can control the interference & overlap of the contrast pairs. We then fuse this channel division in to region channels. The region channels work to enhance the characteristics of image and fuse that results to reduce artifacts and provide maximum enhancement that results to reduce artifacts and provide maximum enhancement that results to reduce artifacts and provide maximum enhancement. The transformation function for the region is formed and we apply SGolay filter to the transformation function to remove the noise.

To carry out the proposed algorithm first we transform the image in to HSV color space which is Hue-Saturation-Value. Next we apply the proposed algorithm to the V component that is illumination component of the image where the H & S are retained. Later the preserved H & S are fused with the enhanced V component to provide enhanced image.

*A. Contrast Pair Distribution*

In our algorithm first the intensity pair distribution is formed by extracting both local and global information of the image. [2] For a given image the intensity difference is found out between the center pixel and neighboring 8 pixels.

The contrast pair $\rho_{ij}$ between two given intensities $i$ and $j$ is formed as a set of votes for every intensity in the intensity set $(i,……,j)$. We define the set of contrast pairs for a pixel $(x, y)$ as

$$P(x,y) = \left\{ \rho_{I(x,y)}^{I(x',y')} \big| (x',y') \in N(x,y) \right\} \qquad (1)$$

where $N(x,y)$ is a set representing 8 neighbours of the center pixel $(x,y)$.

The first four contrast pairs are formed by scanning the three neighbors above the pixel and the one directly to its left. And the other four pairs are

formed by scanning the three neighbors below and the one to its right.

The set of contrast pairs of each image is divided into two classes: edge [8] and smooth. If the intensity difference between the pair intensities exceeds the threshold (10 intensity levels in our process) then it is considered an edge contrast pair, otherwise it is considered as smooth contrast pair.

To create the transformation function we use LCI of the contrast pairs. We use the LCI which is normalized since we found that channel division provides higher enhancement than the proposed method. The LCI is formed by grouping the votes formed by the contrast pairs [2]. Here we use an edge contrast pair which reveals the details of the image. This procedure preserves the flat regions. As a result the accumulation of all the edge contrast pairs generates an LCI function $f$, defined by

$$f(i) = \sum_{x,y} \sum_{\rho \, \in P_e(x,y)} \rho(i) \qquad (2)$$

where $f(i)$ is the $i^{th}$ position of the LCI $f$, which acts like a vector of the accumulated votes from the contrast pairs, $x$ and $y$ are coordinates of the image, $P_e(x, y)$ is the set of neighboring edge contrast pairs for pixel $(x, y)$, $\rho(i)$ is the $i^{th}$ position in an edge contrast pair of $(x, y)$, i is the intensity index in the range $0 \leq i \leq N$, and $N$ is the maximum number of intensities. Note that, for simplicity, the intensities have been removed from the contrast pair notation for pairs that are identifiable. Furthermore, the edge contrast pairs for the pixel $(x, y)$, i.e., $P_e(x, y)$, are defined by

$$P(x,y) = \left\{ \begin{array}{l} \rho_{I(x,y)}^{I(x',y')} \big| (x',y') \in N(x,y) \\ \wedge \big| I(x,y) - I(x',y') \geq \varepsilon \big| \end{array} \right\} \qquad (3)$$

where $(x, y)$ and $(x', y')$ are the positions of the pixels in the image with intensities $I(x, y)$ and $I(x', y')$, $N(x, y)$ contains the eight neighbors of $(x, y)$, and $\varepsilon$ is a constant. Once the LCI is computed, it is integrated and normalized by

$$F(k) = \frac{\sum_{i=0}^{k} f(i)}{\sum_{i=0}^{N} f(i)} \qquad (4)$$

where $F(k)$ is the $k^{th}$ position in the integrated expansion force $F$, $f(i)$ is the $i^{th}$ position in the LCI $f$, $k$ is the intensity index in the range $0 \leq k \leq N$, and $N$ is the maximum number of intensities. Since the transformation function should be monotonically increasing and single-valued, we normalize and project the transformation function $T$ onto the identity transformation $I$, which is defined by $I(x)=x\ /N$ for $0\leq x \leq N$. Then the transformation function can be defined by

$$T(k) = \frac{I(k) + F(k)}{\max(I + F)} \qquad 0 \leq k \leq N \qquad (5)$$

This process is well understood with an example showing a sub image with some pixel values as shown in Fig. 1.



Intensity Pairs formed are:

(90,170)    (90, 85)   (90,120)   (90, 60)

(90,100)    (90,150)   (90,180)   (90, 95)

Figure 1: Sub image & 8 Neighbours with 8 intensity pairs

*1)    Formation Of Expansion Force*

If the Intensity difference of an Intensity Pair is larger than a pre-selected threshold (10), train of *Expansion Forces* is generated. From the example considered some Expansion forces (difference >10): (90,170), (90, 120)
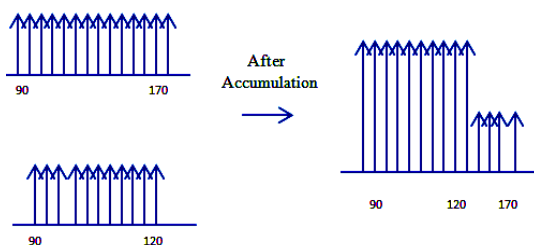


Figure 2: Expansion Forces

Voting between 90,170 and 90,120 are shown as impulses with magnitude one if difference is greater than 10 otherwise zero and after accumulation or

integration the net expansion force values are shown as impulses with magnitude 2 between intensity values 90,120 and magnitude 1, between 120, 170 as shown in Figure 2.

*B.  Formation of Intensity channels*

In intensity pair distribution, the contrast pairs belong to different regions. Thus, one accumulation of contrast pairs does not represent the intensity relations and may separate the intensities that should stay together. To overcome this problem we group the contrast pairs into intensity channels and the transformation obtained from the intensity channels gives better result than the intensity pair distribution because the LCI of each channel affects only its peers. Hence the intensity channels avoid the interference of LCI's that excessively spread the intensities of the group, and consequently compress other intensities [2]. This intensity channels maintains the flat regions in the image and enhance the textured regions, which avoids the introduction of artifacts.

The intensity channel LCI, $f^{\,i}(j)$, for the intensity $i$ is defined by

$$f^{\,i}(j) = \sum_{x,y} \sum_{\rho\, \in P^{i}{}_{e}(x,y)} \rho(j) \qquad (6)$$

where $f^{\,i}(j)$ is the $j^{th}$ position in the LCI $f^{\,i}$, $x$ and $y$ are coordinates of the image, $P^{i}_{e}(x,\ y)$ is the set of the eight neighboring edge contrast pairs for the pixel $(x,\ y)$ such that the intensity $i$ is within that pair's intensity, and $\rho(j)$ is the $j^{th}$ position in an edge contrast pair of $(x,\ y)$. Note that $i$ and $j$ vary from zero to the maximum number of intensity levels, i.e., $N$. Furthermore, the set of edge contrast pairs for the pixel $(x,\ y)$ and intensity $i$, $P^{i}_{e}$, is defined by

$$P^{i}_{e}(x,y) = \left\{ \begin{array}{c} \rho^{I(x',y')}_{I(x,y)} \big| (x',y') \in N(x,y) \\ \wedge \big| I(x,y) - I(x',y') \big| \geq \varepsilon \\ \wedge \left( i = I(x,y \vee i) = I(x',y') \right) \end{array} \right\} \qquad (7)$$

where $(x,\ y)$ and $(x',\ y')$ are the positions of the pixels in the image with intensities $I(x,\ y)$ and $I(x',\ y')$, respectively, $N(x,\ y)$ contains the eight neighbors of $(x,\ y)$, and $\varepsilon$ is a constant. Finally, the accumulation for each intensity channel LCI, $F^{i}$, is computed as in (4), and their transformation functions, $T^{i}$, are projected as in (5), by replacing $f$ with $f^{\,i}$, as follows:

$$F^i(k) = \frac{\sum_{j=0}^{k} f^i(j)}{\sum_{j=0}^{N} f^i(j)} \qquad (8)$$

$$T^i(k) = \frac{I(k) + F^i(k)}{\max(I + F^i)} \qquad 0 \le k \le N \qquad (9)$$

*C. Region channels*

Grouping the contrast pairs in to intensity channels is not sufficient to produce the best enhancement, as there may be intensity channels with similar properties so we mix the channels with similar characteristics in to region channels [1].

$$T_r = \frac{\sum_{i=I^r\min}^{I^r\max} T^i}{I^r\max - I^r\min + 1} \qquad 1 \le r \le R \qquad (10)$$

where $T_r$ is the $r^{th}$ region channel transformation, $T^i$ is the transformation function for each intensity channel $i$, and $I^r_{min}$ and $I^r_{max}$ are the lower and upper bound (intensities) for the $r^{th}$ region channel

We divide the intensity channels in to three regions namely dark, middle & bright intensities. We produce the transformation function for three regions that spreads intensities. The obtained results are grouped using weighting functions to create final image. The enhanced image is mixture of region channels each channel has different weighting function that emphasizes its characteristics. The final transformation is given by

$$\xi(i) = \sum_{r=1}^{R} \omega_r(i).T_r(i) \qquad (11)$$

where $\omega_r$ is the weighting function for the $r^{th}$ region channel, and $T_r(i)$ indicates the $i^{th}$ position in the $r^{th}$ region channel transformation function.

Here the weighting functions are the shifted Gaussian functions shown in the Figure 3.

Finally, the image is enhanced by

$$I_e(x,y) = \xi(I(x,y)) \qquad (12)$$

where $I(x, y)$ is the intensity of the pixel $(x, y)$ in the original image, $\xi$ is the final transformation function after smoothing using SGolay filtering(Curve Fitting Toolbox in MATLAB) , and $I_e$ is the enhanced image.
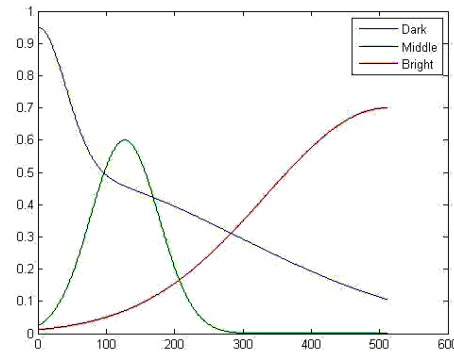


Figure 3: Weighting Shifted Gaussian Functions

# III. **Savitzky Golay Filtering (Curve Fitting Toolbox in Matlab)**

Savitzky-Golay filtering can be thought of as a generalized moving average [5]. We derive the filter coefficients by performing an un-weighted linear least-squares fit using a polynomial of a given degree. For this reason, a Savitzky-Golay filter is also called a digital smoothing polynomial filter or a least-squares smoothing filter. Note that a higher degree polynomial makes it possible to achieve a high level of smoothing without attenuation of data features.

The Savitzky-Golay filtering method [6] is often used with frequency data or with spectroscopic (peak) data. For frequency data, the method is effective at preserving the high-frequency components of the signal. For spectroscopic data, the method is effective at preserving higher moments of the peak such as the line width. By comparison, the moving average filter tends to filter out a significant portion of the signal's high-frequency content, and it can only preserve the lower moments of a peak such as the centroid. However, Savitzky-Golay filtering can be less successful than a moving average filter at rejecting noise. The Savitzky-Golay smoothing method used by Curve Fitting Toolbox software follows these rules:

i. The span must be odd.

ii. The polynomial degree must be less than the span

*iii.* The data points are not required to have uniform spacing

Normally, Savitzky-Golay filtering requires uniform spacing of the predictor data. However, the Curve Fitting Toolbox algorithm supports non uniform spacing. Therefore, we are not required to perform an additional filtering step to create data with uniform spacing. We can use the smooth function to smooth response data [5]. We can also use optional methods for moving average, Savitzky-Golay filters, and local regression with and without weights and robustness (lowess, loess, rlowess and rloess). The syntax of the smoothing methods is presented below:

*Syntax* [7]

```
yy = smooth(y,span)
yy = smooth(y,method)
yy = smooth(y,span,method)
yy = smooth(y,'sgolay',degree)
yy = smooth(y,span,'sgolay',degree)
```

## IV. Quantitative and Qualitative Analysis

*A. Quantitative Measures*

To evaluate the image, we use three different metrics: measure of enhancement by entropy, structural similarity. The structural similarity metric was an alternative to intensity based metrics. The structural similarity is based on the assumptions that natural images are highly structured, since their pixels exhibit strong dependencies, and that the human visual system is highly optimized to recover the structural information from an image. We estimate the luminance of the image as the mean intensity such that

$$\mu_I = \frac{1}{N}\sum_{x,y} I(x,y) \qquad (13)$$

where $N$ is the number of pixels in the image and $I(x, y)$ is the intensity at the position of the pixel *(x, y)*. Instead of using the correlation proposed by Wang et al., we use the ratio of the original image luminance to that of the enhanced image. This process allows us to identify the differences in images, given that the enhanced image should be brighter than the original, and simultaneously determine the structural Similarities between the

images. Note that the definition by Wang et al. measures only the similarity to the dark image.

Thus, we define the luminance index by the ratio

$$L(I_o, I_e) = \frac{\mu_{Ie}}{\mu_{Io}} \qquad (14)$$

where $I_o$ is the original image, $I_e$ is the enhanced image, and estimate the contrast as the standard deviation of the image, given by

$$\sigma_I = \sqrt{\frac{1}{N-1}\sum_{x,y}(I(x,y)-\mu_I)^2} \qquad (15)$$

Similar to the luminance index, we use the ratio of the contrast of the original image to that of the enhanced image. Hence, the contrast index is defined by

$$c(I_o, I_e) = \frac{\sigma_{Ie}}{\sigma_{Io}} \qquad (16)$$

Likewise, the structural index is given by the correlation coefficient, which is defined as

$$S(I_o, I_e) = \frac{\sigma_{Io,Ie} + K}{\sigma_{Ie}\sigma_{Io} + K} \qquad (17)$$

where $K$ is a constant to avoid division by zero, and $\sigma_{Io,Ie}$ is

$$\sigma_{Io,Ie} = \frac{1}{N-1}\sum_{x,y}(I_o(x,y)-\mu I_o)(I_e(x,y)-\mu I_e) \qquad (18)$$

where $N$ is the number of pixels of the images, and $I_o(x,y)$ and $I_e(x,y)$ are the intensities in the *(x, y)* position of each image. For our evaluation, we do not mix these indices as Wang et al. proposed [2]. Instead, we analyze them separately, which allows us to do a deeper analysis on the enhancement of each image.

*B. Qualitative Measures*

The enhanced images are for human visual perception. There are four different categories which are given to the observers to evaluate the image.

*1) Similarity:* This refers to the similarity between enhanced image and original image. The question was phrased as : "Which enhanced image is most similar to or better than the original?"

*2) Edge details:* This refers to the amount of detail perceived in the enhanced image. It describes how many details the enhancement algorithm preserves and/or reveals from the original image. The question was phrased

as: "which enhanced image reveals more of the original image's details?"

*3)        Color    and    Tonal    Rendition*: This characteristic refers to any improvements in the colors and tones of the enhanced images with respect to the original. The question was phrased as: "Which enhanced image

presents better colors and tones with respect to the original?"

*4)        Artifacts:* This characteristic refers to the robustness of the algorithm against the creation of artifacts. It is used to measure the artifacts created by the enhancement algorithm. The question was phrased as: "Which enhanced image presents fewer artifacts?"

# v.   **Results**
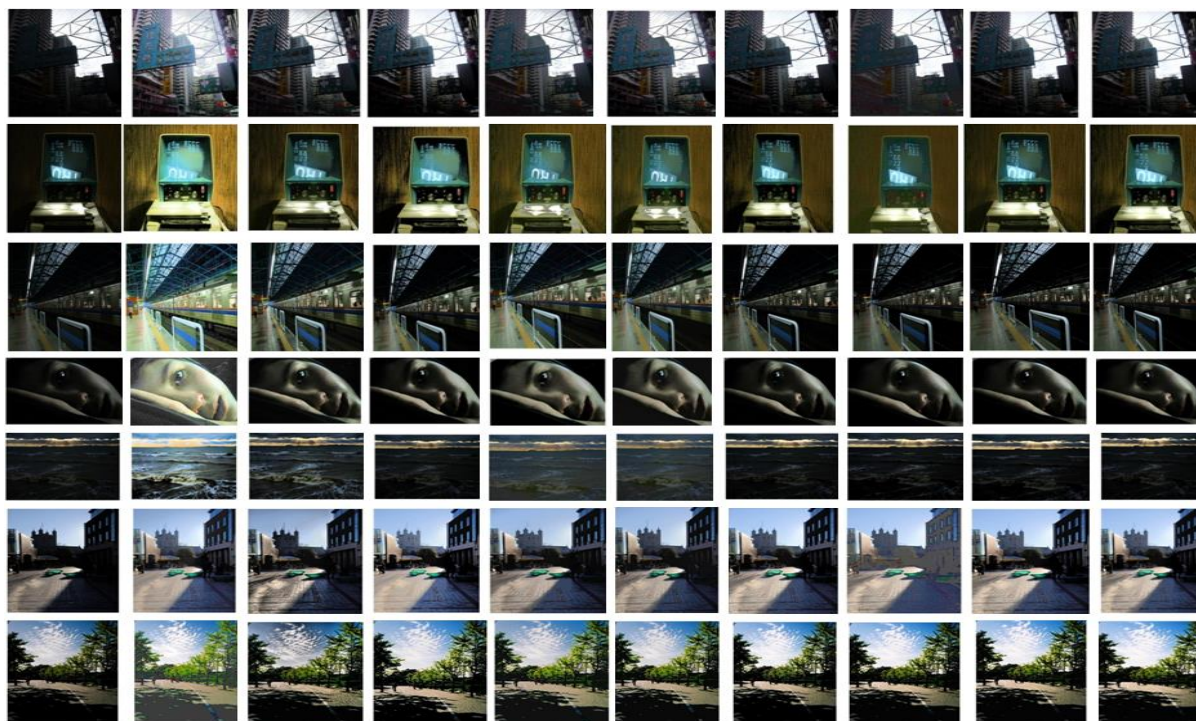


Figure 4: Images from top to bottom:"advertisement","atm","subway","girl","ocean","street1","street2". a)Input image  b) Result of HE  c) Result of AHE d)Result of Intensity Pair Distribution e) Result of Channel Division with Moving Average filter f) Result of Channel Division with SGolay filter g)Result of Region Channels with Moving Average  filter h) Result of Region Channels with Rlowess  filter i) Result of Region Channels with Lowess  filter j) Result of Region Channels with SGolay  filter

Fig. 4 show the outputs of different alternative methods which are compared to proposed method. The methods compared here are HE, AHE, Intensity Pair Distribution, Channel Division using Moving Average filter and SGolay filter & Region Channels using Moving , Rlowess, Lowess & SGolay filters. The images used here are "advertisement", "atm", "subway", "girl", "dark ocean", "street1" and "street2".

The methods other than the proposed method have drawbacks in them such as over enhancement, artifacts, unnatural images, lowered boundaries sharpness etc. To overcome this we used our proposed algorithm which gives the enhanced image compared

to previous methods. From the above outputs we observe that our proposed method is best

*Quantitative and Qualitative Measures report*

The Luminance Index for the result of HE for all the images considered is more compared to other methods. It is because of over enhancement which is a limitation for that method. Thus, we used two additional metrics, the Structural Similarity Index and Contrast pair-based metric, to evaluate the enhancement. Considering our proposed metric, it scored better in the "Girl," and "Street" images. It revealed details in the shadow areas, as shown in the

face of the girl an image for which other methods scored poorly in the contrast pair-based metric, and had poor balance in the structural similarity indices. Additionally, the algorithm was able to maintain the smoothness in the regions of the face and the background. Moreover the proposed method was able to recover details in mixed images as well. For example, the "Street" image had a shadow due to a building that hid some of the details in the image, but other areas in the image were well exposed. The proposed method was able to reveal the details near the building and maintain the details in other parts of the image because it created different transformation functions. This behavior is verified in the balance of the luminance, contrast, and structural indices – all of which exhibited high scores for the proposed method.

Overall, the proposed method did a better job in producing images with means closer to ideal images—i.e., points closer to the diagonal in the space defined by the edge and smooth means. Furthermore, the structural similarity indices reveal that the proposed method procured good luminance and contrast indices while maintaining the structural index the proposed method maintained the image's structure during the enhancement process and simultaneously increased the luminance and the contrast more than other methods.



a)

b)



c)
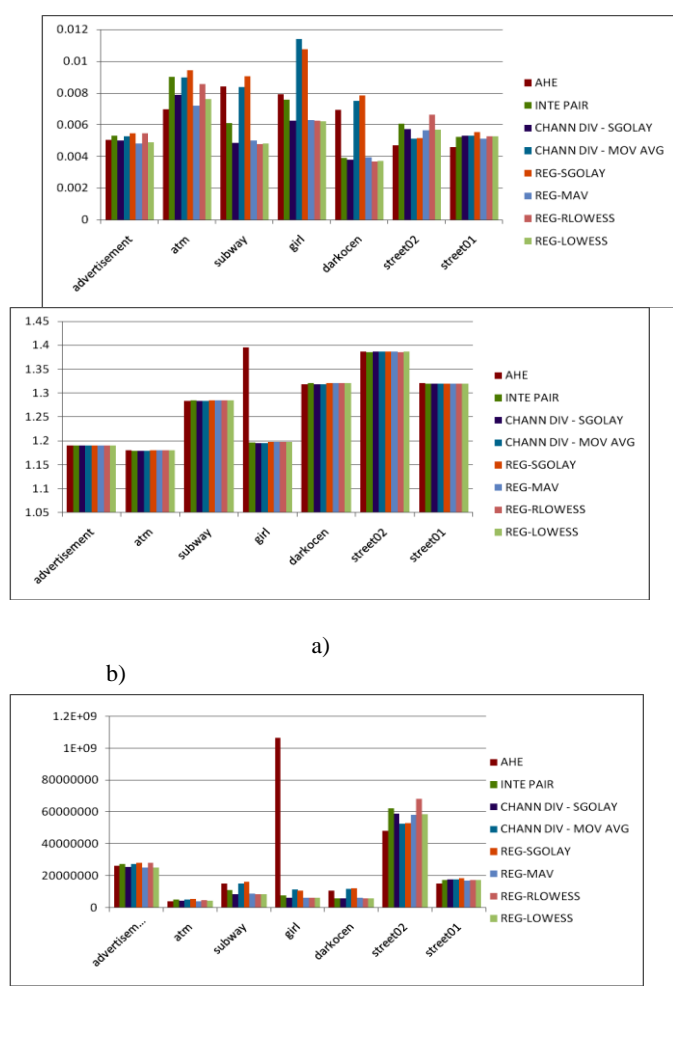
Figure 5: Structural Similarity Indices (SSI) of the results from different image enhancement methods a) Luminance Index b) Contrast Index c) Structural Index

a)

b)

c)

d)

Figure 6: Percentage of evaluators who preferred each image according to (a) similarity (b) edge details (c) color and tonal rendition and (d) presence of fewer artifacts
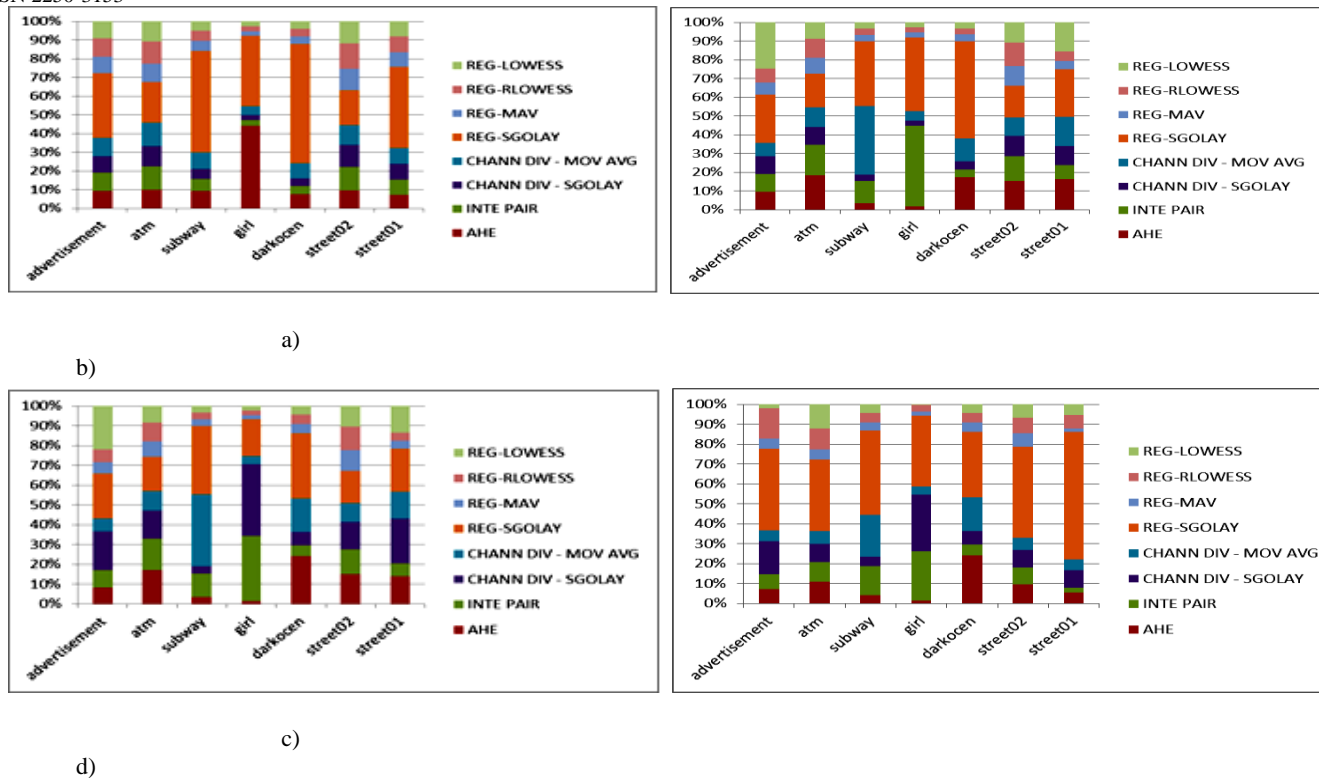
Moreover, the proposed method outperformed the intensity pair algorithm, which produced below par results, as revealed by the contrast pair-based metric and the structural similarity indices as shown in Fig. 5. Unfortunately, enhancement errors in the HE introduced peaks in the luminance and contrast indices, but kept the structural index low in comparison to other methods. Finally, we performed a subjective evaluation of the methods to better assess their performances. For each set of images and for each category, the evaluators were asked to select the result that best exemplified their opinions. They were not informed of the methods that produced each result, and the images were presented in random order. The results of opinions are shown in Fig. 6 and observed that Region Channels method with SGolay filtering was made as a best choice for image enhancement.

## VI.  Conclusion

In this paper, we introduced a content-aware enhancement algorithm that can enhance images from different environments. The algorithm creates different enhancement functions based on the contents of the image, thereby improving its enhancement capabilities while reducing the artifacts and other unnatural effects in the resulting images. The method analyzes the contents through contrast pairs, which are grouped together according to their intensities. Ideally this process increases the enhancement and level of revealed. Ultimately the enhancement is intended to mimic the human visual perception, which is accomplished by adaptively combining different region channels. This mixture allows us to enhance some characteristics, such as the details in dark and bright regions and preserves smooth and flat regions.

The proposed method is robust because it adapts its transformation functions to the contents of the image, which avoids the introduction of errors in the image. The mixture of different region channels also increases the quality of the output because it allows a distinct enhancement for different parts of the image. This process avoids over enhancement problems in areas with normal dynamic ranges.

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# Normal and variant anatomy of Left Coronary Artery: 64-Slice Multi Detector Computed Tomography (MDCT) Coronary Angiographic Depiction in North Indian population

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   *Abstract-* The aim of this study was to review the appearance of normal patterns of left coronary artery, its anatomic variants and anomalies and to assess their incidence in subjects of North India who underwent 64-slice Computed Tomographic Coronary Angiography (CT-CA) for suspected or known coronary artery disease (CAD).
   This study was carried out in the Departments of Anatomy and Radiodiagnosis, KGMU, U.P, Lucknow, India. Fifty CT Coronary Angiograms of routine subjects of either sex and of different age groups coming to the department of Radiodiagnosis were evaluated prospectively to see the normal and variant anatomy of Left Coronary Artery (LCA) regarding its origin, length of main trunk and branching pattern.
   In all the cases LCA arose either below the Sinotubular (ST) junction from Left Posterior Aortic Sinus (LPAS) or from ST junction except one which demonstrated a high take off from tubular part of ascending aorta. The LCA had a mean length of *7.11 ± 3.04* mm. The two main branches of LCA are Left Circumflex (LCX) artery and Left Anterior Descending (LAD) artery. This study revealed that the main trunk of LCA bifurcated into LCX artery and LAD artery in *38 (76%)* subjects. The artery was seen to be trifurcating in *12 (24%)* cases with the Ramus Intermedius (RI) being the third artery.
   Left coronary artery is one of the feeding arteries of the heart, so a detailed knowledge of its anatomy is very important. High takeoff of LCA may cause difficulty in cannulation during coronary arteriography. Its trifurcation can cause technical problems during catheterization and may be a source of complication or misdiagnosis.

   *Index Terms*- Coronary angiography (CA), Left coronary artery (LCA), Main trunk, Ramus intermedius (RI), 64-Slice Multi-detector Computed Tomography (MDCT).

## I.   INTRODUCTION

The cardiovascular diseases are the leading cause of mortality worldwide; responsible for one-third of all deaths. With the ever increasing load of coronary heart diseases, a detailed study of coronary arteries has been felt by the medical fraternity.
   There are two coronary arteries, *Right Coronary Artery* (RCA) and *Left Coronary Artery* (LCA) which delivers oxygen-rich blood to the heart.
   The *Left Coronary Artery* (LCA) is an artery of great challenge for interventional cardiologists and radiologists. Therefore a detailed knowledge of its accurate anatomy is mandatory for avoiding misdiagnosis of left coronary illnesses and for proper placement of a stent during percutaneous coronary intervention. Proficiency in the anatomy of coronary arteries and their variations is significant for proper interpretation of the coronary angiographies, assessment of the complexity and result of the coronary insufficiency as well as surgical myocardium revascularization [ 23].
   LCA presents a wide range of variations in its origin, length and branching pattern. The high degrees of variations have anatomical, pathophysiological diagnostic and therapeutic implications. An in-depth knowledge of these variations is of paramount importance in management of congenital and acquired heart diseases. Failure to distinguish these variations may lead to misinterpretations and disastrous complications during heart surgery.
   LCA "normally" originates from *Left Posterior Aortic Sinus* (LPAS) of ascending aorta. "High takeoff" refers to the origin of LCA at a point above the junctional zone between its sinus and the tubular part of the ascending aorta [19]. LCA divides in several ways. It bifurcates into Anterior Inter-Ventricular Artery (AIVA) & Left Circumflex (LCX) artery and trifurcates into AIVA, LCX artery and Ramus Intermedius (RI) artery. Ramus Intermedius artery is also called intermediate branch (IMB) or Ramus Medianus, arising between LAD and LCX arteries Presence of ramus intermedius artery is the most common anatomic variation observed in the left coronary system and its prevalence is 33% [7]. The size of ramus intermedius artery varies greatly from a very small vessel to a very large branching vessel [20]. Bifurcation is the most frequent branching pattern [25]. AIVA is also known as Left Anterior Descending (LAD) artery.

Since decades the anatomy of LCA has been studied in various populations by cadaveric dissection, corrosion casting techniques and different modes of angiography such as Magnetic Resonance Angiography (MRA), Computed Tomographic (CT) angiography etc. But no such study was conducted in North Indian population to the best of our knowledge, so this endeavor was made to study the normal and variant anatomy of LCA by 64 slice CT coronary angiography in North Indian population.

## II.   MATERIALS AND METHODS

To study the anatomy of LCA, CT coronary angiograms of 50 subjects of both sex and different age groups [32 males (14-75 years), 18 females (12-70 years); mean age 51.36±14.07 years, age range 12-75 years] were analyzed.

**CT scan and reconstruction parameters**

Coronary Angiography (CA) was performed on 64 Slice Multidetector Computed Tomographic (MDCT) scanner (BRILLIANS$^{TM}$CT, Version 2.45.22042, manufactured by Philips) which is installed in the department of Radiodiagnosis, King George .Medical University (KGMU), Lucknow, Uttar Pradesh (U.P.), India. Retrospective Electrocardiographically (ECG) gated imaging was performed (scan protocol is given in Table1)

**Pre-procedure precautions**

- The subjects were enquired, to rule out the presence of any drug allergy, to avoid the occurrence of any untoward anaphylactic reaction during the procedure.
- Two days prior to the procedure the patients were advised to avoid the intake of fatty food.
- They were advised to drink only water just prior to the procedure.
- Blood urea and creatinine levels were evaluated.

**Procedure**

The subjects were laid supine. Their heart rate was stabilized with an oral dose of 50-100 mg Metoprolol one hour before the scan. If heart rate was not stabilized with an oral dose, then intravenous (IV) Metoprolol was given. Electrocardiogram (ECG) and pulse rate were monitored half an hour prior to the procedure. The subjects were counseled to reduce their anxiety.

The subjects were connected to a cardiac monitor. For venous access, an upper extremity vein (antecubital vein) and a 20-gauge intravenous canula was used. 80-85 ml of non-ionic contrast Iohexol (Omnipaque, GE, GE Healthcare Ireland, Cork)containing iodine concentration of 350 mgI/ml, injected with a flow rate of 5.5ml/sec, followed by a 20 ml saline flush at a rate of 4ml/sec with a pressure injector (PSI-325). The scan timing was determined with automated bolus tracking technique by placing the region of interest over mid ascending aorta and setting the trigger threshold to 180 Hounsfield (Hu). The subjects were asked to lie still on the "scanning bed" for a period of 5-10 minutes. The instruction was given to the subjects to maintain an inspiratory breath hold during which CT data and ECG tracings were taken. CTCA was performed 5 seconds after aortic peak density. Scanning coverage was from the level of carina to the bottom of the heart. Raw spiral CT data of coronary arteries were reconstructed in various phases of cardiac cycle on a work station (Brilliance 64 version 4.5) to obtain images with the highest quality (without motion artefact).Reconstruction performed at 75% of R-R interval was found to be optimal for image analysis in most of the subjects. In some, if heart rate could not be stabilized properly, then reconstructions were performed at 45% of R-R interval. The images generated were reconstructed and viewed utilizing a separate workstation which enabled generation of the coronary arteries in the standard and in various other anatomical planes as and when required and were interpreted with the help of a cardiac radiologist. Subjects with previous bypass surgery and also those with suboptimal study due to breath hold artefacts were excluded.

All images were reviewed first in axial projection and then with post processing tools such as Multiplanar Reconstruction (MPR), Curved Planar Reformation (CPR), thin-slab Maximum Intensity Projection (MIP), and Volume-Rendering Technique (VRT) with transparent background display. MIPs were obtained using various thicknesses (5–30 mm). Volume-rendered images were also obtained using various orientations.

The length of main trunk of LCA was measured in straight MPR format (Figure 1) from its orifice to its division into the Left Anterior Descending (LAD) and Left Circumflex (LCX) arteries in case of bifurcation and into LAD, LCX and Ramus Intermedius (RI) arteries in case of trifurcation

CTCA images of LCA were observed for: (1) Origin (2) Length of main trunk (3) Branching pattern

The origin of LCA was studied with relation to Sino-tubular (ST) junction.

The statistical analysis was performed by using software SPSS (Statistical Package for Social Sciences) version 15.0. The values were represented in Number (%) and Mean ± Standard Deviation (SD).

## III.    RESULTS

A complete visualization of all the images revealed that LCA was originating from ascending aorta in all the cases. In 84% of cases the LCA was arising below the ST junction (Figure 2 a, b & c). In 14% of cases the LCA was arising at the level of ST junction (Figure 3) and in 2% of cases the LCA was arising above the ST junction (*High takeoff*) ( (Figure 4 a, b & c) (Table 2). None of the case showed anomalous origin of LCA.

The main trunk of LCA presented a variable length (mean *7.112 ± 3.04* mm, range 1.8–15 mm) (Figure 5) <5mm (n= 9, 18%), 5–10mm (n=34, 68%), and 10-15mm (n=7, 14%). The length of shortest LCA was 1.8mm and of longest LCA was 15mm. (Figure 6)
The length of main trunk of LCA had no statistically significant difference among males and females (p=0.15) (Table 3).

The most common branching pattern of LCA observed in the present study was the bifurcation into LAD and LCX arteries (Figure 7 a, b, c & d). Another branching pattern observed was the trifurcation into LAD, LCX and RI arteries. Variable patterns of RI artery were observed viz. small and large RI artery without branching (Figure 8 a & b) and RI artery with branching (Figure 9) Bifurcation and trifurcation was seen in 76% and 24% of cases respectively (Figure 10).   No other branching pattern was observed. The branching pattern of LCA had no statistically significant difference among males and females (p=0.825) (Table 4).

## IV.    DISCUSSION

The LCA can have a variant origin. Normally the LCA arises from left posterior aortic sinus of ascending aorta. If LCA arises from tubular part of ascending aorta, then its origin is called as *'High takeoff'*. The definition of High takeoff differs among different authors. According to *Montaudon et al.*[24].  LMCA originating from the proximal 1-cm segment of the ascending aorta might be considered as a normal variant, while a takeoff distal to the first 1-cm segment of the ascending aorta should be considered as an anomaly. In the present study, High takeoff of LCA is referred to its origination above the Sinotubular junction (junctional zone between sinuses and tubular part of ascending aorta). *High takeoff* of LCA may cause mainly a technical difficulty in cannulation of vessels during coronary angiography without crucial clinical problems [31]. In high takeoff position of LCA, acute angle between aortic cusp and coronary artery is suspected as a possible mechanism of ischemia.

The length of LCA varies from *0-15mm*. [7]. The mean length of main trunk of LCA observed in the present study was *7.11 ± 3.08* mm and there is no statistically significant difference among males and females (p= 0.15) (Table 3). This length is similar to the observations (6.48 ± 2.57mm) of an autopsy study done by *L. E. Ballesteros & L. M. Ramirez* [1]. The mean length in the present study is considerably smaller than that is reported in some previous studies conducted on different populations [3, 4, 6, 10, 13, 15, 21, 22, 26, 27]. None of the case showed a length >15mm, while this is reported by some authors [4, 13]  (Table 6).

In the present study *18% of cases had a very short main trunk of LCA* (<5mm).  *Fry* in 1968 postulated that a short left main coronary artery results in a <u>small pressure drop</u> and a <u>large flow</u> at the bifurcation. The resulting <u>high wall shear</u> favours atherogenesis at the bifurcation and in the proximal segments of the LAD and LCX arteries [12]. The report of an angiographic study said that the length of main trunk of LCA was significantly shorter in patients with either a dominant left or balanced circulation than that of patients with a dominant right coronary circulation [21]. *Stephen saltissi et al* also had the similar observations and found shorter mean length of main LCA in cases of dominant LCX artery than in the cases having dominant right coronary artery [27]. In other angiographic study, *Lewis CM et al* postulated that an *unusually short* (less than 6 mm) or *absent main LCA predisposes* to *Left Bundle Branch Block* (LBBB) [22]. This was the first study in which a correlation was established between the length of main trunk of LCA and the development of LBBB. They presume that the main trunk of LCA provides a slack which minimizes disruption of the coronary blood flow to the endocardial surface of the left ventricle near the summit of the muscular part of inter-ventricular septum, where the left bundle branch originates. *Gazetopoulos et al* also found that the length of main trunk of LCA was <6mm in patients of LBBB in their study group [13]. The findings of this study also showed a shorter length of the main LCA in patients with coronary atherosclerosis than in subjects without coronary artery disease (CAD). After these observations they  suggested that a *short main LCA should be considered as a congenital predisposing factor for the development of CAD* and it also increase the chance of development of atherosclerosis at origin of LAD artery.

*Stephen saltissi et al* found a correlation between length of main trunk of LCA and the location of atherosclerotic lesions in CAD. They found a much shorter mean length of main LCA in patients with proximal CAD than those with distal lesions [27]. The length of LAD and LCX arteries is inversely proportional to the length of main trunk of LCA.  Thus a shorter main trunk of LCA is associated with long untethered proximal segments in the LAD and LCX arteries which may then be prone to excessive systolic motion and hence to increased risk of atheromatous degeneration.

The length of main trunk of LCA is an anatomical variable which alter haemodynamics and thus may affect distribution of atherosclerotic lesions . In view of the poor prognosis of proximal lesions and their suitability for bypass grafting the discovery of innate anatomical risk factors which favors their formation is of importance. [16].

A wide variety of branching pattern of LCA was reported in previous studies conducted on different populations, and the most common branching pattern of LCA reported till date is bifurcation into LAD & LCX arteries. Results of the present study are

consistent with earlier reports that bifurcation is the most common branching pattern .The incidence of bifurcation in the present study is greater than that reported by some authors [1, 2, 3, 9, 15,  17,  23,  26, ] (Table 7 ).

Trifurcation is less common and lowest reported in the present study (Table 7). The incidence of both these patterns did not differ significantly between males and females (p value 0.825) (Table 4). Table 8 shows that the incidence of trifurcation in the present study is nearer to the finding of Cademartiri et al [4]. By comparing Table-7 & Table-8 it is concluded that the incidence of trifurcation reported in autopsy and cadaveric studies is more than that is reported in CT angiographic studies. It can be explained on the basis of adoption of different definitions of Ramus Intermedius artery. Ramus intermedius artery including its anastomoses, presents important pattern of the collateral blood flow, under conditions of coronary insufficiency. Left main trifurcating coronary artery disease (LMT CAD) is a complex and challenging anatomy to treat percutaneously [25]. *Trifurcation of LCA* can cause *technical difficulties in catheterization* and may be a source of *complication or misdiagnosis*. [20]. Left main trifurcation stenting carries an overall high rate of adverse events and may need to be reserved for patients who are at high risk or who refuse bypass surgery [28].

Tetrafurcation and Pentafurcation were also observed in previous studies [1, 2, 3, 9, 15,  17, 23 ] but no such pattern was seen in the present study, as well as single branch which was reported earlier [17] was not seen. Usually the incidence of bifurcation is more than the incidence of trifurcation, although *Huseyin S Surucu et al* [15] reported exactly the same incidence of both these patterns and *Fazliogullari Z et al*  reported almost equal incidence [9] (Table-7). In the present study the incidence of trifurcation (24%) is approximately one third the incidence of bifurcation (76%).

Congenital abnormalities of the coronary arteries are significant cause of chest pain and sudden cardiac death. The findings of present study will be beneficial in making a correct diagnosis and treat the patient accordingly. Variations in the origin, length and branching pattern of LCA have anatomical, pathophysiological, diagnostic and therapeutic implications. A detailed knowledge of all these variations is crucial for the interpretation of coronary angiograms, implementation of stenting procedures and surgical revascularization of myocardium.

## V.   CONCLUSION

Several variations can occur in the anatomy of left coronary artery. A higher incidence (2%) of *'High takeoff'* of LCA was found in the present study. The length of main trunk of LCA is relatively smaller in North Indian population as compared to other populations. The reported incidence of bifurcation is highest and that of trifurcation is lowest in the present study.

The findings of this study are of immense use for interventional cardiologists and radiologists during planning and performing any procedure on left coronary artery.

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**FIGURES**
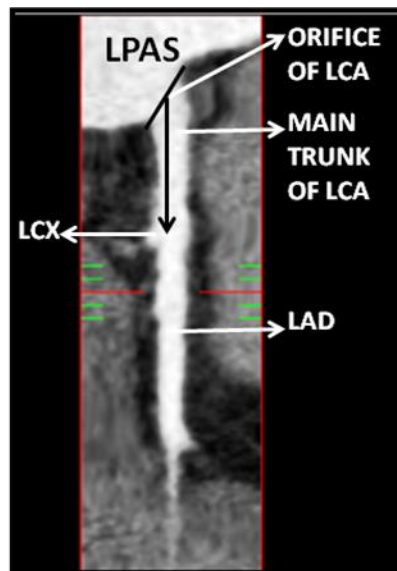


**Figure1:** Straight Multi-planar Reconstruction (MPR) image showing measurement of length of main trunk of LCA in case of bifurcation. **LPAS-** *Left Posterior Aortic Sinus,* **LCA-** *Left Coronary Artery*, **LAD-** *Left Anterior Descending,* **LCX-** *Left Circumflex.*
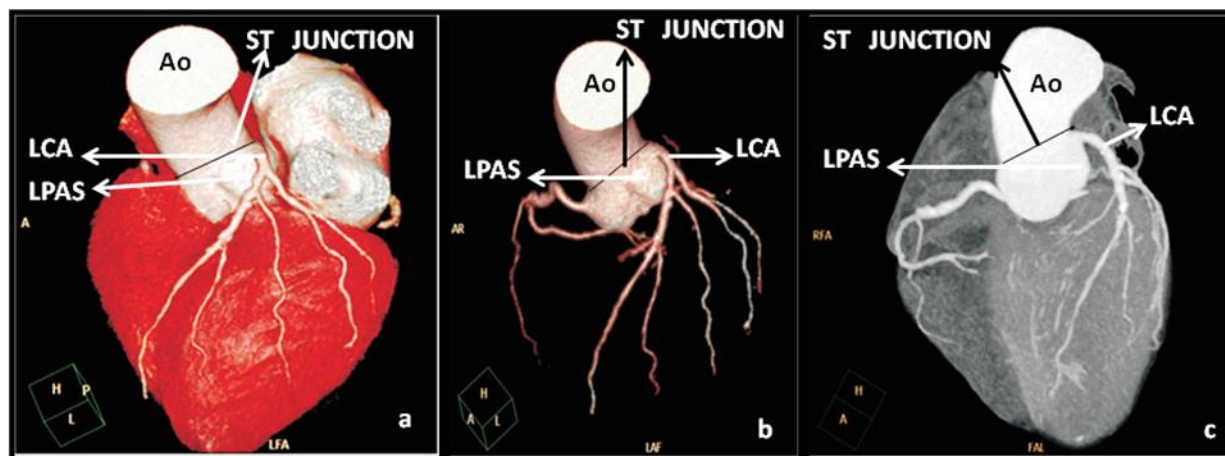
**Figure 2:** MDCT Coronary Angiographic images of the heart showing **origin of LCA below ST junction**. **a-** Three Dimensional Volume Rendered (3D-VR) image, **b- 3**D-VR image (contrast vessel tracking tree), **c-** 3D-VR image (cardiac outline protocol). **Ao-***Aorta***, ST JUNCTION-** *Sinotubular Junction,* **LPAS-** *Left Posterior Aortic Sinus,* **LCA-** *Left Coronary Artery*.
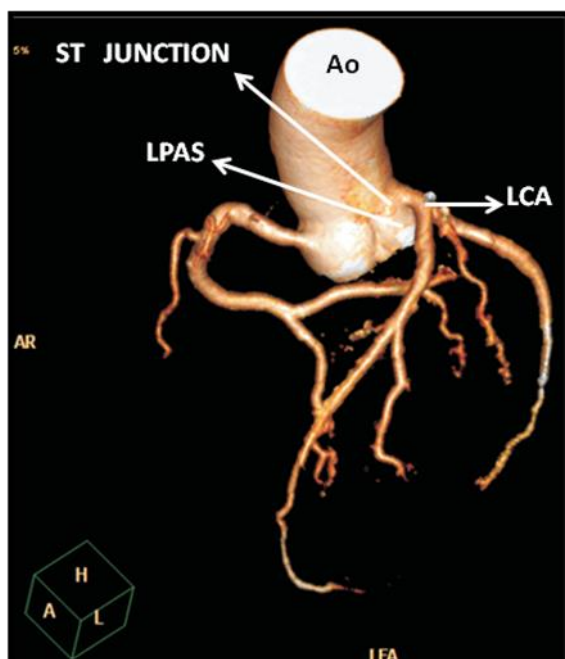


**Figure 3:** 3D-VR image (contrast vessel tracking tree) showing **origin of LCA at ST junction**. **Ao-***Aorta*, **ST JUNCTION-** *Sinotubular Junction,* **LPAS-** *Left Posterior Aortic Sinus,* **LCA-** *Left Coronary Artery*.
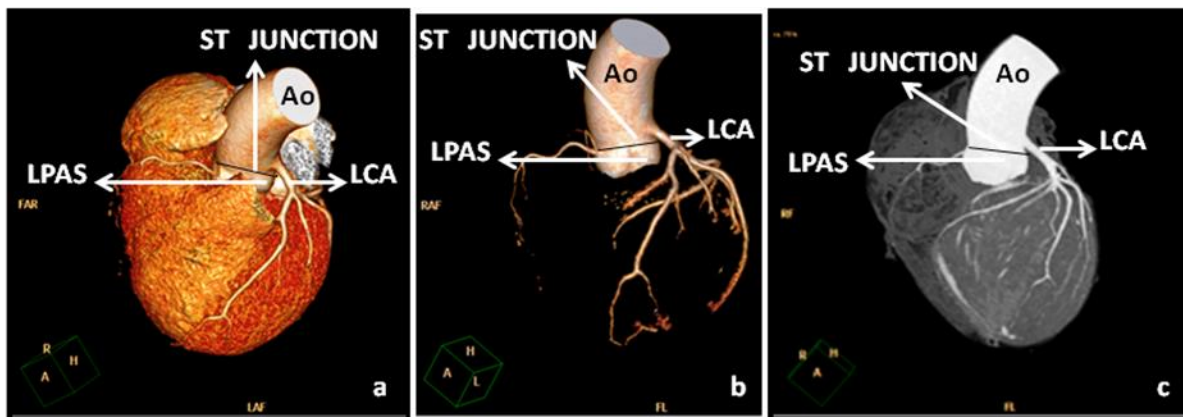
**Figure 4:** MDCT Coronary Angiographic images of the heart showing **origin of LCA above ST junction**. **a-** Three Dimensional Volume Rendered (3D-VR) image, **b- 3**D-VR image (contrast vessel tracking tree), **c-** 3D-VR image (cardiac outline protocol). **Ao-**_Aorta_**, ST JUNCTION-** _Sinotubular Junction,_ **LPAS-** _Left Posterior Aortic Sinus,_ **LCA-** _Left Coronary Artery_.
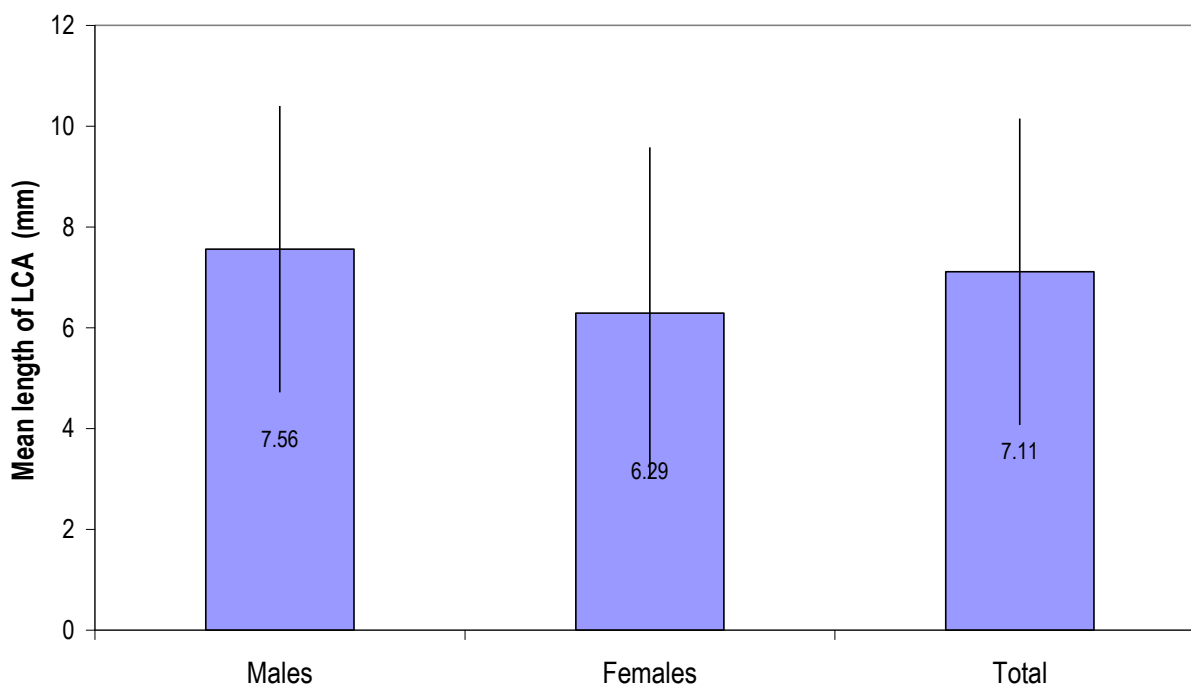


**Figure 5:** Bar diagram showing gender wise **mean length of main trunk of LCA**

**Figure 6:** 3D-VR images of the heart showing variable length of LCA. **a-** shortest LCA (*1.8mm*) & **b-** longest LCA (*15mm*). **Ao**- *Aorta,* **LA-** *Left Atrium*, **LCA-** *Left Coronary Artery*.
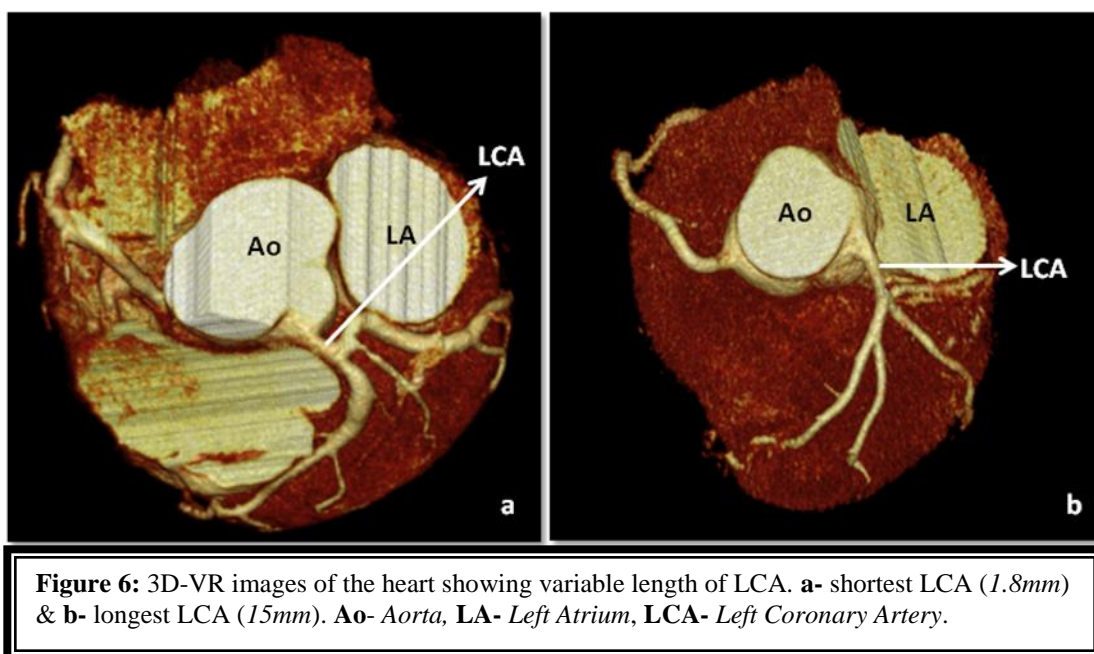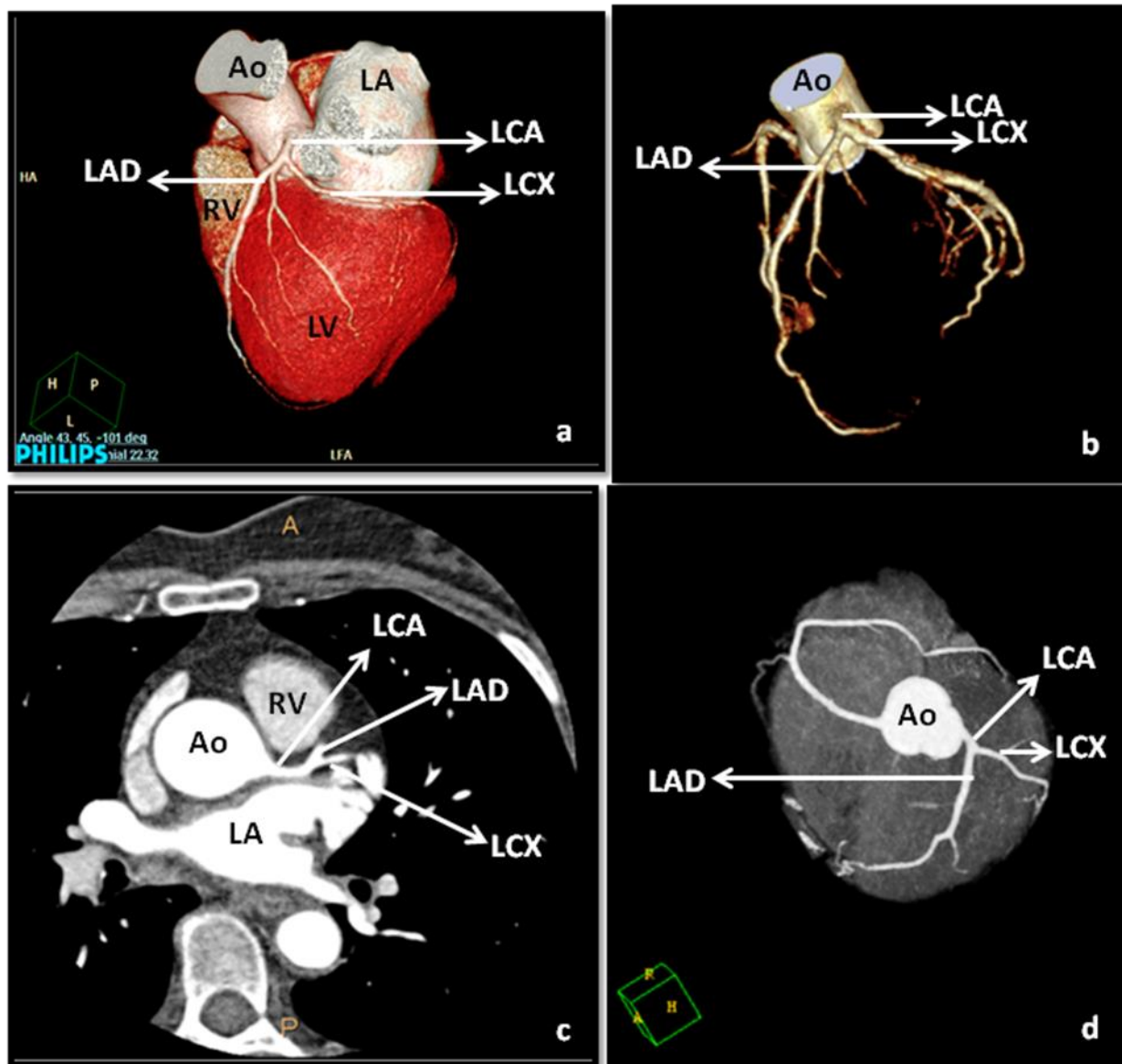
**Figure 7:** MDCT Coronary Angiographic images of the heart showing **bifurcation of LCA**. **a-** 3D-VR image, **b- 3**D-VR image (contrast vessel tracking tree), **c-** Axial maximum intensity projection (MIP) image, **d-** 3D-VR image (cardiac outline protocol). **Ao**-*Aorta*, **LA-** *Left Atrium*, **LV-** *Left Ventricle*. **RV-** *Right Ventricle*, **LCA-** *Left Coronary Artery*, **LAD-** *Left Anterior Descending,* **LCX-** *Left Circumflex.*
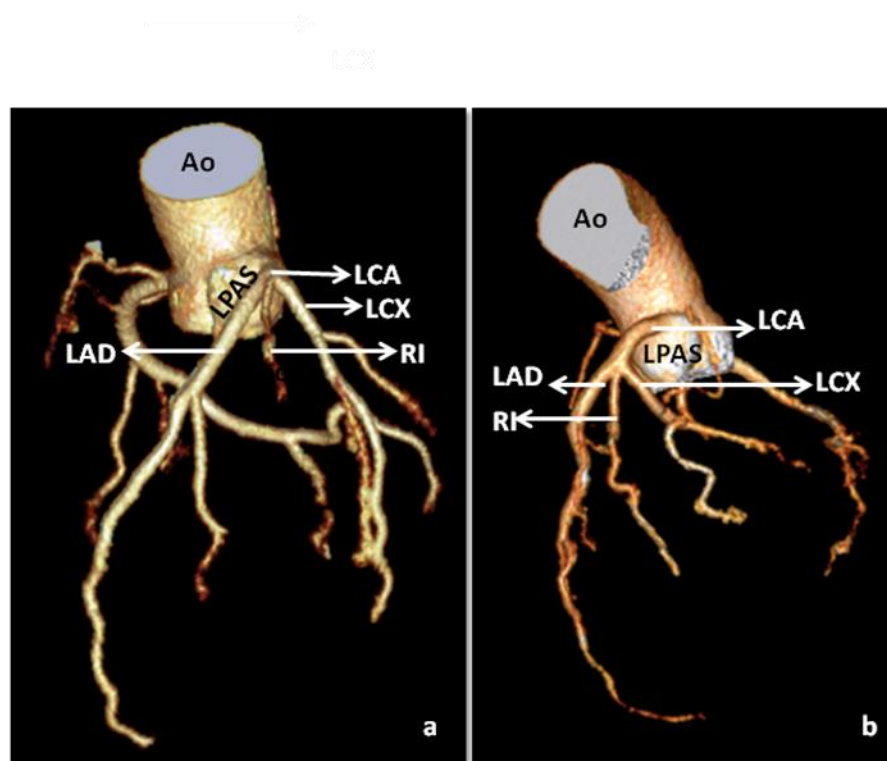
**Figure 8:** 3D-VR image (contrast vessel tracking tree) showing trifurcation of LCA. **a-** Small Ramus Intermedius (RI) artery,  **b-** Large Ramus Intermedius (RI) artery. **Ao-***Aorta*, **LPAS-** *Left Posterior Aortic Sinus.* **LCA-** *Left Coronary Artery*, **LAD-** *Left Anterior Descending,* **LCX-** *Left Circumflex.*
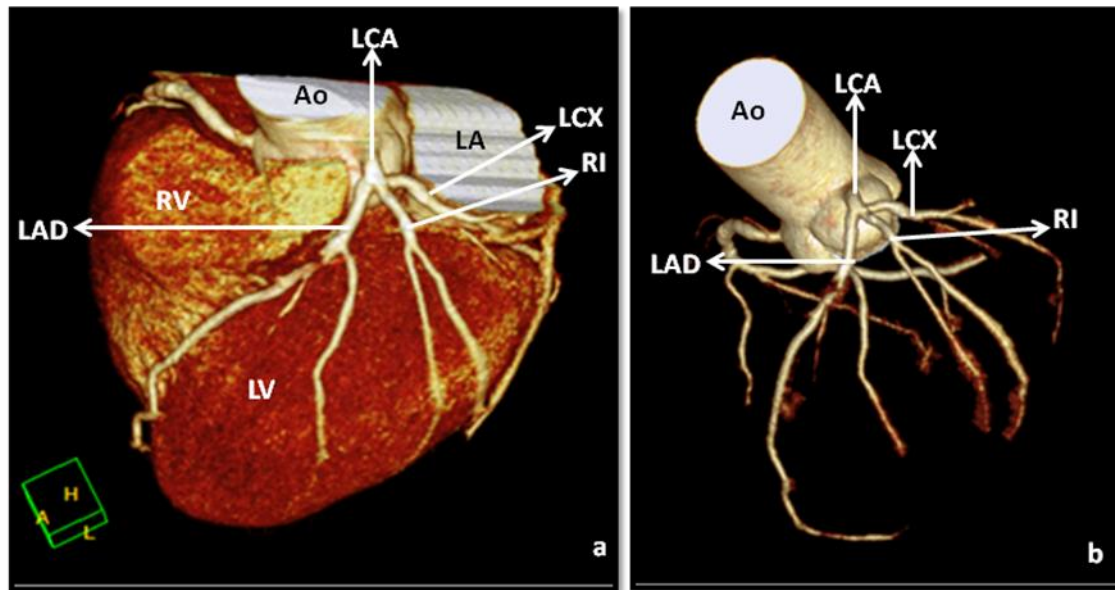
**Figure 9:** MDCT Coronary Angiographic images of the heart showing **branching RI artery**. a- 3D-VR image, b- 3D-VR image (contrast vessel tracking tree). **Ao**- *Aorta*, **LA-** *Left Atrium, LV- Left Ventricle*. **RV-** *Right Ventricle*, **LCA-** *Left Coronary Artery*, **LAD-** *Left Anterior Descending,* **LCX-** *Left Circumflex,* **RI-** *Ramus Intermedius.*
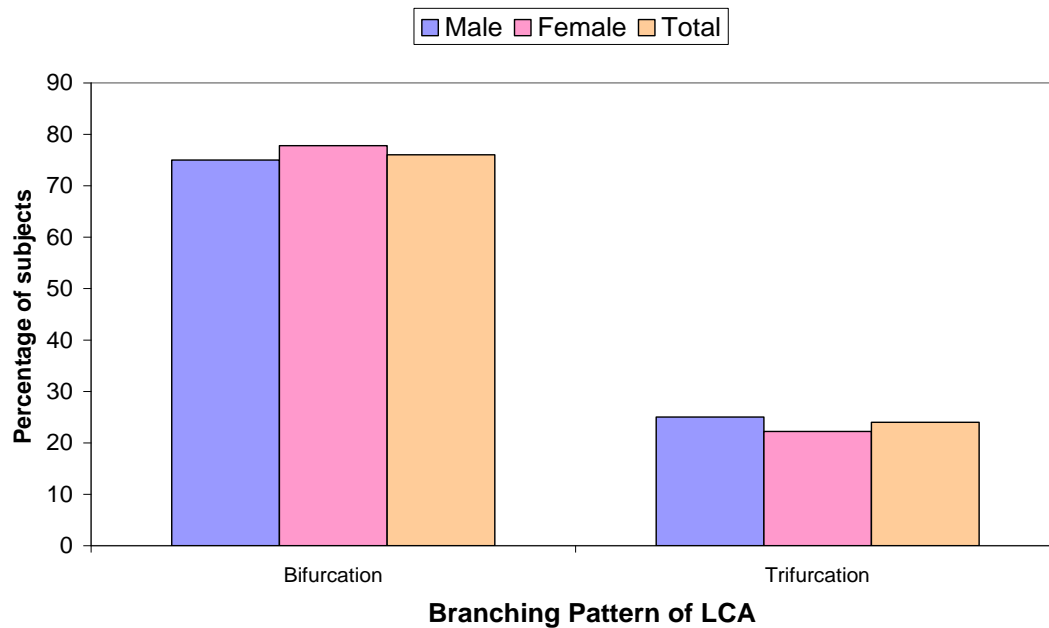


**Figure 10:** Bar diagram showing gender wise distribution of **branching pattern of LCA.**

**TABLES**

**Table - 1**
**Scan protocol of 64 slice CTCA**

| | |
|---|---|
| Slices/collimation | 64/0.625mm |
| Effective temporal resolution (with 180°algorithm) | 165 ms |
| Tube current | 800mAs |
| Pitch | 0.2 |
| Tube voltage | 120kV |
| Tube rotation time | 400ms |
| Section thickness | 0.9mm |
| Reconstruction Increment | 0.45mm |
| Field of view (FOV) | 220mm |
| ECG gating | Retrospective |
| Isotropic voxel resolution | 0.4× 0.4× 0.4 mm. |
| Scanning time | 10-12 seconds |

**Table – 2**
**Origin of LCA**

| Level of origin | Males (n=32) | | Females (n=18) | | Total (n=50) | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| **Above ST junction** | 0 | 0 | 1 | 5.56 | 1 | 2 |
| **At ST junction** | 4 | 12.5 | 3 | 33.33 | 7 | 14 |
| **Below ST junction** | 28 | 87.5 | 14 | 77.78 | 42 | 84 |

**Table – 3**
**Length of main trunk of LCA**

| Length of main trunk of LCA | Males (n=32) | Females (n=18) | Total (n=50) | 't' | 'p' value |
|---|---|---|---|---|---|
| **<5mm** | 2 | 7 | 9 | | |
| **5-10mm** | 26 | 8 | 34 | | |
| **10-15** | 4 | 3 | 7 | | |
| **Range(mm)** | 1.8-15 | 2.9-13 | 1.8-15 | | |
| **Mean±SD (mm)** | 7.56±2.84 | 6.29±3.29 | 7.11±3.04 | 1.433 | 0.15 |

**Table - 4**

**Branching pattern of LCA**

| Branching pattern of LCA | Males (n=32) | | Females (n=18) | | Total (n=50) | | χ² | 'p' value |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | | |
| Bifurcation | 24 | 75 | 14 | 77.78 | 38 | 76 | 0.0487 | 0.825 |
| Trifurcation | 8 | 25 | 4 | 22.22 | 12 | 24 | | |

**Table-5**
**Incidence of different sites of origin of LCA in various studies**

| Authors and Year of study | Type of study | Population and Number of cases | Origin of LCA | | | | |
|---|---|---|---|---|---|---|---|
| | | | AAS* | LPAS | RPAS** | Pulmonary Trunk | High takeoff |
| Chaitman BR et al., 1976 | Catheter angiography | Canadian 3750 | 7 | | | | |
| Charles E.Wilkins et al., 1988 | Catheter angiography | American 10,672 | 3 | | | 3 | |
| Carla Frescura et al., 1998 | Autopsy | Italian 1200 | 4 | 7 | 1 | 5 | |
| Harikrishnan S et al., 2002 | Catheter angiography | South Indian 7400 | 1 | | | | |
| Duran C et al., 2006 | MDCT angiography | Turkish 725 | 1 | | | | |
| G.J.R. ten Kate et al., 2008 | 64-slice CT angiography | Dutch 1000 | 2 | | | 1 | |
| Pinar Kosar et al., 2009 | 64-slice CT angiography | Turkish 700 | | | | | 0.7% |
| Franz von Ziegler et al., 2009 | CT angiography | American 748 | | | | | .oo1% |

| Yang Shan et al., 2010 | 64-slice CT angiography | Chinese 6014 | | | 0.00% | | .001% |
|---|---|---|---|---|---|---|---|
| **Present study** **2011** | 64-slice CT angiography | North Indian 50 | | **98%** | | | **2%** |

*AAS- *Anterior aortic sinus.*
**RPAS- *Right Posterior aortic sinus.*

**Table - 6**
**A comparison of length of main trunk of LCA among different studies**

| Authors And Year of study | Type of study | Population and Number of cases | Mean length of main trunk of LCA | Range of length of main trunk of LCA |
|---|---|---|---|---|
| Lewis C. M. et al, 1970 | Catheter angiography | American 366 | *12.8 ± 0.8* mm (in control) *4.5 ± 1.7* mm (in patients) | *7.5-20.5* mm |
| Fox C. et al, 1973 | Autopsy and Coronary cineangiography | English 200 (100-by Autopsy, 100-by Coronary cineangiography) | *5.5* mm (by Autopsy) *9.5* mm (by Coronary Cineangiography) | Maximum-*32* mm |
| Kronzon I. et al, 1974 | Catheter angiography | 100 | *10.4* mm | |
| Gazetopoulos N. et al, 1976 | Catheter angiography | Greek 43 | *16.8 ± 4.13* mm (without atherosclerosis) *10.28 ± 2.57* mm (with atherosclerosis *3.75 ± 1.89* mm (with complete LBBB) | |
| Saltissi S. et al, 1979 | Catheter angiography | English 149[54 (normal), 95 (patients) ] | *12.9* mm (in normal) *10.6* mm (in patients) | |
| Reig J. & Petit M., 2004 | Autopsy | Spanish 100 | *10.8±5.52* mm | *2-23* mm |
| Surucu H.S. et al, 2004 | Autopsy and Cadaveric | Turkish 40 | *14.1* mm (in bifurcation), *15* mm (in trifurcation), *9.1* mm(in tetrafurcation &pentafurcation) | |
| Ballesteros L.E. & Ramirez L.M., 2008 | Cadaveric | Colombian mixed race 154 | *6.48 ± 2.57* mm | |
| Cademartiri F. et al, 2008 | 64 slice CT coronary angiography | Multiethnic dutch 543 | *112 ± 55* mm | |
| Christensen K.N. et al, 2010 | MDCT coronary angiography | American 105 | *9.9 ± 4.15* mm | *2-21* mm |
| Bhimalli S. et al, 2011 | Cadaveric | Indian 60 | *13.5 ± 0.27* mm | |
| **Present study** **2011** | 64 slice CT coronary angiography | North Indian 50 | ***7.11 ± 3.08 mm*** | ***1.8-15*mm** |

**Table-7**

**A comparison of the frequency of LCA branching pattern among various studies**

| Authors and Year of study | Type of study | Population and Number of cases | Branching pattern of LCA | | | | |
|---|---|---|---|---|---|---|---|
| | | | Bifurc-ation | Trifurc-ation | Quadrifurc-ation | Pentafurc-ation | One branch |
| Baptista CA et al, 1991 | Cadaveric | American 150 | 54.7 | 38.7 | 6.7 | | |
| Kalpana R., 2003 | Cadaveric | Indian 100 | 47 | 40 | 11 | 1 | 1 |
| Reig J. & Petit M., 2004 | Autopsy | Spanish 100 | 62 | 38 | | | |
| Huseyin S. Surucu et al., 2004 | Autopsy & Cadaveric | Turkish 40 | 47.5 | 47.5 | 2.5 | 2.5 | |
| Lujinovic A et al., 2005 | Coronary angiography | Bosnian 100 | 71 | 29 | | | |
| Lujinovic A et al., 2005 | Cadaveric | Bosnian 20 | 65 | 35 | | | |
| Ballesteros L.E. & Ramirez L.M., 2008 | Cadaveric | Colombian mixed race 154 | 52 | 42.2 | 9 | | |
| Fazliogullari Z et al, 2010 | Cadaveric | Turkish 50 | 46 | 44 | 10 | | |
| Bhimalli S. et al, 2011 | Cadaveric | Indian 60 | 56.66 | 33.33 | 8.33 | 1 | |
| **Present study, 2011** | 64-sliceCT angiography | North Indian 50 | **76** | **24** | | | |

*All values represent percentage of cases.*

**Table-8**

**A comparison of the frequency of trifurcation of LCA among various 64-slice CT angiographic studies**

| Authors & Year of study | Type of study | Population & Number of cases | Trifurcation of LCA |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Cademartiri F.et al, 2008 | 64-sliceCT angiography | Italian 543 | 21.9 |
| Pinar Kosar et al, 2009 | 64-sliceCT angiography | Turkish 700 | 31 |
| Kevin N. Christensen et al, 2010 | 64-sliceCT angiography | American 105 | 19 |
| **Present study, 2011** | 64-sliceCT angiography | North Indian 50 | **24** |

*All values represent percentage of cases.*

# Effect of blending on the Proximate, Pasting and Sensory Attributes of Cassava – African yam Bean Fufu Flour

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## ABSTRACT

*Abstract* - Nutritional attributes of Fufu-fermented cassava flour was improved through blending with 10, 20, 30 and 40% African Yam Bean (*Sphenostylis stenocarpa*) flour and the products were subjected to proximate analysis, pasting properties and sensory evaluation, with 100% cassava fufu flour as control. The results showed that the African Yam bean - Fufu flour contained 6.50% protein, 1.08% ash, 0.65% fibre, 0.26% fat at 10% level of inclusion and this increased to 16.45, 1.22, 0.90 and 1.24% respectively at 40% level of inclusion. However, the carbohydrate contents decreased from 91.51 - 80.87% at 10% and 40% inclusion of African yam bean flour respectively. All pasting characteristics with the exception of pasting temperature and peak time decreased with increased African Yam Bean inclusion. Peak viscosity (340.22 - 203.34) RVU, final viscosity (300.06 - 180.33) RVU, setback (79.72 - 39.13) RVU, break down (133.22 – 88.00) RVU, trough at $95^0$ C (220.00 – 141.20) RVU at 10% and 40% level of inclusion of African Yam Bean respectively. There was a slight significant difference ($p \leq 0.05$) in overall acceptability between 10% level of inclusion and the control (100% cassava flour). The values ranged from 6.2 – 7.9 respectively. Generally, the rating of all the sensory attributes assessed reduced with increased in the inclusion of AYB flour.

*Index Terms* – Blending; Cassava - African Yam Bean (AYB) fufu flour; Pasting Characteristics; Proximate Analysis; and Sensory Evaluation

## I. INTRODUCTION

Cassava *(Manihot esculetus Crantz)* is a root crop cultivated and consumed as a staple in many regions of the developing countries). In Nigeria, cassava is processed into various products that are consumed in various ways. Among the fermented cassava roots products are 'garri', 'fufu', 'tapioca', and 'lafun' (Oyewole, 1991).

Cassava plays a food security role in areas prone to drought, famine and in periods of strives and civil disturbance. The crop's ability to provide a staple food base is a function of its flexibility in terms of planting and harvesting strategies and because of its relative tolerance of poor solids and pest/disease problems (Adebowale *et al.*, 2005). Cassava is a major source of dietary energy for low income consumers in many parts of tropical Africa, including major urban areas.

However, the utilization of cassava is limited by its extremely low protein content and so the consumption of its products has been implicated in malnutrition. The low protein intake in Africa has been attributed to the increasing high cost of traditional sources of animal protein. Legumes are some of the low-priced sources of protein rich foods that have been important in alleviating protein malnutrition (Aykroyd *et al.*, 1992). Accordingly the compositional evaluations of leguminous seeds such as soybean, cowpea, groundnut, pigeon pea, chicken pea and red gram have been carried out in different locations by many investigators (Oloyo, 2002).

African Yam bean (*Sphenostylis stenocarpa*) is one of the edible, underutilised grain legumes widely cultivated in Africa that is used for man and animal nutrition (Eke, 2002). Like most grain legumes cultivated in Africa, African Yam bean is rich in protein (19.5%), carbohydrates (62.6%), fat (2.5%), vitamins and minerals (Iwuoha and Eke, 1996). The protein is made up of over 32 % essential amino acids, with lysine and leucine being predominant (Onyenekwe *et al.,* 2000). In spite of its composition, it has a low consumption rate. This is mainly due to its long cooking time about 145 min. (Nwokolo, 1996). Cultivation of African yam bean which has started as far back as 3000 years ago, are now widely cultivated in all tropical and semi-tropical regions of both the old and the new world. Therefore, African Yam bean as one of the ideal source for protein supplementation of starchy foods has been proposed because it will also help to extend the use of this lesser- known and utilised legumes in a number of food preparations especially in the developing countries for human consumption.

Fortification of inexpensive staples such as cassava and maize has resulted in products of high nutritional value (Oyarekua, 2009). An acceptable, nutritionally-enriched food that can be stored in the home should be produced for consumption in areas where protein intake is low. This work is aimed at determining the effect of in-cooperation of African Yam bean on the pasting, proximate and sensory attributes of "fufu" a fermented cassava-based- food.

## II. MATERIALS AND METHODS

**Collection of samples and equipments:** Freshly harvested matured cassava *(Manihot esculetus Crantz)* roots (NR 8083) were obtained from the research farm of Imo State Polytechnic, Umuagwo-Ohaji. Imo State, Nigeria. African Yam Bean (*Sphenostylis stenocarpa*) seeds were bought from Ekeonunwa market in Owerri, Imo state, Nigeria. Facilities and equipments described for cassava and African Yam Bean (AYB) flour processing used were source from cassava processing plant of Imo State Polytechnic Umuagwo-Ohaji. Imo state Nigeria.

**Preparation of samples:** The cassava roots were sorted and cleaned to remove dirts and soils. The following steps were adopted in the production of fufu: manual peeling of cassava roots, washing, soaking, sieving, sedimentation, decantation, drying and milling. The African yam bean flour was prepared according to the method described by Enwere (1998). During preparation, two kilograms of African yam bean seeds which were free from foreign particles such as stones, leaves and sticks, as well as damaged and contaminated seeds were weighed, cleaned and soaked in tap water containing 0.1% sodium metabisulphite ($NaHS0_3$) for 12h. Thereafter the soaked seeds were manually dehulled, drained and boiled ($100^0$C, 20min). The dehulled and boiled seeds were spread on the trays and dried in the tray dryer ($60^0$C, 10h). After that, the dried seeds were immediately milled (attrition mill) and sieved through a 500µm mesh sieve. The cooked African yam bean flour produced was finally packaged in sealed polyethylene bags for blending with fufu flour as shown in table 1.

**Analytical Methods**

**Proximate Composition Analysis:** This was carried out according to the method of AOAC (1995).

**Moisture Content Determination**
Two grams of each of the sample was weighed into dried weighed crucible. The samples was put into a moisture extraction oven at $105^0$C and heated for 3h. The dried samples were put into desiccators, allowed to cool and reweighed. The process was reported until constant weight was obtained. The difference in weight was calculated as a percentage of the original sample.

$$\text{Percentage moisture} = \frac{W2 - W_1}{W_2 - W_3} \times \frac{100}{1}$$

**Where:**
$W_1$ = Initial weight of empty dish
$W_2$ = Weight of dish + un - dried sample
$W_3$ = Weight of dish + dried sample

**Ash Content Determination**
Two grams of each of the samples was weight into crucible, heated in a moisture extraction oven for 3h at $100^0$C before being transferred into a muffle furnace at $550^0$C until it turned white and free of carbon. The sample was then removed from the furnace, cooled in a desiccator to a room temperature and reweighed immediately. The weight of the residual ash was then calculated as Ash Content.

$$\text{Percentage Ash} = \frac{\text{Weight of Ash}}{\text{Weight of original of sample}} \times \frac{100}{1}$$

**Crude Protein Determination**
The micro Kjeldahl method described by A.O.A.C (1995) was used. Two grams of each of the samples was mixed with 10ml of concentrated $H_2SO_4$ in a heating tube. One table of Selenium catalyst was added to the tube and mixture heated inside a fume cupboard. The digest was transferred into distilled water. Ten millimeter portion of the digest mixed with equal volume of 45% NaOH solution was poured into a Kjeldahl distillation apparatus. The mixture was distilled and the distillate collected into 4% Boric acid solution containing 3 drops of Methyl red indicator. A total of 50ml distillate was collected and titrated as well. The sample was duplicated and the average value taken. The Nitrogen content was calculated and multiplied with 6.25 to obtain the crude protein content.

$$\text{This is given as percentage Nitrogen} = \frac{(100 \times N \times 14 \times VF)T}{100 \times Va}$$

**Where:**
N= Normality of the titrate (0.1N)
VF= Total volume of the digest= 100ml
T= Titre Value

Va= Aliquot Volume distilled

## Fat Content Determination

Two grams of the sample was loosely wrapped with a filter paper and put into the thimble which was fitted to a clean round bottom flask, which has been cleaned, dried and weighed. The flask contained 120ml of Petroleum ether. The sample was heated with a heating mantle and allowed to reflux for 5h. The heating was then stopped and the thimbles with the spent samples kept and later weighed. The difference in weight was received as mass of fat and is expressed in percentage of the sample.

The percentage oil content is percentage fat $= \frac{W_2 - W_1}{W_3} \times \frac{100}{1}$

**Where;**

$W_1$ = weight of the empty extraction flask

$W_2$ = weight of the flask and oil extracted

$W_3$ = weight of the sample

## Crude Fibre Determination

Two grams (2g) sample and 1g asbestos were put into 200ml of 1.25% of $H_2SO_4$ and boiled for 30 minutes. The solution and content then poured into Buchner funnel equipped with muslin cloth and secured with elastic band. This was allowed to filter and residue was then put into 200ml boiled NaOH and boiling continued for 30 minutes, then transferred to the Buchner funnel and filtered. It was then washed twice with alcohol, the material obtained washed thrice with petroleum ether. The residue obtained was put in a clean dry crucible and dried in the moisture extraction oven to a constant weight. The dried crucible was removed, cooled and weighed. Then, difference of weight (i.e. loss in ignition) is recorded as crucible fibre and expressed in percentage crude fibre

$= \frac{W_1 - W_2}{W_3} \times \frac{100}{1}$

**Where:**

$W_1$ = weight of sample before incineration

$W_2$ = weight of sample after incineration

$W_3$ = weight of original sample

## Carbohydrate Content Determination

The nitrogen free method described by A.O.A.C (1995) was used. The carbohydrate is calculated as weight by difference between 100 and the summation of other proximate parameters as Nitrogen free Extract (NFE) percentage carbohydrate.

(NFE). $= 100 - (m + p + F_1 + A + F_2)$

Where:

m = moisture

p = protein

$F_1$ = Fat

A = ash

$F_2$ = Crude fibre

**Pasting characteristics Determination:** Pasting characteristics of the flour blends were evaluated using a Rapid Visco Analyzer (RVA). First, 2.5 g of samples were weighed into a dried empty canister; then 25 ml of distilled water was dispensed into the canister containing the sample. The solution was thoroughly mixed and the canister was well fitted into the RVA as recommended. The slurry was heated from $(50-95)^0C$ with a holding time of 2 min followed by cooling to $50^0C$ with 2 min holding time. The rate of heating and cooling were at a constant rate of $11.25^0C$ per min. Peak viscosity; trough, breakdown, final viscosity; set back, peak time and pasting temperature were read from the pasting profile with the aid of thermocline for windows software connected to a computer (Newport Scientific, 1998).

**Sensory evaluation:** The sensory evaluation was carried out on the following parameters: appearance, taste, aroma, mouth feel (texture) and overall acceptability on the heat – treated reconstituted samples by a panel of twenty semi – trained members who were familiar with the product 'fufu' using a 9-point Hedonic scale. The rating of the samples ranged from 1 (Dislike extremely) to 9 (Like extremely).

**Statistical analysis:** The statistical significance of the observed differences among the means of triplicate readings of experimental results was evaluated by Analysis of Variance (ANOVA) while means were separated using Duncan's Range Test. These analyses were carried out using SPSS (2001) Package (Version 11.0).

## III. RESULTS AND DISCUSSION

**Proximate Composition of the Cassava-African Yam Bean Fufu Blends:** Proximate composition of the fufu blend samples showed a significant variation among the parameter examined with exception of carbohydrate (Table 2). Fufu blend of 60:40 ($FAY_4$) had the highest protein content (16.45 %) when compared with value of (6.50%) sample blend containing the least African Yam bean incorporation ($FAY_1$). The high protein content of the $FAY_4$ could be due to the level of African yam Beans flour inclusion, which has high protein content. According to Padmaja and Jisha (2005), protein content of the Cassava based composite flours could be elevated through the incorporation of legume flours. Similar trend was observed on other proximate properties such fat content which increased from 0.26 – 0.56 %, ash 1.08 – 1.22 %, crude fibre 0.65 – 0.90% for $FAY_1$ and $FAY_4$   respectively. The blend $FAY_1$ (Fufu flour/ African yam Beans flour 90:10) had the highest carbohydrate content (91.51) %, while the blend $FAY_4$ (Fufu flour/African yam Beans flour 60:40) had the lowest (80.87) %. The observation on carbohydrate could be attributed to differences in proportion of blend of the two major materials. From the results, it appears that the improvement of nutritional value of fufu could be dependent on the level of African yam Beans inclusions. This work confirms earlier report by Fashakin *et al*. (1986) on the beneficial effect of vegetable protein supplementation in carbohydrate-based foods.

**Pasting characteristics of Cassava-African Yam Bean Blends:** Amylographic studies (Table 3) showed that the pasting characteristics of Cassava-African Yam Bean blends are generally lower in values when compared with the control sample (FF).  Peak viscosity is the maximum viscosity developed during or soon after the heating aspect of the test. High peak viscosity has been attributed to be significant in the preparation of stiff dough products like fufu (Thomas and Atwell, 1999).The peak viscosity of FF was 370.22 RVU at a temperature of 74.40 $^0$C in 4.00 min. The Fufu- African yam bean flours had lower values in the range of (203.34-340.22) RVU. However, higher peak viscosity may be attributed to difference in protein content (Sandhu and Singh, 2007). This suggests that the presence and interaction of components like fats and protein (from African yam bean) with cassava starch lowers the peak viscosity of the blends (Egouletey and Aworh, 1991).  The holding period is usually accompanied by breakdown viscosity which could also be referred to as shear thinning, hot paste viscosity, paste stability or trough. It is regarded as the measure of the degree of disintegration of the granules or "paste stability" (Dengate, 1984). It gives an indication of hot paste stability and the smaller the value, the higher the stability (Hugo *et al*., 2000). Trough and breakdown are pasting properties which indicate the ability of a food material to remain undisrupted when subjected to long periods of constant high temperature and ability to withstand breakdown during cooking (Normita and Cruz, 2002). The breakdown viscosity of FF was 200.33 RVU. The blend samples had lower values in the range of 133.21-88.00RVU as inclusion of AYB flour increased. Adebowale *et al*. (2005), reported that the higher the breakdown in viscosity, the lower the ability of the sample to withstand heating and shear stress during cooking. Therefore, sample $FAY_4$ might be able to withstand heating and shear stress compared to other samples because of its low breakdown value. The final viscosity ranged from 180.33-332.24RVU and the control sample FF had the highest 332.24 RVU final viscosity. Shimels *et al*. (2006) reported that final viscosity is used to indicate the ability of starch to form various paste or gel after cooling and that less stability of starch paste is commonly accompanied with high value of breakdown. The final viscosity is the most commonly used parameters to determine a particular starch based sample quality. It gives an idea of the ability of a material to gel after cooking. This implies that sample FF will be less stable after cooling compared to Fufu- African yam bean flours blend. The variation in the final viscosity might be due to the simple kinetic effect of cooling on viscosity and the re - association of starch molecules in the samples. The difference between final viscosity and trough give rise to a pasting property known as setback viscosity. Setback values have been reported to correlate with ability of starches to gel into semi solid pastes. It is the phase of the pasting curve after cooling the starches to 50 $^0$ C. This stage involves re – association, retrogradation or re – ordering of starch molecules. It has been correlated with the texture of the food products (Michiyo *et al.,* 2004). High setback viscosity is associated with weeping or syneresis. Among the fufu blends studied, $FAY_1$ had the highest retrogradation tendency of 79.72 RVU setback viscosity, followed by $FAY_2$ (66.00RVU) and $FAY_3$ (41.99RVU) while $FAY_4$ had the lowest value 39.13RVU. The apparent gelatinization (pasting) temperature is the temperature were viscosities first increases by at least 2 RVU over a 20 Sec period. This was 74.40 $^0$C for the control sample while those of Cassava - African yam bean fufu flours varied from (76.33-78.11) $^0$C. This may be due to the buffering effect of fat (from African yam bean) on starch which interferes with the gelatinization process (Egouletey and Aworh, 1991). The pasting temperature is one of the characteristic which provide an indication of the minimum temperature required for sample cooking, energy cost involved and other components stability. It is clear from the results that the control sample FF will cook faster with less energy, thereby saving cost and time compared to other samples because of its lower pasting temperature. The ability of starch to imbibe water and swell is primarily dependent on the pasting temperature. Hence in the presence of water and heat, starch granules swell and form paste by imbibing water (Rincon *et al.,* 2004).

**Sensory Evaluation of Reconstituted Cassava-African Yam Bean Blends:** Table 4 showed a significant difference ($p \leq 0.05$) on the sensory characteristics of fufu blends. It was observed that the control sample and blends varied in terms of overall acceptability, and the value ranged from 7.9 - 5.0. The control food sample was rated higher than Cassava – African Yam Beans–Fufu flours. This could be attributed to the fact that panellist have been used to control sample (FF) and difference in the nature and chemical composition of the major raw materials used. African Yam beans flour supplementation ($FAY_1$) was rated next to the control food sample but there was no significant difference between $FAY_3$ and $FAY_4$ in overall acceptability because of closeness in the blending proportions. The rating for aroma significantly differs from each other and reduced as the inclusion of AYB flour increases (7.3 - 3.2). This could be attributed to the increase in bean-off flavour associated with legumes (Eke, 2002).

## IV. CONCLUSION

This study has shown that the nutritional status of Fufu a cassava – based staple food can be enhanced through African yam Beans Flour supplementation .The developed Cassava - African Yam Bean Fufu flour were found to be nutritious and can easily be prepared by using simple domestic processing techniques. The developed composite flour can be incorporated into the diet to prevent protein-energy malnutrition in Nigeria and other African countries where cassava products are staples, which is known to exacerbate many diseases prevalent in Nigeria and other African countries where cassava products are staples. These value-added products can also be produced to diversify the monotonous Nigerian diet and be a fortress against diseases.

The study also, revealed the pasting property variations that exist in samples of composite Cassava- African yam bean-fufu flours. The knowledge of pasting characteristics will assist consumers to know the ease of reconstitution and consistency of starchy pastes prepared from these varying blends of flours.

## ACKNOWLEDGMENT

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**Table 1: Cassava - African Yam Bean  fufu flour blends**

| Samples | Fufu (%) | African Yan Bean (%) |
| --- | --- | --- |
| FF | 100 | 0 |
| AYF | 0 | 100 |
| FAY$_1$ | 90 | 10 |
| FAY$_2$ | 80 | 20 |
| FAY$_3$ | 70 | 30 |
| FAY$_4$ | 60 | 40 |

FF = Fufu flour; AYF = African Yam Beans flour; FAY = Fufu-African Yam Beans blend

**Table 2: Mean proximate composition (%) of developed supplements**
Proximate composition (%)

| Samples | Protein | Ash | Crude fat | Crude fibre | Carbohydrate |
|---|---|---|---|---|---|
| FF | 3.09 [a] | 0.96 [a] | 0.18 [a] | 0.36 [a] | 95.41 [a] |
| $FAY_1$ | 6.50 [b] | 1.08 [a] | 0.26 [b] | 0.65 [b] | 91.51 [b] |
| $FAY_2$ | 10.05 [c] | 1.10 [a] | 0.37 [c] | 0.76 [c] | 87.72 [c] |
| $FAY_3$ | 13.44 [d] | 1.14 [b] | 0.44 [d] | 0.84 [d] | 84.14 [d] |
| $FAY_4$ | 16.45 [e] | 1.22 [c] | 0.56 [e] | 0.90 [e] | 80.87 [e] |

Means with the same superscripts on the same column are not significantly different from each other at ($p \leq 0.05$).
(FF = 100% Fufu, $FAY_1$ = 90:10% of Fufu: African yam bean, $FAY_2$ = 80:20% of Fufu: African yam bean, $FAY_3$ = 70:30% of Fufu: African yam bean, $FAY_4$ = 60:40% of Fufu African yam bean)

**Table 3: Mean pasting properties of Cassava – African yam beans fufu flour blends**
Viscosity (RVU)

| Samples | Peak Viscosity | Final Viscosity | Peak time (min) | Pasting Temp ($^0$C) | Trough @ ($95^0$C) | Break down | Set back |
|---|---|---|---|---|---|---|---|
| FF | 370.22 [e] | 332.24 [e] | 4.00 [a] | 74.40 [a] | 230.00 [e] | 200.33 [e] | 102.24 [e] |
| $FAY_1$ | 340.22 [d] | 300.06 [d] | 4.23 [b] | 76.33 [b] | 220.34 [d] | 133.21 [d] | 79.72 [d] |
| $FAY_2$ | 292.09 [c] | 266.00 [c] | 5.32 [c] | 76.00 [b] | 200.00 [c] | 99.35 [c] | 66.00 [c] |
| $FAY_3$ | 263.11 [b] | 230.34 [b] | 3.60 [a] | 78.35 [c] | 188.35 [b] | 92.00 [b] | 41.99 [b] |
| $FAY_4$ | 203.34 [a] | 180.33 [a] | 4.25 [b] | 78.11 [c] | 141.20 [a] | 88.00 [a] | 39.13 [a] |

Means with the same superscripts on the same column are not significantly different from each other at ($p \leq 0.05$)
(FF = 100% Fufu, $FAY_1$ = 90:10% of Fufu: African yam bean, $FAY_2$ = 80:20% of Fufu: African yam bean, $FAY_3$ = 70:30% of Fufu: African yam bean, $FAY_4$ = 60:40% of Fufu African yam bean)

**Table 4: Mean Sensory evaluation scores for reconstituted Cassava - African Yam Bean Fufu flour blends**

| Samples | Appearance | Taste | Aroma | Texture | Overall acceptability |
|---------|-----------|-------|-------|---------|----------------------|
| FF | 8.0$^c$ | 7.6$^c$ | 7.3$^c$ | 7.4$^c$ | 7.9$^c$ |
| FAY$_1$ | 7.4$^{bc}$ | 6.4$^{bc}$ | 5.5$^{bc}$ | 6.5$^{bc}$ | 6.2$^b$ |
| FAY$_2$ | 6.0$^{ab}$ | 5.2$^b$ | 5.3$^b$ | 5.0$^a$ | 5.0$^a$ |
| FAY$_3$ | 5.8$^a$ | 5.2$^b$ | 5.2$^b$ | 5.4$^{ab}$ | 5.3$^a$ |
| FAY$_4$ | 6.0$^{ab}$ | 3.4$^a$ | 3.2$^a$ | 5.0$^a$ | 5.3$^a$ |

Means with the same superscripts on the same column are not significantly different from each other at ($p \leq 0.05$).
(FF = 100% Fufu, FAY$_1$ = 90:10% of Fufu: African yam bean, FAY$_2$ = 80:20% of Fufu: African yam bean, FAY$_3$ = 70:30% of Fufu: African yam bean, FAY$_4$ = 60:40% of Fufu African yam bean)

# Association of GSTT1 and GSTM1 Null Polymorphisms with Premalignant Laryngeal Lesions in South Indian Population

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*Abstract*- The objective of this study is to identify association of GSTM1 and GSTT1 null gene polymorphisms with risk of cancer in defined populations in South India with histologically confirmed pre-malignant laryngeal lesions. Different parameters were taken into consideration and a demographic risk profile was defined as reported from a hospital-based cancer registry in Hyderabad, Andhra Pradesh, India. 23 histologically confirmed pre-malignant laryngeal cancer tissue and blood samples were collected and analyzed for GSTM1 and GSTT1 null polymorphisms by PCR method. GSTT1 null polymorphism was found to be more associated with the risk of malignancy than GSTM1 null polymorphism in the study population.

*Index Terms*- GSTM1, GSTT1, pre-malignant laryngeal lesions, South India.

## I. Introduction

Cancer is an uncontrolled proliferation of cells that can in principle arise from every tissue. Cancer currently accounts for one-fifth of the total mortality in high-income countries and is the second leading cause of death after cardiovascular diseases. Majority of neoplasms (90%) are head and neck squamous cell carcinomas (HNSCC) that develop in the squamous layer of the mucosal lining, in upper aerodigestive tract, corresponding to 25% of cancer of larynx.[1]

Laryngeal cancer is the second most common respiratory cancer after lung cancer. Larynx cancer is the seventeenth most common cancer in men in the UK, but is uncommon in women. In the larynx, epithelial changes are frequently noted[26]. It is one of the worst recurrence rates for any malignancy, is known to be influenced by several environmental factors. Its incidence is increasing over time in much of the world and this increase is generally accepted to be related to changes in tobacco and alcohol consumption. It is a relatively common cancer in men, but rarer in women. Most laryngeal cancers are squamous cell carcinomas, reflecting their origin from the squamous cells which form the majority of the laryngeal epithelium.

Familial clusterings of laryngeal cancer have been reported but no systematic evaluation of the clinical feature of the disease or an in-depth analysis of familial forms of the disease has been made. Studies revealed a distinct clinical pattern of disease in familial cases of laryngeal cancer, which may provide a valuable basis for the identification of genetic determinants of this malignancy. [2]

The incidence of laryngeal cancer in males around the world is at its highest in Spain accounting to 18.0 %, followed by USA (17.3 %), Australia (9.8 %), India (9.7 %) with China (0.8 %) and Gambia, Western Africa (0.2 %) recording the least cases.The incidence in India is highest in Nagpur, Maharashtra recording to 7.6 % of the laryngeal cancer cases, followed by Pune (6.7 %), Delhi (6.5 %) and Kolkata (5.7 %) with the least in Kerala accounting to 3.3 %. The incidence rate in Andhra Pradesh is 3.73 %. (**CANCER ATLAS INDIA.org, A** Project of the **National Cancer Registry Programme,** *(Indian Council of Medical Research)* Supported by the **World Health Organization**). According to the Department of Biostatistics and Cancer Registry in Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, 4.6 % males,  0.4 % females and a total of 2.3 % represent tobacco related laryngeal cancer in India.

A pre-malignant lesion is a lesion that, while not cancerous, has strong potential for becoming cancerous. It is an apparently benign, morphologically altered tissue which has a greater than normal risk of containing a microscopic focus of cancer at biopsy or of transforming into a malignancy after diagnosis. Precancerous condition can be defined as a disease or patient habit which does not necessarily alter the clinical appearance of local tissue but is known to have a greater than normal risk of pre-cancer or cancer development[3].

Precancerous laryngeal lesions are pathologic conditions of the epithelium, which can undergo malignant degeneration in a higher rate than other epithelial lesions[4]. The diagnosis and management of premalignant lesions of the larynx has not progressed much in the last decade.

A wide spectrum of lesions ranging from dysplasia to in situ carcinoma has to be considered when dealing with laryngeal precancerous conditions. Early vocal cord cancer has a very high cure rate when treated[5]. Laryngeal premalignant lesions range from simple hyperplasia or keratosis to carcinoma in situ (CIS). According to WHO, it is characterized into hyperplasia, keratosis, mild, moderate or severe dysplasia, and CIS. No universally accepted histopathologic classification system. A male predominance is noted in premalignant laryngeal lesions. A positive correlation between age and degree of dysplasia shows that as the degree of dysplasia increases, there is an increase in malignancy risk.

Leukoplakia and erythroplakia are two clinical lesions widely considered to be premalignant[6]. Leukoplakia, exophytic

keratosis, and polypoid thickening are early signs which may arouse the suspicion of malignancy[4].

Factors contributing to malignant transformation of laryngeal pre-neoplastic lesions remain largely unknown. Potential etiologic factors may be related to a genetically controlled sensitivity to environmental carcinogens.[7]

Studies show it takes an average of 3.9 years between the first laryngeal biopsy and the diagnosis of invasive carcinoma. About 5-18% of epithelial dysplasias become malignant[8, 9, 10, 11].

With the completion of the first draft of the human genome and the availability of cheaper and quicker technique genotyping technologies, there is a rapidly increasing interest in identifying genes and genetic polymorphisms that predispose people to increased risk of cancer.[12, 13]

Polycyclic aromatic hydrocarbons (PAHs), present in tobacco smoke or metabolites of alcohol, are precursors of chemicals that increase the risk of cancer. Most carcinogens are not biologically active when they enter the body. They need to be converted into biologically active forms before they can interact with host DNA to cause mutations.

Most PAHs first require activation by Phase I enzymes, such as cytochrome P4501A1 (CYP1A1), to become an ultimate carcinogen. These activated forms may be subjected to detoxification by Phase II enzymes, especially glutathione *S*-transferases (GSTs).[14]

The glutathione *S*-transferases (GSTs) are a family of enzymes known to play an important role in the detoxification of several carcinogens found in tobacco smoke. GSTs are dimeric proteins that catalyze conjugation reactions between glutathione and tobacco smoke substrates, such as aromatic heterocyclic radicals and epoxides. Conjugation facilitates excretion and thus constitutes a detoxification step. In addition to their role in phase II detoxification, GSTs also modulate the induction of other enzymes and proteins important for cellular functions, such as DNA repair[15]. This class of enzymes is therefore important for maintaining cellular genomic integrity and, as a result, may play an important role in cancer susceptibility. In humans, based on their primary structures, GSTs are divided into seven families/classes: α (alpha), μ (mu), π (pi), τ (theta), φ (sigma), ω (omega), and ζ (zeta).[16,17,18] Deletion of these genes results in a lack of enzyme activity and a reduction in the elimination of carcinogenic substances.[19] Two loci in particular, GSTM1 and GSTT1, may be of relevance for susceptibility to squamous cell carcinoma of the head and neck (SCCHN).[20]

The role of the GST enzymes in detoxification mechanisms of the carcinogenic compounds has led to the hypothesis that if the individual's genotype at GST locus encodes a deficient GST enzyme it may result in increased risk of cancer.[46] GSTM1 and GSTT1 can both detoxify carcinogenic polycyclic aromatic hydrocarbons, such as benzo[a]pyrene[21] and the absence of the GSTM1 and GSTT1 genes has been reported to increase the risk of several common cancers, particularly those caused by cigarettes smoking including cancers of the mouth, lung, bladder and breast[15,22]. Although GSTM and GSTT are considered as low penetrance genes they may still contribute significantly to the number of cancer cases in the general population because of their high prevalence[23].

The GSTM1 gene located on chromosome 1p13.3[35,36] codes for cytosolic GST μ class enzyme, is known to be highly polymorphic and has a deletion polymorphism that when homozygote (GSTM1 null) results in the complete absence of functional gene product [35,37]. GSTT1 locus has been mapped on chromosome 22q11.2[22].

Some studies showed that polymorphisms in CYP1A1 and GSTM1 may increase the risk of cancer.[24, 25] By contrast, other studies showed no significant association between the null genotypes of these genes with the risk of cancer.[26-34] The relationship between genetic polymorphism of the above genes and pre-malignant laryngeal lesions was not previously investigated in South India. Therefore, the aim of this study was to investigate the genetic polymorphisms in GSTM1 and GSTT1 and its association with pre-malignant laryngeal cancer risk in a specific South Indian population.

## II. MATERIALS AND METHODS

### A. Sample collection

23 cases of clinically confirmed premalignant lesions of the larynx were taken for study. The patients had histologically confirmed pre-malignant laryngeal lesions, who reported during the period from 2010-2011 in one hospital-based cancer registry of Govt. ENT Hospital, Hyderabad, Andhra Pradesh, India.

The age range for patients with premalignant laryngeal lesions was 18 - 48 years and 7 - 43 in years in females and in controls, 25-50 years in males and 18-38 years in females (Table 1).

**Table 1: Distribution based on age and gender in clinically confirmed cases with pre-malignant laryngeal lesions (n = 23)**

| Age Group | No. of males (n = 13) | No. of females (n = 10) | *P value |
|---|---|---|---|
| 0 – 10 years | 2 | 3 | |
| 11 - 20 years | 2 | 1 | |
| 21 – 30 years | 6 | 4 | < 0.001* |
| 31 – 40 years | 2 | - | |
| 41 – 50 years | 1 | 2 | |

*P value obtained by Chi-square test

Three retrospective tissue samples and 20 prospective blood samples were obtained from Pathology lab of the Govt. ENT Hospital, Hyderabad, AP, India. The tissue samples were of 2 females (7 years and 21-30 years old) and 1 male (21-30 years old). Fresh blood samples from 23 healthy individuals, who had no risk factor habits, were used as controls.

Physical examination was carried out and information from patients on their age, occupation, nature of job, illness, lifestyle, habits such as smoking, alcohol consumption and chewing tobacco (Table 2), exposure to chemicals or radiation, family

history, surgical history, etc. were recorded using a standard questionnaire. Volunteers recruited for the study were informed about the study and their consent was taken.

**Table 2: Distribution of cases based on risk factor habits**

| Parameters | Patient group (n = 23) | Control (n = 23) | *P value |
|---|---|---|---|
| Smoking | 1 | 0 | |
| Alcohol | 0 | 0 | |
| Chewing Habits | 2 | 0 | < 0.001* |
| Smoking & Alcohol | 4 | 0 | |
| Chewing & Alcohol | 1 | 0 | |
| No habits | 15 (65 %) | 23 (100 %) | |

*P value obtained by Chi-square test

### B. DNA extraction

The 3 retrospective formalin-fixed, paraffin embedded tissue samples of 4 μ - 1 mm thickness was deparaffinized using xylene, followed by ethanol wash and tissue lysis using Proteinase-K. The resulting cell lysate was heated at 95°C for 8 minutes to inactivate the Proteinase-K. Standardised phenol-chloroform method was used to extract DNA from the tissue samples.[39-43]

Similarly 5 millilitre blood samples were collected from 20 patients clinically diagnosed with pre-malignant laryngeal lesions and from 23 healthy individuals. They were collected into EDTA tubes and stored at -20°C until DNA extraction was performed using standard protocols. DNA was extracted from anti-coagulated blood (EDTA) samples by Proteinase-K digestion and phenol-chloroform extraction.

### C. GSTM1 and GSTT1 polymorphism

The protocol for analysing null genotypes was considered from G. Tirumala Vani et al.,[45] Regina Grazuleviciene et.al.,[46] Rozati et al.,[35] M. Singh et al.[47] and standardised in the working lab.

The primers used for analysing GSTM1 gene: 5'-GAACTCCCTGAAAAGCTAAAGC-3' and 5'-GTTGGGCTCAAATATACGGTGG-3'; GSTT1 gene: 5'-TTCCTTACTGGTCCTCACATCTC-3' and 5'-TCACCGGATCATGGCCAGCA-3'; β-globin gene: 5'-CAACTTCATCCACGTTCACC-3' and 5'-GAAGAGCCAAGGACAGGTAC-3'.

Multiplex-PCR was performed in a 50 µl reaction mixture containing 5 µl of 10X PCR buffer (100 mM Tris-HCl, pH 9.0, 500 mM KCl), 1.5 mM MgCl2, 200 µM dNTPs, 25 pM each of GSTM1 primers, GSTT1 primers and β-globin primers, 5 U Taq DNA Polymerase and 50 ng of genomic DNA. The mixture was made upto 50 µl by adding auto-claved double distilled water.

PCR was carried out for 35 cycles in a DNA thermal cycler using a thermal profile of initial denaturation at 95°C for 2 mins, denaturation at 95°C for 40s, annealing at 62°C for 40s and primer extension at 72°C for 40s and final extension at 72°C for 8 mins.

### D. Analysis of PCR products

After PCR amplification, The PCR products were then separated on a 2% agarose gel at 150 V for 1.5 h and stained with 1 µg ml^{-1} ethidium bromide at 25°C for 10 min. The gel was carefully taken out after electrophoresis and placed in UV gel doc for analysis of the amplified products and gel documentation. Three bands of final PCR products were observed on the gel viz., GSTM1 gene-215 bp, GSTT1-480 bp and β-globin (internal control)-268 bp. The 215 bp band and 480 bp band were not observed in samples with GSTM1 and GSTT1 null genotypes respectively (Illustrative Fig.1).
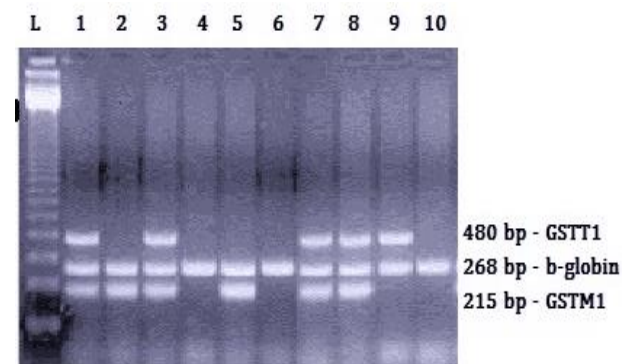


Fig.1 PCR products from the co-amplification of GSTM1 (215 bp), GSTT1 (480 bp) and the internal control, β-globin (268 bp). Lane 9 did not have only 215 bp band, representing GSTM1 null genotype. Lanes 2,5 did not have only 480 bp band, representing GSTT1 null genotype. Lanes 4,6,10 did not have 215 and 480 bands representing both GSTM1/GSTT1 null genotypes. L= 1 Kb ladder. (Illustrative figure)

### E. Statistical analysis

The data were analyzed using SPSS version 19 (SPSS Inc., Chicago, IL, USA). Significance (P) values and Correlation values were determined by Pearson Chi-square test to assess the association of gender with age groups, habits and type of premalignancy. P value of <0.05 was considered to be statistically significant. Any P value more than 0.05 was considered non-significant in this particular study population.

## III. RESULTS

800 cases of head and neck squamous cell carcinoma was considered for an epidemiological study out of which, a total of 23 cases of clinically confirmed pre-malignant laryngeal lesions were reported during the study period of 2010-2011 in one hospital-based cancer registry of Govt. ENT Hospital, Hyderabad, Andhra Pradesh. Total no. of males diagnosed with pre-malignant lesions of the larynx was 13 and total no. of females was 10 (Table 1). Maximum patients were in the age

group of 21-30 years. 15 out of 23 patients i.e., 65% of patients did not indulge in any kind of risk factor habits (Table 2). 4 of 23 (17%) patients had a combined habit of smoking and alcohol consumption, which was the highest risk factor habit recorded in the study population.

Three different types of pre-malignant laryngeal lesions were observed in the study population viz., Recurrent multiple papilloma of larynx, Juvenile laryngeal papillomatosis and Laryngeal papillomatosis.

11 cases of recurrent multiple papilloma of larynx, 7 cases of laryngeal papillomatosis and 5 cases of juvenile laryngeal papillomatosis. 7 males and 4 females had recurrent multiple papilloma of larynx, 4 males and 3 females had laryngeal papillomatosis, 2 males and 3 females had juvenile laryngeal papillomatosis (Table 3 & 4). P value had a significant value of less than 0.001.

| Pre-malignant laryngeal lesions | Total patients (23) $n$ (%) | [⊥]Males (13) $n$ (%) | [‡]Females (10) $n$ (%) | [*]P value |
|---|---|---|---|---|
| Recurrent multiple papilloma of larynx | 11 (47.8) | 7 (53.8) | 4 (40) | |
| Juvenile laryngeal papillomatosis | 5 (21.7) | 2 (15.3) | 3 (30) | < 0.001* |
| Laryngeal papillomatosis | 7 (30.4) | 4 (30.7) | 3 (30) | |

[*]P value obtained by Chi-square test. [⊥]Percentage of all male cancer sites. [‡]Percentage of all female cancer sites.

**Table 3: Distribution of cases based on gender and type of pre-malignant lesions (n = 23)**

**Table 4: Distribution based on type of premalignant laryngeal lesions, gender and age group (n = 23)**

| Type of lesion | 0 – 10 years | | 11 – 20 years | | 21-30 years | | 31- 40 years | | 41-50 years | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| Recurrent multiple papilloma of larynx | - | - | 1 | 1 | 4 | 2 | 2 | - | - | 1 |
| Juvenile laryngeal papillomatosis | 2 | 3 | - | - | - | - | - | - | - | - |
| Laryngeal papillomatosis | - | - | 1 | - | 2 | 2 | - | - | 1 | 1 |

Table 5 represents the results of GSTM1 gene polymorphism. The frequency of GSTM1 null genotype was 56.5% in study patients as against 39.1% in controls. Similarly, the frequency of GSTM1 wild type or non-null genotype in study patients was 43.4% as against 60.8% in controls.

**Table 5: Distribution of GSTM1 polymorphisms in controls and patient groups**

| Group | GSTM1 | | | |
|---|---|---|---|---|
| | Wild-type | % | Null-type | % |
| Controls (n = 23) | 14 | 60.8 | 9 | 39.1 |
| Test samples (n = 23) | 10 | 43.4 | 13 | 56.5 |

GSTT1 null genotype was 52.1% in study patients as against 26% in controls. Similarly, GSTT1 wild-type genotype was 47.8% in test samples as to 73.9% in controls [Table 6].

**Table 6: Distribution of GSTT1 polymorphisms in controls and patient groups**

| Group | GSTT1 | | | |
|---|---|---|---|---|
| | Wild-type | % | Null-type | % |
| Controls (n = 23) | 17 | 73.9 | 6 | 26 |
| Test samples (n = 23) | 11 | 47.8 | 12 | 52.1 |

A combination of smoking and alcohol habits, followed by chewing habits had a significant P value of <0.005 in the patient group. Whereas in controls, none of the risk factor habits were of any significant value [Table 2].

**Table 7: Statistical significances of GSTM1 and GSTT1 polymorphisms**

| Genes | P values | OR | 95% CI | | df |
| --- | --- | --- | --- | --- | --- |
| | | | Lower bound | Upper bound | |
| GSTM1 | 0.197 | 4.667 | 0.702 | 31.036 | 1 |
| GSTT1 | 0.015 | 0.889 | 0.138 | 5.723 | 1 |

P values – calculated by Pearson chi-square test; OR – odds ratio; 95% CI – 95% confidence intervals; df – degrees of freedom

Statistical significances of GSTM1 and GSTT1 polymorphisms have been described in Table 7. Odds ratio was 4.667 for developing GSTM1 null polymorphism and 0.889 for GSTT1 null polymorphism. 95% CI values for GSTM1, lower bound - 0.702 and upper bound - 31.036. Relative risk for GSTM1 null polymorphism is 1.815 and 0.389 positive. Relative risk for GSTT1 null polymorphism is 0.944 and 1.063 for positive. 95% CI values for GSTT1, lower bound – 0.138 and upper bound- 5.723. Degrees of freedom was 1 in both cases. Asymptotic $t$-value for GSTM1 was 1.678 and 0.119 for GSTT1.

## IV. CONCLUSIONS

A pre-malignant lesion is a lesion that, while not cancerous, has strong potential for becoming cancerous. It is important to identify the right type of the pre-malignant lesion in order to have an insight into the stage of pre-malignancy and specific treatment plan. The study population reported 3 types of pre-malignant conditions i.e., Recurrent multiple papilloma of larynx, Juvenile laryngeal papillomatosis and Laryngeal papillomatosis.

Papillomas are benign epithelial tumor growths similar to warts on the skin[47]. Malignant degeneration to squamous cell carcinoma can occur, but is very rare. It is a relatively uncommon disease in adults while approximately 70% of this disease showing juvenile onset (at 10 years of age or less).[48,49] Based on clinical parameters, the papillomas were divided into juvenile multiple papillomas, adult multiple papillomas and adult solitary papillomas[50]. Laryngeal papillomatosis, also known as recurrent respiratory papillomatosis or juvenile multiple papilloma of the larynx, is a rare disease characterized by the development of tumors in the larynx. These tumors can reoccur frequently, may require repetitive surgery, and may interfere with breathing.

Glutathione S-transferases are a family of dimeric enzymes that play an important role in the detoxification of several carcinogens found in tobacco smoke, significant role in cellular protection against toxic foreign chemicals and oxidative stress and other cellular functions, such as DNA repair.

Normal and malignant squamous cells of the larynx have been shown to express the GST-mu isoform in the highest concentration compared with the other GST enzymes.[20,51-54] Persons who do not have the ability to produce the GSTM1 enzyme potentially accumulate more DNA adducts through their inefficiency at excreting activated carcinogens.

GSTT1 (GST-theta isoform) is expressed not only in the adult liver but also in human erythrocytes and, as a result, is believed to play a more global role than GSTM1 in detoxification of carcinogens in the body[55]. Unlike the GSTM1 enzyme, however, GSTT1 has detoxification and activation roles.[20,15,55] The presence of GSTT1 enzyme within red blood cells may allow red cells to act as a detoxification sink among those who are able to synthesize the enzyme. Interestingly, if the capacity for removal of detoxification products from the circulation is exceeded among those with GSTT1 functionality, the risk of carcinogenesis may be increased compared with risk among those who have no function of the enzyme.[20] Persons with homozygous deletions of the GSTM1 and GSTT1 locus have no enzymatic functional activity of the respective enzymes.

Molecular epidemiological studies have shown varying evidence that individual susceptibility to cancer is mediated by both genetic (gene polymorphisms) and environmental factors (smoking, alcohol consumption and tobacco chewing). The inherited differences in the effectiveness of detoxification or activation of carcinogens play a crucial role in host susceptibility. However, polymorphism of GSTM1 and GSTT1 genes and their effects on cancer studied in many countries worldwide for the last thirty years have displayed varying results.

The polymorphisms of the GSTM1 and GSTT1 genes involved may result in differences in the enzymatic activity, possibly favoring mechansims that increase the susceptibility to cancer. Studies relating these polymorphisms of deletion with the occurrence of head and neck carcinoma diverge between themselves, some demonstrate the association of these neoplasias with null genotype of GSTM1 or GSTT1, while others do not.[38,46,56-65]

In our study, we did not find evidence for a strong interaction between risk factor habits, metabolizing enzyme polymorphisms, and the risk of malignancy. 65% of patients did not indulge in any type of risk factor habits and yet had a pre-malignant condition. There was no clear pattern of increasing risk in the presence of risk factors habits for at-risk genotypes of GSTM1 and GSTT1.

Our study evidenced an increased frequency of the GSTT1 and GSTM1 null genotype in patients with clinically confirmed pre-malignant laryngeal lesions, when compared to control group of individuals. The wild-type genotypes were in higher frequency in control cases for both gene groups. Our results conclude that since the null-genotypes were more in test samples than the wild-type genotypes, it may be associated with an increase in risk for the development of malignancy. However, it cannot be confirmed as one of the reasons though. The statistical results show that GSTT1 null polymorphism are of significant value ($P = 0.015$) whereas, GSTM1 null polymorphisms are not ($P < 0.05$). These data are confined to a specific and small population and hence cannot be used to reflect the same for general population.

The relationship between habitual risk factors and prevalence of premalignancy risk was not statistically significant with GST polymorphism in the study group. The distinct role of enzymes in different tissues and cancers yields different features of genotypes. Thus, there might be an instance of divergence between the ethnic differences in allelic frequency of GSTM1

and GSTT1 polymorphism and the differences in environmental and lifestyle risk factors.

Detecting malignancy at an earlier stage, upon finding any early symptoms i.e., pre-malignant stage is very important in diagnosing and treating a disorder. Delay by people in getting medical attention and treatment at the right time, reduces the possibility of identifying disorders in pre-malignant stage. It is necessary to carry out more studies on a larger population to access further probable patterns leading to malignancies. Genetic analysis and counselling of at-risk population can be provided thereby ensuring early diagnosis and management.

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# Analysis of Plastic Flow in Two Plate Multi Cavity Injection Mould for Plastic Component for Pump Seal

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*Abstract*- This is focused on the analysis of plastic flow in two plate injection mould. Motor rare housing component is designed with multi cavity as the plastic part in the two plate injection mould which is used in domestic motor. Mould flow analysis software is used to perform the analysis of filling, wrap and best gate location. This will discuss the flow of molten plastic inside the injection mould. The analysis begins with the origin of the flow channels such as Barrel, nozzle, sprue, runners, and gates until the cavity is completely filled. In this analysis, plastic flow behavior is studied together with parameters settings in plastic injection mould, Based on the analysis improvement has been made to the part design and feed systems in the mould. This includes the location of the gate at the part design, size of sprue, runners and gates. From the analysis also, CAE helps to determine the part defects that might occurred during plastic injection molding process such as Short shot, unequal filling, over filling, welding lines and others. From that, the optimum parameters setting are selected in order to get a quality plastic. So this will explain the plastic flow analysis clearly.

## I. INTRODUCTION

This is base to determine the plastic process flow. Plastic is a material that can produce many shapes that can be used by human in routine life. All of plastic products are produce from various type of operation or process. All of product Produces with different type of plastic material depend to needed. Plastics are divided into two distinct groups' thermoplastics and thermo sets.

Plastics can be moulded into various forms and hardened for commercial use. Plastic is perfect for this modern age. It is light, strong, easily moulded and durable. Although plastics are thought of as a modem invention, there have always been "natural polymers" such as amber, tortoise shells and animal horns. These materials behaved very much like today's manufactured plastics and were often used similar to the way manufactured plastics are currently applied.

The plastic product can make from the several processes like injection moulding, blow moulding, compression molding, film insert mounding, gas assist moulding, rotational moulding, structural foam moulding, extrusion and Thermoforming. This thesis will explain and study more about injection moulding. Injection moulding is a process in which the plastic material is injected into a mould forming a plastic product. Injection moulding is a manufacturing technique for making parts from thermoplastic material. The solid plastic material is fed into an injection moulding machine, heated and then pressed into

the mould. In injection moulding, plastic pellets or granules are fed from a hopper into a heating Chamber. A plunger or screw pushes the plastic through the heating chamber, where the material is softened into a fluid state. At the end of this chamber, the resin is forced into a cooled, closed mould. Once the plastic cools to a solid state, the mould opens and the finished part is ejected.
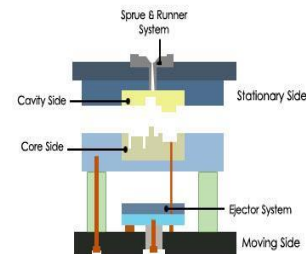


Standard Two Plate Mold

Injection moulding is very widely used for manufacturing a variety of parts, from the smallest component to entire body panel. It is the most common method of production, with some commonly made items including bottle caps and outdoor furniture. Plastic moulding products can be seen everywhere such as plastic tubes, grips, toys, bottles, cases, accessories, kitchen utensils and a lot more. The mould is made by a mould maker from tool steel, usually either steel or aluminum, and precision machined to form the features of the desired part. Mould is used to produce desire product that we needed. Many elements are involved in mould such as feeding, cooling and injector system. In modern technology, CAD software can be used to design mould and after that perfiune machining raw material to produce complete mould. Feeding system is important element for plastic flow in injection mould. All of this will be explain detail inside this project. In this thesis, the analysis is concentrate for plastic flow in two plate injection mould.

## II. PROBLEM STATEMENT

A parameter setting and feeding system such as gate, runner and sprue inside the plastic injection mould are located by mould makers using trial and error method. At this situation, people that have a lot of experience in injection moulding process who capable to decide the size and location of feeding system especially in two plate mould are needed. The problems occur when this person cannot perform the job with good method and needed to take much time to think and make an experiment.

Waste time and higher cost maybe happened during this period. This situation happened at past time before process analysis can perform with software.

Simulation software is the new technology that can examine the behaviors of plastic flow inside the cavity mould. It can decide the better method to select the best design for feeding system like runner, sprue, and gate and process parameter. The size of gate, runner and sprue is importance thing to consider for producing good quality plastic product. It can give effect to product if the unsuitable type or sizes are used. There are many type of simulation software now that can make work more easy and accurate.

The Plastic adviser Software is one of software used to ensure the best choice location of feeding system and size of gate, runner and sprue. It's one of the most advanced tools ever devised for the plastic injection moulding engineer. More precisely, it's a computer generated 3D simulation that models the flow of resin material into a single or multi-cavity mould. With the aid of mould flow analysis, engineers can obtain statistical data of the moulding process before the mould is actually constructed. The object is to optimize the fill process of a mould and the integrity of the moulded part. The data provided during the analysis helps the engineer select the optimum location for gate, sprue and runner. Temperature variations and all the suitable parameter are clearly defined in the simulation. The end result is accurate, economical and reliable plastic parts.

### III. OBJECTIVE

The main objectives of this research are:
i. To design plastic part.
ii. To design feeding system like sprue, runner and gate in two plate injection mould.
iii. To set optimum process parameter like injection pressure, speed, temperature and other.
iv. Analysis plastic flow in two plate injection Mould

### IV. COMPONENT DETAILS

The component is made of nylon66 (PA66) polyamide materials have high mechanical strength and superior resistance to wear and organic chemicals. NYLON 66 GF30 has more than doubles the strength and stiffness of unreinforced nylons and a heat deflection temperature which approaches its melting point. NYLON 66 is 30% glass-fiber-reinforced nylon 66 materials whose important properties include high tensile and flexural strength, stiffness, excellent heat deflection temperature, and superior abrasion and wear resistance.

The below figure gives a 3d model of Pump Seal which is designed using CATIA software



**Component name: Pump Seal**

Component material: Polyamide (Nylon 66) PA66
Shrinkage: 1.5 %
Component weight: 10.5 grams
Moulding type: Multi Cavity injection mould tool

### V. MOLDFLOW ANALYSIS SIMULATION

Numerical simulation of polymer processing is getting more and more popular in the Industry because it helps to forecast the problems that may occur due to the wrong tool design or use not optimized processing conditions. As result, a lot of money and time can be saved. The simulation is done before the final tool design phase, when the changes in tool design are still possible.

The simulation is usually done with special commercial programs, not only for injection moulding, but also for other processing technologies, like extrusion, blow extrusion, calendaring, thermoforming, etc. The target of numerous research conducted with the use of numerical simulation of the injection moulding process is usually to obtain the pressure, temperature and shear rate distribution in a closed mould and investigation of melt flow front movement in cavity as well as determining the flow length in different injection moulding conditions. A mathematical model which allows evaluating the orientation of short fibers used as filler in injection moulded parts was also worked out. It is possible to calculate the pressure required for total cavity filling, clamping force after cavity filling, evaluating the optimal processing conditions.

The optimal processing conditions can be found during the filling, holding and cooling stage simulation. The criteria of optimization are the proper values of temperature, pressure, and shear rate and even their distribution in the moulded part, what can guarantee the good properties of finally formed parts. The relationship between processing conditions and parts properties is the topic of many research works.

### VI. MOLD FLOW SOFTWARE

Mold flow software has been developed by Mold flow International Pvt. Ltd., Australia. It helps in finite elemental analysis used in the design of plastic product, mould design and production of plastic components. Following are the modules of MOLDFLOW software:

Flow Analysis: The Flow analysis is used to determine the gate position and filling pattern. It analyses polymer flow within the mould, optimizes mould cavity layout, balances runners and obtains mould processing conditions for filling & packing phases of the Moulding cycle.

Cooling Analysis: It analyses the effect of cooling on flow, optimizes cooling line geometry & processing conditions.

Process Optimization Analysis: It gives optimized-processing parameters for a component considering injection-moulding conditions.

Warpage Analysis: This analysis simulates the effect of Moulding on product geometry, isolates the dominant cause of warpage so that the correct remedy can be applied.

Shrinkage Analysis: This analysis gives dimensions of mould cavities, using shrinkage determined from specific grade material shrinkage data & flow analysis results.

The analysis is carried out using the software Mold flow Plastic Adviser.

The Benefits of Predictive Analysis are as below:

To avoid the high costs and time delays associated with problems discovered at the start of manufacturing, it is necessary to consider the combined effects of part geometry, material selection, mold design and processing conditions on the manufacturability of a part. Using predictive analysis tools to simulate the injection molding process, organizations and industries can evaluate and optimize interactions among these variables during the design phases of a project before production begins, where the cost of change is minimal and the impact of the change is greatest.

The productive analysis can simulate the filling, packing and cooling phases of thermoplastics molding processes using materials with or without fillers and fiber reinforcements, as well as predict post-molding phenomena such as part warpage, also simulate material flow and cure of reactive molding processes.

MPI also offers the world's largest material database of its kind with more than 7,800 thermoplastic materials characterized for use in plastics CAE analysis, as well as thermoset materials, coolants and mold materials, and injection molding machine-specific analysis capabilities.

## VII. MOLD FLOW RESULT
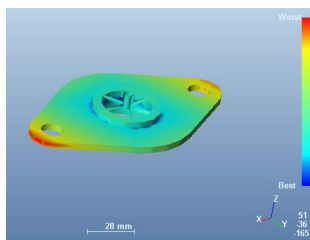


BEST GATE LOCATION

The Gate Location result rates each place on the model for its suitability for an injection location. The most suitable areas, colored blue, are rated as best, and the least suitable areas of the model, colored red, are rated as worst.
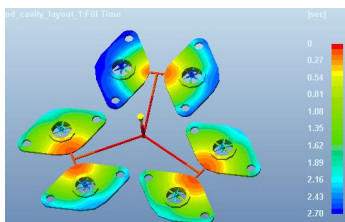


ANALYSIS FOR FILL TIME

This result shows the flow path of the plastic through the part by plotting contours which join regions filling at the same time. These contours are displayed in a range of colors from red,

to indicate the first region to fill, through to blue to indicate the last region to fill.
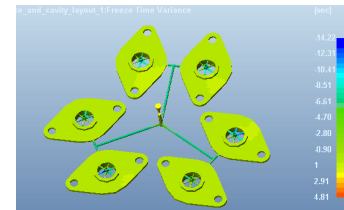


**ANALYSIS FOR FREEZE TIME**

The Freeze Time Variance result plots the deviation of the time it takes the polymer to freeze in any region of the part from the average time to freeze for the entire part. Areas that are plotted as positive values (red) take longer to freeze than the average time to freeze, and areas that are plotted as negative values (blue) freeze more quickly.
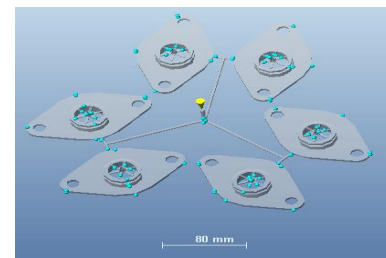


**ANALYSIS FOR AIR TRAPS**

The Air Trap result shows the regions where the melt stops at a convergence of at least 2 flow fronts or at the last point of fill, where a bubble of air becomes trapped. The regions highlighted in the result are positions of possible air traps.
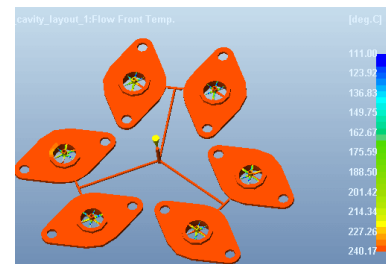


**TEMPERATURE AT FLOW FRONT**

The flow front temperature result uses a range of colors to indicate the region of lowest temperature (colored blue) through to the region of highest temperature (colored red). The colors represent the material temperature at each point as that point was filled. The result shows the changes in the temperature of the flow front during filling.
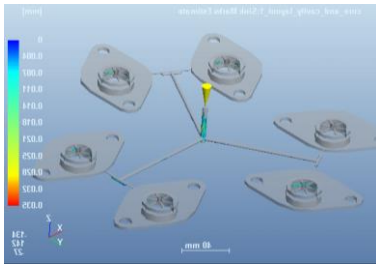
**VOLUMETRIC SHRINKAGE AT EJECTION**

As the hot plastic material cools in the mould, it contracts towards the center, and will stick to core because of shrinkage factor. Thus, while designing a tool, the shrinkage allowance must be added to the core and cavity. Different materials will have different shrinkage.

## VIII.   CONCLUSION

Mold flow analysis was carried out on the component and feed system of injection molding tool. This gave satisfactory results and the same was confirmed from analysis  such  as injection pressure, fill time, flow front temperature, quality of fill, weld line, air traps etc.  The results indicated that the injection molded components could be manufactured with minimum molding defects. The tool was manufactured using the CNC and NC machining process according to DME standard and manufactured elements were assembled.

The trial out of the injection mold tool revealed the components produced without defective. Further work can be carried out by performing the stress analysis to core and cavity inserts using ANSYS software for more effective design. Fatigue analysis can also carried out for the tool which results in improving the life of the tool. The mold flow analysis can further be used to carry out for design of experiments for fill analysis, Wrap analysis, the best gate location and the result can be utilized for further optimization of the tool design.

> ➢ From the Mold flow analysis report large numbers of air traps were observed. This is eliminated during manufacturing of the tool by providing the air vents at proper locations.
> ➢ Mold flow analysis helped in deciding the process parameters like mould and melts temperature, fill time, injection pressure. This reduced considerable amount of time and cost during trail run.

CAD/CAE technology facilitates the use of numerically controlled machining technology in fabrication of mould. In, turn this reduces number and complexity of manual setup operations

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# Domestic Violence against Women

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## I. INTRODUCTION

Domestic Violence is thus the most prevalent, and yet the least reported crime in society. It is very unfortunate that we have to keep reminding everyone that violence against women is increasing. Bettered women are only too often reluctant to report that they have been beaten up because of social stigma, guilt, shame and loyalty. They may lose the economic support of their husband on harness their career. Also, battered women do not report their problems to the police because they usually get a negative response (Ekelaar, 1991).

The discrimination on the ground of sex has been responsible in depriving Indian women form education, economic independence and personal freedom for centuries.

In India as in all countries the world over, the situation is no different. The astronomical number of wife murders, more popularly known as "dowry deaths" that occur every year are an enduring cause for national shame. Wife beating is perhaps prevalent form of violence against women.

In India where almost half of the population are women they have always been ill treated and deprived of their rights to life and personal liberty as provided under the constitution of India.

Women in India as a group are more vulnerable than men to the extremes of exploitation and subjugation. The discrimination being a females are obvious in Indian society, such as the lower expectancy, minimum education, poorly paid jobs, lower status expectations and very few rewards than men in comparable situations, sex role differentiation and ideological assumptions about "Women's place" is linked to the equal distribution of resources, rewards, rights and authority between men and women which in turn influence patterns of family and workplace.

The cultural traditions the world over historically granted men permission to beat their wives, and even kill them in certain circumstances. In India wife's position was no different as the code of man decreed that she be considered of no more importance than the chattel of the husband. A wife was regarded as subordinate to and the property. She could not sue, she had no legal status apart from her husband. There are certain special limitations due to India's cultural and familial background the social, economic and political conditions are also responsible for women's oppressions. They are the victims of the circumstances which have been created due to gender discrimination which persists in India from cradle to grave. This phenomenon, however takes its rise from the decline of the religion.

Domestic violence is a serious human rights threat to women in every society rich and poor, developed and industrialized, particularly in patriarchal societies, it is used as a weapon for subjugating women and suppressing their rights as equal partners in the family structure. Domestic violence is widespread and cuts across caste, greed, class and all educational levels. Around the world, on an a average, one in every three women has experienced violence in an intimate relationship. It strikes in various forms :-

> Physical abuse
> Sexual abuse
> Emotional abuse
> Psychological abuse

It is not only damaging to women but causes deep psychological effects on their children too, because of constant fear of humiliation they live with. Because the wife is treated as husband property and there is a social acceptance of his rights to chastise her, it she has displaced or disobeyed him in anyway, however minor.

Any act of gender based violence that result in or is likely to result in physical, sexual or psychological harm or suffering to women including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or private live".

When domestic violence take physical forms and results in torture, beating, causing physical and mental tensions to women so that they get tired of their life's.

The women are denied food and good place to sleep etc. It is not restricted to a particular are or type of people. Its tentacles are spreading in every area. However the gravitation of violence against women in rural areas are more prevalent as compared to cities. The interesting feature of this is that it is found even among educated religious minded people as well. Such a horrible situation causes havoc and makes life of women miserable.

Emotional, psychological abuse includes any acts intended to denigrate, isolate or dominate a partner. Emotional abuse is intended to control victims sense of self worth, competence, and value. Emotional maltreatment can include verbal abuse, such as insults, criticisms, ridicule, name calling, discounting and discrediting isolation of the victim; control of social and family contacts denial of access to finances of transportation; demonstration of extreme jealously and possessiveness ; the monitoring of behavior; accusations of infidelity; and damage to or destruction of personal property. (Health care, mental health,and legal researchers).

National Institution of Justice as a course of conduct directed at specific person that involves repeated visual or physical proximity, non consensual communication, or verbal, written implied threats or a combination thereof, that would cause a reasonable person fear". For examples include behavior such as following the victim, conducting surveillance, threatening the victim or victims , family, harassing the victim through phone calls on letters, appearing at the victims home or place of business, or breaking into the victims home. Although high profile cases of celebrity stalking have attracted media and public interest.

Abuse may include one or more of the following types of mistreatment physical, sexual and emotional/psychological. These kind of abuse occur in every race, class and educational background from doctors to truck drivers. It is extremely prevalent with 3 to 4 million women being battered each year in the United States.

It is common misconception that domestic violence is prevalent only the lower sections of society. The fact is that domestic violence is a malaise that can strike any household, irrespective of caste, religion or financial status. When domestic violence is targeted only at the partner, it is referred to as spousal abuse.

Abuse: This is first stage in Domestic Violence cycle the abuser will display some form of violent or aggressive behavior towards his victims. Abuse is not always physical. Some abusers drive greater pleasure form mentally torturing their victims rather than actual physical pain. This could involve insulting the victim or damaging her self esteem. In all forms of domestic violence, the abuse is a type of power struggle. The abuser seeks to control victim or demonstrate who incharge of the relationship is.

Guilt:- An abusive session is almost always followed by feeling of guilt. In the case of an abuser, this guilt is usually not because of the harm her has caused. It is more out of fear that authorities may apprehend him and he will have to face the consequences of his action.

Even victims experience feeling of guilt these feelings are largely related to thoughts like "what wrong have I done?" or "why cant I do things correctly". This is classic behavior displayed by a victim. She will usually try o put the blame for the abuse on herself rather than her abuser. This is especially true for situation where the victim is financially dependent or her abuser.

Excuses: This is third stage of the cycle. To assure his feelings of guilt, the abuser will try to rationalize his behavior. He will make all sorts of excuses to himself and to his victim. The most common excuse is to blame the victim for making him resort to abuse. The abuser does not want to believe that he is responsible for his own behavior. He prefers to think that his actions are in response to a situation than left him no other alternative.

Pretence: The next stage is to fall in to a 'normal' behavior. The abuser will pretend as if nothing has happened and will go about his daily routine. This behavior is largely to allow the abuser to regain some control over his emotions. This is also to reassure the victim that an abusive incident will not happen again.

Planning: This stage occurs simultaneously with the "Pretence" stage. Even while abuse is pretending to be a good person, he is busy planning his next attack.

Setup:- Once a plan is ready, the abuser sets in motion. Based on his plan, the abuser will seek to create a situation where his victim will make a mistake. Once this occurs, he can then pounce on her mistake and use it as a reason to attack her. A victim must remember that an act of violence is usually premeditated, No matter how hard she tries to avoid making a is take , abuser is not going to let her go.

Socio-religious norms have affected the women's status which has become another by another causative factor in right form the past Vedic era down to the modern times, the religious, practice, rituals, socio pictures, scriptures , precepts , historical force which have created for women their existing secondary status in Indian Society. The chief apologist for lowering the status of women was Manu. As psychologists suggest our Beliefs and Values conditions our behavior.

Women experience violence more sharply than men because social definitions of their biological equipment assign them to a special secondary descriptor as a limitation of their social status at every level in a given social hierarchy.

Dowry, a common phenomenon relevant in all over India was initially a kind of presorted inheritance of daughters in parental property. Which was given at the time of marriage ceremony for better status at the in-laws house? This social evil has plagued the society since ancient times as chattterjee (1971) has mentioned. Hindu religious scripture provide evidences that Lord Shiva and Rama received valuable items such as jewels, gold , horses, elephants, vehicles, cows etc. as dowry. During the Moghal period to the Aine-Akbar (1977) has traced the evil of dowry.

The worst part of the problem is that women today are not feeling safe and secured even in the family. The concept of home is taking many changes, so far any women who suffer violence against women need cooperation from the society, voluntary organizations, and governmental agencies. Such a burning problem of violence against women needs a multidisciplinary conceptual analysis.

Domestic violence contributes to a member of long term consequences physical and emotional psychological, innumerable chronic physical conditions along with mental health problems such as depression, anxiety, post traumatic stress disorder, alcohol and drug abuse, and suicide may result. There is evidence that one tactic women frequently are the first time and only professional to whom victims turn for help.

The one best plan women should be able to feel safe and secure is in own house. Women should be able to have control over her own life, choices and decisions. In an abusive relationship women are not able to do this and in effect self respect, self esteem, self worth often making women believe her are a nothing and therefore don't deserve to be treated better.

Domestic violence is traditionally associated with cases of physical violence occurring within intimate relationship and in a domestic betting. It is most commonly perpetrated by a male against a female partner. But it also includes married, defaults and separated socialization process for violence. But the psychological process for violence. But the psychological attributes alone cannot explain the phenomenon as it also depicts a form of behavior. As women become more self conscious and we began to explore our experience with each other, we also began to question the assumptions about the women in traditional disciplines. Domestic violence also known as domestic abuse, spousal abuse, family violence and intimate partner violence. It can be broadly define as patterns of abusive behaviors by one or both partners in an intimate relationship. Such as marriage, dating family, friends or cohabitation the term used to describe this exploiting problem of violence within our homes is Domestic Violence. This violence is towards someone who we are in relationship with, be it a life husband, son, daughter, mother, father, grandparent or any other family member. It can be males or females atrocities towards another male or a female. Anyone can be a victim and a victimizer. This violence has a

tendency to explore in various forms such as physical, sexual or emotional.

The most common causes for women staking and battering include dissatisfaction with the dowry and exploiting women for more of dowry, arguing with partner, refusing to have sex with him, neglecting children's going out of home without telling the partner, not cooking properly or one time, indulging in extra marital affairs, not looking after in-law's etc. In some cases infertility in females also leads to their assault by the family members. The greed for dowry desire for a male child and alcoholism of the spouse are major factors of domestic violence against women in rural areas.

There have been gruesome reports of young bride being burnt alive or subjected to continuous harassment for not bringing home the amount of demanded dowry. Women in India also admit to hitting or beating because of their suspicious about the husband's sexual involvement with other women. The Tandoor Murder case of Naina Sahni in New Delhi in the year 1995 is one such dreadful incident of a women being killed and then burnt in a Tandoor by her husband. This incidence was an outcome of suspicious of extra marital affairs of Naina Sahni which led to marital discord and domestic violence against her.

In urban areas there are many more factors which lead to differences in the beginning and later take the shape of domestic violence. These include more income of working women than her partner, her absence in the house till late night, abusing and neglecting in-laws, being more forward socially etc. Working women are quite often subjected to assaults and coercion sex employees of organization. All times, it could be voluntary for a better pay and designation in the office. Violence against young widows has also been on a rise in India. Most often they are cursed for their husbands death and are deprived of proper food and clothing. They are not allowed or encouraged for remarriage in most of the homes, especially in rural areas. These have been cases of males taken and rape attempts of women by other family members in nuclear families or someone in the neighbor. At times, women's are even sexually coerced by their partners themselves against their will.

They are brutally beaten and tortured ripping of women's womb for killing the female fetus when she disagree for abortion have also come to light especially in rural areas. Female feticide and female infanticide continue to be a rising concern. A common Indian house wife has a tendency to bear the harassment. She is subjected to by her husband and the family. One reason could be to prevent the children from undergoing the hardships if she separates from the spouse. Also the traditional and orthodox mindset makes them bear the sufferings without any protest.

Other forms of physical abuse against women include slapping, punching, grabbing, burdening them with drudgery, public humiliation and the neglect of their health problems. Some of the other forms of psychological torment against them could be curtailment of their rights to self expression and curbing the freedom to associate with the natal family and friends.

## II.    EFFECTS ON THE VICTIM AND THE FAMILY

Consequences of violence against women. Battened women have tendency to remain quiet agonized and emotionally disturbed after the occurrence of the torment. A psychological set back and trauma because of domestic violence affects women's productivity in all forms of life. The suicide case of such victimized women is also a deadly consequence and the number of such cases is increasing.

One of the sexual effects of domestic violence against women is its effect on her children. It natures phenomenon that a child generally has a greater attachment towards the mother for she is the one who given birth. As long as the violence subjected to the mother is hidden from the child. She/he may behave normally at home. The day when mother's grief and suffering is revealed. A child may become upset about the happening deeply, children may not even comprehend the severity of the problem. They may turn silent, reserved and express solace to the mother. When the violence against women is openly done in front of them since their childhood, it may have a deeper and gruesome impact in their mind set. They get used to such happenings at home, and have a tendency to reciprocate the same in their lives. Its common in especially in rural homes in India which are victimized by the evil of domestic violence.

## III.    EFFECTS OF DOMESTIC VIOLENCE ON THE SOCIETY

All the different forms of violence discussed in this essay adversely affect the society, violence against women may keep them locked in homes succumbing to the torture they face. If they come out in open and reveal the wrong done to them for help and rescue. It influences the society both positively and negatively. At one hand it also spoils the atmosphere of the society. When something of this kind happens in the society, few families may witness the evil of domestic violence knocking their door steps. Some families try to initiate what others indulge in irrespective of it being good or bad for the family.

Police play a major role in tackling domestic violence cases. They need to sensitize to treat domestic violence cases as seriously as any other crime. Special training to handle domestic violence cases should be important to police force. There should be a separate wing of police dealing with women issues.

Authorities should take steps to recognize Domestic Violence as a public health issue. A crisis support call needs to be established in all major government and private hospitals with trained medical social worker for provide appropriate services. Training programmes must be organized for health professionals in order to develop their skills to provide basic support for abused people.

Conclusion having looked at sensitive topic of "Domestic Violence in India", we can sense the importance of discussion Domestic Violence. The every case which can spark the violence within the forum walls of homes need to be analyzed carefully and a wise study of the factors causing the violence may prevent families to suffer from the means of Domestic Violence. A nodal agency should also be setup for the annual consolidation of documented work and publish the same for wider publicity among the public for increasing awareness.

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# Feasibility Study for the Application of Solar Technologies in Dairy Plant

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*Abstract-* According to the Ministry of new and renewable energy, Government of India, Dairy industry suggested as one of the most suitable industrial area for the commercialization of solar energy. This paper aims to find out the opportunities of solar energy in a dairy processing plant. This study is very important in India, because India is an energy deficient country. Moreover solar technologies are environmental friendly.

*Index Terms*- feasibility study, solar application, dairy sector in India, solar energy, renewable source

## I. INTRODUCTION

This study was conducted at a dairy plant which is located at Kerala state in India. The plant has a capacity of processing about 100000 litres of milk per day.  The first step is to identify the energy needs in the dairy plant. Then we study the existing energy sources. After that we suggest a suitable solar technology in place of each energy source. At last conduct a technical economic feasibility study. Also conduct an ecological benefit study. The details are given in the following sections

## II. DATA COLLECTION

In a dairy plant energy needs are classified into two- electrical energy needs and thermal energy needs. Electrical energy is used for working of electrical equipments like light, fan, cooling applications ,running of machineries, cold storage, air conditioning, office equipments etc. Electrical energy usage in this plant is about 1.5 lakh  units of electricity every month. That means per day usage is about 5000 units of electricity. Electricity supply is from Kerala State Electricity Board.

Heat energy is used for heating processes and  cleaning applications.  A fire tube horizontal boiler is used here which is the source of heat energy and steam is generated from the boiler. The pressure of the steam is maintained at $5kg/cm^2$ and about 4 tonne  of wood (as fuel) is used for firing the boiler. The running cost is about Rs 10000  per day and  installation cost is about 20 lakh.  The heating processes within the plant  is identified and listed below

Table 2.1 Heating processes within the plant

| NO | PROCESS | TEMPERATURE($^\circ$c) | DURATION |
|----|---------|-----------------------|----------|
| 1 | Pasteurization phase 1 | 63 | 30 min |
| 2 | Pasteurization phase 2 | 72 | 15 sec |
| 3 | Heating for curd | 90 | 30 min |
| 4 | Storing for curd | 45 | 4-5 hrs |
| 5 | Heating for culture | 92 | 30 min |
| 6 | Storing for culture | 45 | 4-5 hrs |
| 7 | Heating for Ghee | 118 | 4-6 hrs |

## III. WORK DONE

3.1 DESIGN OF SOLAR VOLTAIC PANELS FOR ELECTRICAL ENERGY APPLICATIONS
Here we are assuming that depth of discharge of battery, Inverter efficiency  and battery Charging and discharging cycle efficiency is about 80%,90% and 80% respectively. Then the combined efficiency of  inverter and battery will be calculated as,

Combined efficiency = Inverter efficiency $\times$ Battery efficiency= 0.8$\times$0.9=0.72=72%
Battery voltage used for operation = 12 volts
Battery Capacity = 150Ah

Sunlight available in a day = 8 hours/day(equivalent of peak radiation)

Utilization of electricity per month in the production plant = 1.5 lakh units of electricity

PV Panel Power rating = 1KWp

In operating conditions the actual output power of a PV module is less than the theoretical conditions .Thus a factor called 'Operating Factor' is used to estimate the actual output from a PV Module. The operating factor can vary between 0.60 and 0.90 in normal operating conditions depending upon temperature ,dust on module etc.

A solar PV system design can be done in five steps:

1.Load calculation

Total load connected to PV panel system = 5000KWh/day

2.Estimation of Number of PV Panels.

Actual power output of a PV Panel = Peak power rating $\times$ operating factor

$= 1 \times 0.75 = .75$ kilo watt

The power available for end use = Actual power output of a panel $\times$ Combined Efficiency

$= .75 \times 0.81 = .6075$ kilo watts (VA)

Energy produced by one 1KWp panel in a day = Actual power output $\times$ 8 hours/day

$= .6075 \times 8 = 4.86$ kilowatt-hour

Number of PV Panels required = Total watt- hour rating (daily )/Daily Energy produced by a Panel

$= 5000/4.86 = 1029$ panels

3.Estimation of battery capacity

Total Amp – hour required = Total watt-hour rating/ (Inverter Efficiency $\times$ Depth of Discharge $\times$ Battery Voltage)

$= 5000/(.9 \times .8 \times 12) = 578.7$ kilo A hr

Number of batteries required = Total amp-hour Rating/ Battery rating under Use

$= (578.70 \times 1000)/600$

$= 965$

4.Inverter size calculation

Total Connected load to PV Panel System = 208 kilo watts = 208 VA

Inverter are available with rating of 300KVA

5.Cost analysis of the system

Cost estimation of a solar PV System for Dairy plant is done here. After finding out the required number and capacity of various system components like panels, Battery and Inverter, estimated cost is calculated by adding the cost of all components. But some margin should be taken for other cost like wiring, Supporting infrastructure for panel and batteries, etc.

Cost of solar panels(A) = No of PV Modules $\times$ Cost /module

$= 1029 \times 200000( Rs.200/Wp)$

$= RS 205800000/-$

Cost of Batteries(B) = No of Batteries $\times$ unit cost

$= 965 \times 37500$

$= Rs.36187500$

Cost of Inverter(C) = No. of Inverters $\times$ Unit cost (solectria)

$= 1 \times 4237055.9$

$= Rs.4237055.9$

Total equipment cost = A+B+C

$= Rs.246224555.9$

Additional cost of installation may be taken as **5%** of total system Cost**.**

Total Cost of a system = A+B+C+ installation cost

$= Rs.246224555.9 + 12311227.75$

$= 258535782$

Operating and maintenance cost of the system = Rs3025/KW/year

(Source: Electric Power Research Institute, "Engineering and Economic Evaluation of Central-Station Solar Photovoltaic Power Plants )

Total running cost year=Rs3112725/year

3.2 AREA REQUIRED FOR INSTALLATION

Area required to install the system= Number of panels(1kw) $\times 15m^2$

$= 1029 \times 15$

$= 15433m^2$

Available roof top area for the installation of pv system=22800m$^2$

So technically this system is possible in the dairy plant

3.3CALCULATION OF PAYBACK PERIOD
       Average electricity bill per month=Rs1050000
                              per year  =Rs12600000
Payback period is the time required to return the investment and payback calculation is very important in economical feasibility studies. Here graphical method is used to calculate the solar photovoltaic system. The benefit of using the graphical method is that, it is very easy to understand. If we invest on this system , we can reduce the electricity bill. A graph is plotted between
year of return and investment in Indian rupees. The X axis represents year of return and Y axis represents investment in rupees.
By analyzing the graph, we got the payback period as 27 years . But the life cycle of the system is only 25 years. So economically it is not feasible.

Figure3.1. Payback period calculation
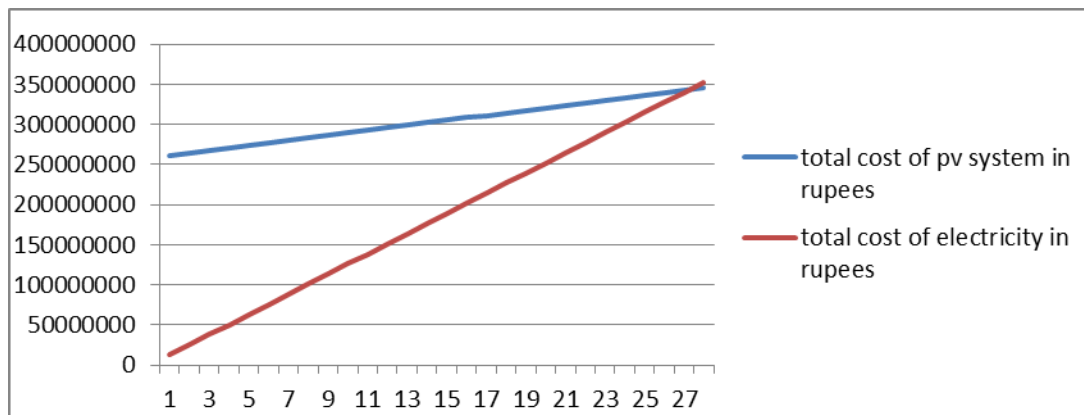


3.4 STUDY OF PARABOLIC TROUGH COLLECTORS FOR HEATING APPLICATIONS WITHIN THE PLANT
At present in the plant a horizontal fire tube boiler is used for generating the steam. Instead of this we can use parabolic trough collectors. The preliminary feasibility study is given in the following sections
                       Heat required to boil 2 tone of water=571200k J
                       Available time to boil 2 tone of water = 1hour
                       Average radiation rate in the location = 5 KWh/ $m^2$
                       Efficiency of parabolic steam generator= 60%
                        Available energy per square meter= 2475kJ
                        Required area  =230 $m^2$
                        Module width of PTC= 6m
                         Required module length=38.46m
                       Available length of a module=13.9
                        No of module needed=3
3.5 ECONOMICAL FEASIBILITY STUDY
Payback period is the time required to return the investment. payback calculation is very important in economical feasibility  studies. Here analytical method is used to calculate the payback period
                       Expected cost of installation = Rs 18000000 /-
                       Working hrs / day= 8 hrs
                       Available sunny days/ year=300 days
                       Quantity of solid fuel needed for 8 hrs working=1.5 tone
                       Cost for 1.5 Tons of fuel=Rs 4000
                       Saving / year=300×4000 =Rs 1200000
                       Payback period=18000000/1200000
                              =15 years
The life of the system is ranging from 25 to 30 years. Payback period is only 15 years. Hence it is  economically feasible
3.6 ECOLOGICAL BENEFIT
                       Ecological saving /year=300×4tone wood
                              =1200 tone wood

It means we can reduce deforestation thereby saving nature and  also reduces the emission of carbon dioxide while burning the wood. So this system is very much environmental friendly .

## IV.   RESULT

The result of this study is summarized below

Table 4.1.summary of result

| Type of energy need | Suggested solar technology | Technical feasibility | Economical feasibility | Ecological benefit | Result |
|---|---|---|---|---|---|
| Electrical energy needs | P V modules | feasible | Not feasible | - | Not suggested |
| Thermal energy needs | Parabolic trough collectors | feasible | feasible | beneficial | Suggested |

## V.   CONCLUSION

 Large quantity of wood is used to produce steam in the plant. According to analysis, parabolic trough system is suitable for heating applications in the plant in sunny days. But there are lot of practical limitations to implement this. Economically this system is not that much profitable. But considering the ecological benefits while using this system instead of fire tube boiler , it is a good option. Ecological impacts like, deforestation, global warming  etc can be reduced with the reduction of usage of wood (as fuel) . By considering the importance of green conservation of our planet and scarcity of energy, it can be considered as the future steam boiler for  plant.

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# Kinetics of Lead and bio-concentration factor (BCF) in different tissues of *Clarias batrachus* during experimental Plumbism

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**Abstract:**A Common Indian cat fish, *Clarias batrachus Linneaus* was treated with Lead Acetate for sub-acute and chronic exposure to the xenobiotic. The sub acute study included 3 days and 7 days exposure to different concentrations of lead acetate, while chronic study included exposure to 15 ppm lead acetate for 105 days. In all the cases tissues from Gills, Bones, Liver, Blood, Kidneys, Muscles, Skin and GI tract were removed and analyzed by AAS to find lead accumulation. The Bio-Concentration Factor (BCF) was calculated .The BCF varies from organ to organ. Additionally , X-rays photography was made on the chronic treated fishes from time to time, to see whether skeletal tissue is a target of the heavy metal or not. The Co-relation Co-efficient ( r') in these tissues between Lead treatment and Lead accumulation was found to be highly significant suggesting it both as a dose-dependent and time-dependent process.

**Index terms**: Atomic Absorption Spectrophotometer(AAS), Bio-Concentration Factor (BCF), chronic treatment, Clarias, Kinetics, Lead accumulation, Pool, Sub acute, Target organ, X-rays.

## I. INTRODUCTION

The heavy metals occupy a frontier position in IRPTC. These have been recognized and registered as potentially toxic chemicals, may be neurotoxic, haemotoxic, genotoxic or carcinogenic. The most biologically significant and most significantly studied of these heavy metals include cadmium, mercury, lead, zinc, chromium and copper. As a leading member of the heavy metal family. Lead (plumbum-pb) is extensively used and studied for its toxic nature like mercury(Hg) and cadmium(Cd). Leads toxicity comes from each part of the environment i.e. air, water and soil due to its ubiquitous uses and entry to the respective zones either naturally or artificially or both. Obtained as galena, in the earth's crust, lead has been variously used in different ways. Biologically lead has no significant role in any way, but still it is found in the human body up to 120 mg as a non-essential trace element. Its ubiquitous use has made its entry in to our body through various sources as a contaminant. The over increasing use of this metal has so heavily contaminated the environment that exposure to lead is inescapable. Estimations from various sources have shown that the primitive man had only about 2mg of lead in contrast to 120 mg today. The lead content of the Egyptian mummies was also found to be markedly less-only about 1.5 mg i.e. one-tenth of the lead load in present day (Kanwar and Sharma 1987): The average daily intake of lead by present day man is about 0.45 mg which comes mainly from food (0.22 mg to 0.4 mg) water (0.02 mg), inhalations (0.03 mg) and cigarettes (0.04 mg of one smokes 30 cigarettes a day).

In our country India, the department of Science and Technology (DST) had launched a study related to heavy metal pollution from 1982 through 1987. it has been found various states leading in lead pollution in various forms in India. Murti (1989), based on six years studies reported the lightest level of lead as follows:

| | | |
|---|---|---|
| Air | – | 0.699 $\mu g/m^2$ (Bihar) |
| Water | – | 0.968 $\mu g/ml$ (Tamilnadu) |
| Vegetarian food | – | 18.51 $\mu/g$ (Himachal Pradesh) |
| Non-vegetarian food | – | 9.32 $\mu g/g$ (Orissa) |

As reported by Jana (1987), several brands of shampoos contain lead sulphide to give the hair a dark hue. The eye cosmetics "Kajal" used by Hindus and "Surma" by Muslims have large concentrations of lead, reported 88% lead sulphide in mascara. Face powders, pastes and liquids also contain about 67% lead.

The use of Sindoor, basically red lead by Hindu women continues till date and there is no indication of ban on its use in the near future. Sindoor poses hazards that are well documented but it continues to be considered sacred.

Its properties such as durability, corrosion resistance, easy gluing of its pieces, have made lead a perfect metal for use in batteries, cables, pigneus, petrol additives, solder and steel products and ever as pesticides. The most wide spread use of lead as in

paints. Pottery work, foundry work, welding, soldering, stained glass fabrication ceramic works continue to use lead (Oladele, 2007). Very recently the use of Lead in Calabash chalk as an antidote has been reported( Google Alert, 2013).

So far the literature is concerned as above the report on lead toxicity in aquatic ecosystem are scanty. Kinetics of lead in aquatic ecosystems and its impact on aquatic animals and their systems need to be thoroughly studied as they often remain as an essential component in the food chain. The study may have some implications in understanding the problems of lower vertebrate physiology, biochemistry, immunology environmental biotechnology and aquaculture pathology etc. Therefore, in the present study our aim is to understand some of the major problems under the guidelines of WHO (1995), as out lined below :

- To select a model fish, best for laboratory work and expose it to the soluble compound of lead i.e. lead acetate for toxicological and biochemical analysis.
- To asses the toxicity of the compound with variation of dose and period of exposure in order to select suitable doses for short-term and chronic exposure.
- To study the kinetics of lead under controlled conditions of aquaria both for short-term and chronic exposure on the model fish.

## II.  MATERIAL AND METHODS

**2.1 Experimental design**:

Large-sized (120-200 gms.) fishes were collected from culture ponds of village Deopada in Bhadrak district of Odisha and aclimatized for seven days in the laboratory aquaria as reported earlier (Rout and Naik 1996). For short-term studies, different subacute concentrations of lead acetate [ $Pb (CH_3-COO)_2$], Johnson and Sons, Ltd., London, 1990] were choosen after obtaining $LC_{50}$(500 ppm) and $LT_{50}$ (45 days for25pm, 40 days for 50 ppm, 37days for 75 ppm., 35 days for 100 ppm, 30days for 125ppm and 28 days for 150ppm.

For 3 days and 7 days of treatment seven fishes each were selected and kept in separate aquaria demarcated for control, 25 ppm, 50 ppm, 75 ppm, 100 ppm, 125 ppm and 150 ppm of lead acetate.

For chronic treatment 15 ppm of lead acetate was chosen because of relatively high $LT_{50}$(150 days), suitable for chronic studies.  Eight fishes taken for experiment each in separate aquaria and eight for control. The study periods involve 1st, 15th, 30th, 45th, 60th, 75th, 90th and 105th days respectively with the control for comparison.

All the experiments were repeated ten times and the physico-chemical profiles were monitored  following APHA (1980) carefully in each day during replacement of water.

**2.2 AAS for hard and soft tissues.**

The methods of studying tissue accumulation of lead were followed to Ferguson et. al. (1993) and ATSDR (2005) using a Perkin Elmer Atomic Absorption Spectrophotometer (MODEL - 37).

The collected bone samples were minced and oven-dried at 120°C for 6 hrs. Then desired amount of the ass was taken and digested in 5:1 Nitric and Perchloric acid. The digested material then fumed in a Fume Hood (Macro Scientific Works- MSW 167) with addition of 1 ml of cone. $H_2SO_4$. and the solution kept in ice-bath and filtered. The volume was made up to 100 ml with de-ionized water and kept for analysis by AAS at 510 nm.

After adequate exposure, the fishes were autopsied and the tissues like gill, liver, kidney, muscle, bone and skin were blotted with blotting paper and deep freezed after weighting. Tissues (1g wt.) were digested with concentrated Nitric acid and Perchloric acid (in 4:1 ratio. These were kept in water bath for 6-7 days until the samples were digested thoroughly and became clear.

Cool digests were filtered through What man grade 541 filter paper and made up to 10 ml with double distilled water. Entire metal analysis was done by using Perkin Elmer- 37 Atomic Absorption Spectrophotometer.

Stock lead solution: 0.1599g of Pb $(NO_3)_2$ was dissolved in about 20 ml of distilled water. 1 ml of distilled nitric acid again was added following volume make up to 100 ml with distilled water.

Standard lead solutions : The standard lead solutions were prepared of concentration $1/5$, $10/25$ and 50 μg/1 by two step dilutions stock lead solution with de-ionized distilled water containing nitric acid.

**2.3 Analysis of blood samples for lead**:

It was followed according to Australian standard (AS2411 - 1980) for AAS. After collection the heparinized blood samples were kept at 4°C. During analysis 3ml of thoroughly mixed blood sample were immediately dispensed to the centrifuge tube. The lead in blood was made complexes with APDC by adding 0.5 ml of 2% APDC to it and extracted into 3 ml of n-butyl acetate by proper shaking. Lead was determined in the organic phase by AAS within one hour.

Calculation was done by the help of calibration curve using standard solution.

$$\text{Lead content} = \frac{\text{OD of the sample}}{\text{Standard Value}} \; \mu g/gm/ml \text{ of the tissue.}$$

$$\text{Bio concentration factor (BFC)} = \frac{\text{Concentration of Pb in tissues}}{\text{Concentration of Pb in water}}$$

**2.4. X-ray photography**

To study accumulation of lead on bone X-ray photography was followed according to Yarmenenko (1988) and ATSDR (2005). The fishes were anesthetized by intramuscular injection of sodium barbiturate. Then they were taken to X-ray laboratory and X-ray was taken through ME-2085 machine at frequency 50 KG x 0.2 MA.

**2.5. Statistical methods:**

All the data obtained from the control and experimental fishes were statistically analyzed as follows:

**2.5.1. ANOVA**: One-way analysis of variance (ANOVA) for accumulation and kinetic studies, DNA, RNA and protein relations, activities of different enzymes, haematological studies and Immunological studies were performed with the respective F-values in all observations following Sanders (1994). All the ANOVA tables are separately attached by an annexure.

**2.5.2. Parson's Correlation Coefficient (r)** : The r- values between doses of lead acetate with lead accumulation as well as the lead accumulation and various parameters of the control groups & experimental were calculated with significance following Sanders (1994) and Chainy et. al. (2008).

## III.   RESULTS

The AAS analysis of different tissues displayed accumulation of lead after 3 days of exposure (Table I), 7 days of exposure (Table III) and chronic 105 days of exposure (Table V) The Bio Concentration Factor (BCF) have been worked out as in Tables II, IV and VI respectively.

After 3 days of Exposure, the accumulation was a dose-dependant response in the gills, liver, blood, kidneys and GI tract as evident from the F-values from ANOVA, while in the bones, muscles and skin there was no significant response. The correlation Co-

efficient (r) between lead accumulation and lead treatment is also significant in cases of the described organs ( Figure 4). The BCF is very high (Table II & Figure 1 )

After 7 days of exposure, lead accumulation in various tissues was invariably a dose-dependant response, as evident from the Table III, and Figure 5. BCF was also very high (Table IV, Figure 2) and correlation coefficient between Lead treatment and Lead accumulation is also highly significant ( Figure 5).

The accumulation gradually increases with increase in period of exposure during chronic treatment(Table V). There is a +ve correlation between the period of exposure and lead accumulation in different tissues for 105 days. Accumulation steadily increases up to 60 days in the gills and then falls. A similar response is observed up to 75 days in the kidneys and muscled. In other organs there is a steady increase. A similar response is in BCF (TableVI, Figure 3) and there is a highly significant correlation coefficient (r) between the period of exposure and lead accumulation ( Figure 6).

The X-ray photography of control and exposed fishes have been compared (Plate-I). Gradual deposition of deep lead- lines on the skull and vertebral bones have been depicted after 45th day, 75th day, and 105th day of chronic exposure. The X-ray results support the AAS studies on Lead accumulation in the bones.

**Table I: Accumulation of lead after short-term (48 hrs) of exposure to various concentrations of lead acetate**.

| Concentration of lead acetate(ppm) | Lead content μg / gm weight of tissues | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Gills | Bones | Liver | Blood (μg/dl) | Kidney | Muscle | Skin | GI tract |
| Control | 0.1 ±0.001 | 0.2 ±0.001 | 0.01 ±0.001 | 3.8 ±0.001 | 0.01 ±0.001 | 0.01 ±0.001 | 0.1 ±0.001 | 0.01 ±0.001 |
| 25 | 10.22 ±0.021 | 0.81 ±0.012 | 6.83 ±0.351 | 12.30 ±0.269 | 4.54 ±0.611 | 1.82 ±0.082 | 3.02 ±0.641 | 2.51 ±0.001 |
| 50 | 15.62 ±1.232 | 2.19 ±0.821 | 8.6 ±1.152 | 13.01 ±0.251 | 5.36 ±0.731 | 3.63 ±0.912 | 5.25 ±1.231 | 2.63 ±0.081 |
| 75 | 12.14 ±2.333 | 3.16 ±0.981 | 10.36 ±2.341 | 13.52 ±0.512 | 6.21 ±1.283 | 4.08 ±1.114 | 5.53 ±1.672 | 4.61 ±0.061 |
| 100 | 13.13 ±2.461 | 5.68 ±1.230 | 11.38 ±2.152 | 14.13 ±0.132 | 8.36 ±1.391 | 4.45 ±1.631 | 5.79 ±1.231 | 5.23 ±0.7 |
| 125 | 13.57 ±2.231 | 5.51 ±2.381 | 13.13 ±1.623 | 13.21 ±0.213 | 8.59 ±1.251 | 5.20 ±0.291 | 6.23 ±1.331 | 5.45 ±0.8 |
| 150 | 15.38 ±2.110 | 6.21 ±1.381 | 14.33 ±0.231 | 12.69 ±0.619 | 8.21 ±0.631 | 6.31 ±0.381 | 7.35 ±1.161 | 5.62 ±0.093 |
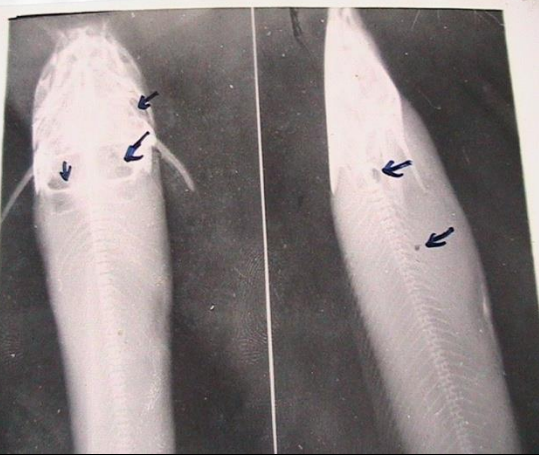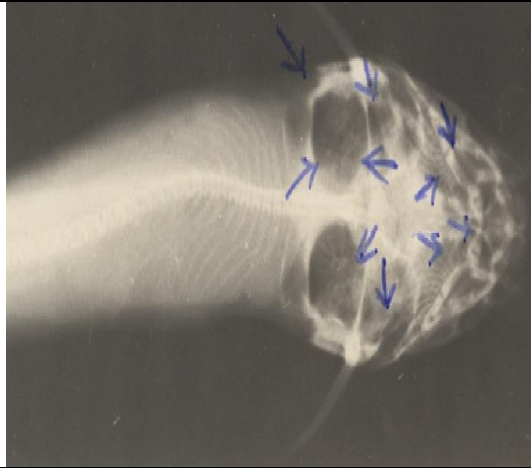
⊥ $P<0.005$, † $P<0.05$

**Table II: Bio concentration factor (BCF) of blood (mg / lit) in different tissues of *Clariasbatrachus* after short-term (48 hrs) of exposure**:

| Concentration levels | Gills | Bones | Liver | Blood | Kidney | Muscle | Skin | GI tract |
|---|---|---|---|---|---|---|---|---|
| 25 | 630 | 50 | 420 | 760 | 270 | 110 | 180 | 0155 |
| 50 | 480 | 60 | 260 | 400 | 160 | 100 | 160 | 81 |
| 75 | 250 | 60 | 210 | 280 | 120 | 80 | 110 | 54 |
| 100 | 200 | 80 | 170 | 210 | 120 | 60 | 80 | 81 |
| 125 | 160 | 60 | 160 | 160 | 100 | 60 | 70 | 67 |

| 150 | 150 | 60 | 140 | 130 | 80 | 60 | 70 | 58 |
|-----|-----|----|-----|-----|----|----|----|----|

**PLATE-I : X-ray Photomicrographs showing Lead Accumulation in Bone**



| | |
|---|---|
| **i)       Control Dorsal View** | **ii)       Control Lateral View.** |
| **iv) After 45 days – Dorsal View** | **v) After 45 days- Lateral View.** |
| **v) After 75 days of treatment** | **v) After 105 days of treatment** |
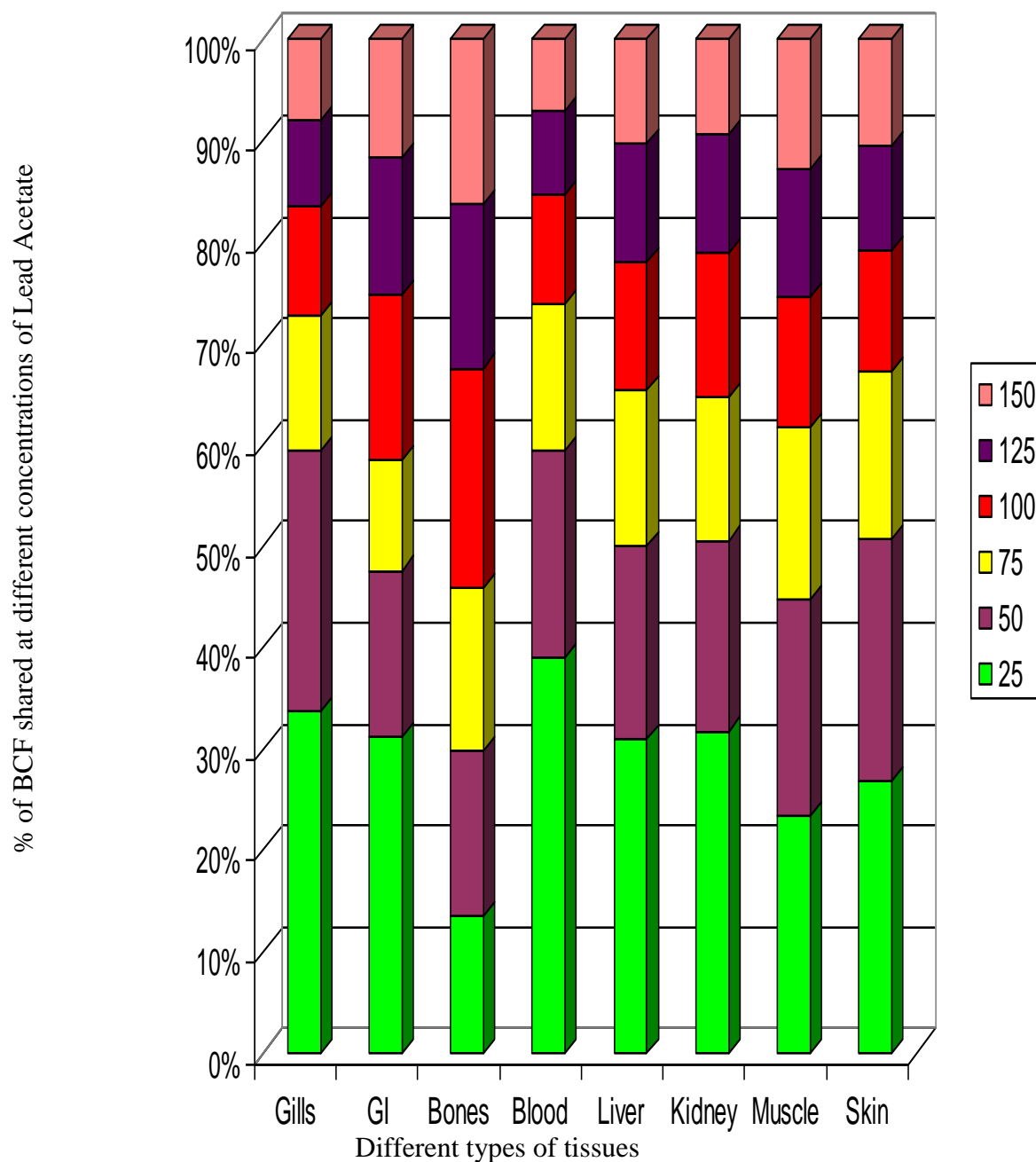
**Figure 1:Bio-Concentration Factor (BCF) of Lead in different tissues after 3 days of exposure to different concentrations of Lead Acetate.**

**Table III: Accumulation of lead in various tissues after seven days of exposure to various concentrations of    lead acetate**.

| Concentration of lead acetate(ppm) | Lead content μg / gm wt. on tissues | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Gills | Bones | Liver | Blood (μg/dl) | Kidney | Muscle | Skin | GI tract |
| Control | 0.1 ±0.001 | 0.2 ±0.001 | 0.1 ±0.001 | 3.7 ±0.001 | 0.01 ±0.001 | 0.1 ±0.001 | 0.1 ±0.001 | 0.01 ±0.001 |
| 25 | 12.46 ±1.24 | 5.12 ±0.938 | 0.72 ±0.001 | 13.50 ±0.544 | 1.01 ±0.001 | 2.56 ±0.001 | 3.58 ±0.012 | 6.28 ±0.08 |
| 50 | 15.62 ±0.924 | 5.56 ±0.726 | 0.93 ±0.001 | 14.56 ±0.279 | 1.52 ±0.001 | 4.23 ±0.001 | 7.23 ±0.312 | 8.69 ±0.13 |
| 75 | 19.69 ±0.815 | 9.23 ±1.291 | 1.59 ±0.006 | 15.26 ±0.716 | 1.69 ±0.003 | 4.76 ±0.002 | 7.82 ±1.231 | 10.168 ±0.113 |
| 100 | 24.92 ±0.741 | 10.13 ±0.368 | 2.58 ±0.007 | 17.19 ±0.218 | 2.18 ±0.001 | 4.31 ±0.003 | 9.35 ±1.114 | 10.25 ±0.14 |
| 125 | 30.13 ±0.069 | 12.13 ±0.694 | 3.62 ±0.006 | 18.25 ±0.125 | 3.18 ±1.201 | 4.59 ±0.231 | 10.12 ±1.235 | 11.11 ±0.115 |
| 150 | 38.25 ±0.192 | 16.52 ±0.215 | 5.26 ±0.123 | 22.21 ±0.238 | 3.56 ±0.126 | 8.39 ±0.001 | 10.79 ±0.115 | 13.12 ±0.611 |

$\perp$ $P<0.005$, * $P<0.001$, † $P<0.05$

**Table IV: Bio concentration factor (BCF-mg / lit) of lead in different tissues after 7- days of exposure to various concentration of lead acetate.**

| Concentration levels | Gills | Bones | Liver | Blood | Kidney | Muscle | Skin | GI tract |
|---|---|---|---|---|---|---|---|---|
| 25 | 772 | 317 | 44 | 837 | 62 | 158 | 222 | 389 |
| 50 | 484 | 172 | 28 | 451 | 47 | 131 | 224 | 269 |
| 75 | 407 | 190 | 32 | 315 | 34 | 98 | 161 | 210 |
| 100 | 386 | 157 | 40 | 266 | 33 | 73 | 145 | 158 |
| 125 | 373 | 150 | 44 | 226 | 39 | 56 | 116 | 137 |
| 150 | 395 | 170 | 54 | 229 | 36 | 86 | 111 | 135 |
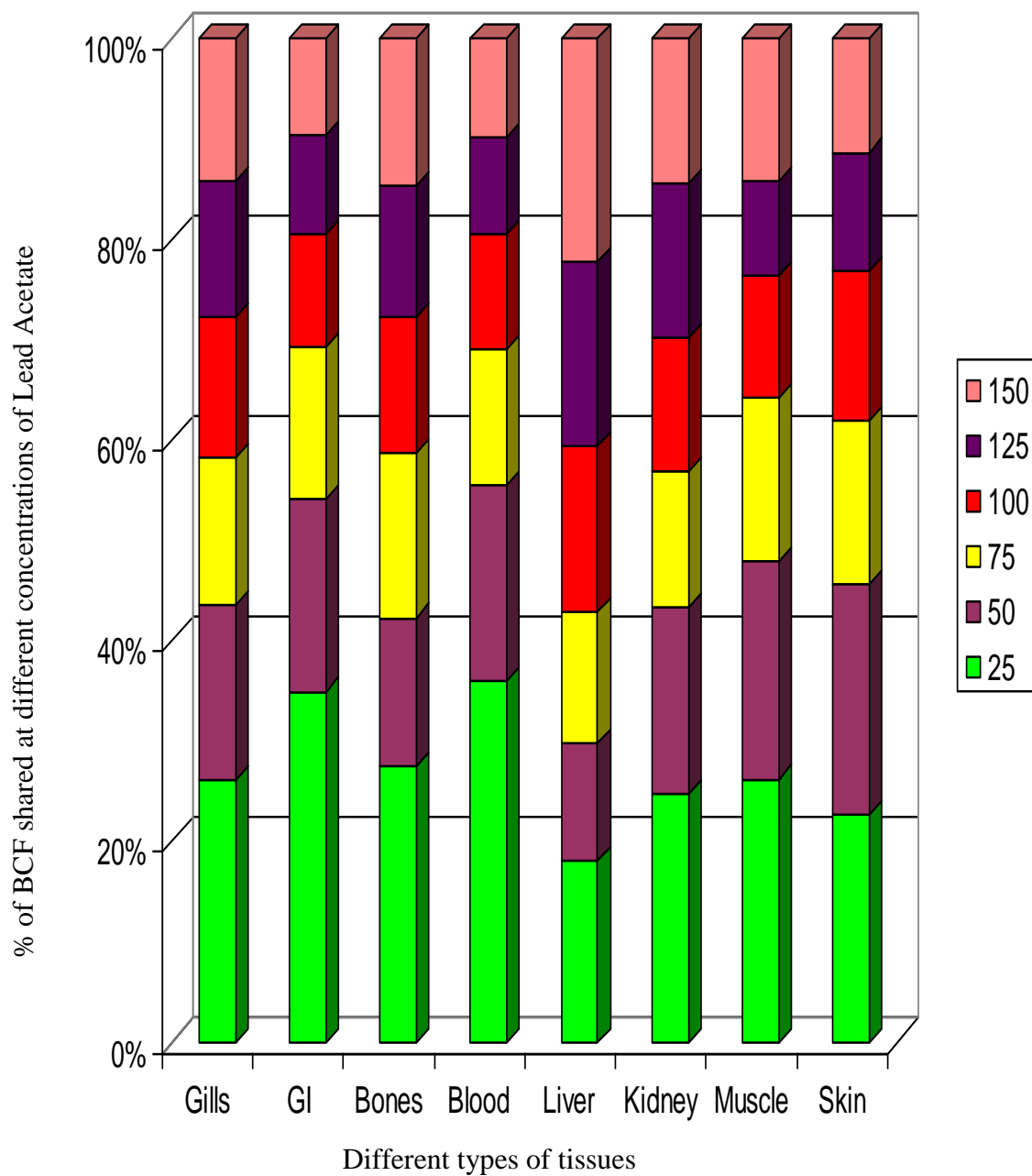
**Figure 2: Bio-Concentration Factor (BCF) of Lead in different tissues after 7 days of exposure to different concentrations of Lead Acetate.**

**Table V:Accumulation of lead(Mean ± SEM) in various tissues of *Clariasbatrachus* during 15 ppm Chronic exposure of lead acetate and F- values obtained from ANOVA showing effectiveness of Period of Exposure.**

| Period of exposure (days) | | Gills (µg/gm) | GI (µg/gm) | Bones (µg/gm) | Blood (µg/dl) | Liver (µg/gm) | Kidney (µg/gm) | Muscles (µg/gm) | Skin (µg/gm) |
|---|---|---|---|---|---|---|---|---|---|
| 01 | C | 0.2 ±0.006 | 0.01 ±0.001 | 0.3 ±0.007 | 5.0 ±0.187 | 0.1 ±0.003 | 0.1 ±0.002 | 0.1 ±0.001 | 0.2 ±0.001 |
| | E | 5.0 ±0.051 | 1.56 ±0.001 | 0.5 ±0.041 | 10.11 ±0.577 | 3.5 ±0.211 | 0.1 ±0.002 | 0.1 ±0.001 | 0.8 ±0.004 |
| 15 | C | 0.15 ±0.001 | 0.01 ±0.001 | 0.23 ±0.002 | 4.83 ±0.178 | 0.2 ±0.001 | 0.08 ±0.001 | 0.09 ±0.001 | 0.3 ±0.001 |
| | E | 70.0 ±6.312 | 6.39 ±0.112 | 8.0 ±0.251 | 21.53 ±0.758 | 1.00 ±0.16 | 0.78 ±0.008 | 0.67 ±0.004 | 2.0 ±0.008 |
| 30 | C | 0.25 ±0.002 | 0.18 ±0.001 | 0.32 ±0.001 | 5.02 ±0.158 | 0.08 ±0.001 | 0.12 ±0.002 | 0.08 ±0.001 | 0.1 ±0.001 |
| | E | 115.0 ±8.512 | 0.28 ±01.132 | 19.53 ±3.412 | 41.53 ±1.561 | 1.35 ±0.121 | 1.11 ±0.008 | 1.56 ±0.005 | 6.0 ±0.052 |
| 45 | C | 0.23 ±0.001 | 0.19 ±0.012 | 0.26 ±0.001 | 4.78 ±0.129 | 0.06 ±0.001 | 0.08 ±0.001 | 0.09 ±0.003 | 0.09 ±0.001 |
| | E | 135.5 ±10.811 | 15.34 ±1.215 | 28.0 ±3.512 | 55.07 ±0.721 | 2.13 ±0.055 | 2.60 ±0.631 | 3.14 ±0.842 | 11.0 ±0.315 |
| 60 | C | 0.18 ±0.001 | 0.15 ±0.011 | 0.41 ±0.002 | 4.98 ±0.286 | 0.09 ±0.001 | 0.09 ±0.001 | 0.16 ±0.001 | 0.31 ±0.001 |
| | E | 161.5 ±9.856 | 22.39 ±2.231 | 38.4 ±3.151 | 82.25 ±1.406 | 3.16 ±0.691 | 4.81 ±0.823 | 3.89 ±0.235 | 13.0 ±2.815 |
| 75 | C | 0.32 ±0.002 | 0.12 ±0.011 | 0.25 ±0.002 | 4.85 ±0.183 | 0.12 ±0.001 | 0.12 ±0.001 | 0.08 ±0.001 | 0.26 ±0.002 |
| | E | 125.0 ±8.536 | 28.39 ±2.125 | 46.5 ±2.517 | 111.29 ±1.504 | 4.31 ±1.131 | 4.98 ±0.121 | 4.21 ±0.962 | 18.5 ±2.112 |
| 90 | C | 0.16 ±0.002 | 0.15 ±0.008 | 0.26 ±0.001 | 4.85 ±0.210 | 0.11 ±0.001 | 0.2 ±0.001 | 0.15 ±0.002 | 0.18 ±0.002 |
| | E | 86.0 ±5.813 | 35.63 ±1.129 | 55.621 ±3.861 | 123.35 ±2.508 | 5.23 ±1.661 | 3.24 ±0.151 | 3.51 ±0.891 | 25.8 ±3.512 |
| 105 | C | 0.23 ±0.001 | 0.12 ±0.001 | 0.35 ±0.001 | 4.98 ±0.613 | 0.10 ±0.001 | 0.25 ±0.002 | 0.09 ±0.002 | 0.25 ±0.002 |
| | E | 69.6 ±5.812 | 38.21 ±1.123 | 89.0 ±2.512 | 141.12 ±2.413 | 6.84 ±1.583 | 2.58 ±0.006 | 2.50 ±0.080 | 32.5 ±3.812 |
| F-value | C | 1.566 | 2.087 | 1.320 | 2.675 | 1.762 | 1.289 | 1.267 | 2.315 |
| | E | 269.987 | 67.54 | 274.147 | 864.154 | 318.076 | 79.324 | 89.567 | 563.254 |

**Table VI: Bio concentration factor (BCF) of lead in various tissues of *Clariasbatrachus*during chronic 15 ppm chronic exposure of lead acetate.**

| Period of exposure (days) | BCF (mg / lit) in various tissues | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Gills | GI | Bones | Blood | Liver | Kidney | Muscle | Skin |
| 01 | 515 | 160 | 515 | 1042 | 360 | 10 | 10 | 82 |
| 15 | 7216 | 658 | 824 | 2219 | 103 | 80 | 64 | 206 |
| 30 | 11855 | 1059 | 2010 | 4281 | 139 | 114 | 160 | 618 |

| 45 | 13917 | 1582 | 2885 | 5677 | 219 | 268 | 323 | 1134 |
| 60 | 16649 | 2308 | 3958 | 8479 | 325 | 495 | 349 | 1340 |
| 75 | 12885 | 2926 | 4793 | 11473 | 444 | 513 | 434 | 1907 |
| 90 | 8865 | 3673 | 5731 | 12716 | 539 | 334 | 361 | 2659 |
| 105 | 717 | 3939 | 9175 | 14548 | 705 | 265 | 257 | 3350 |
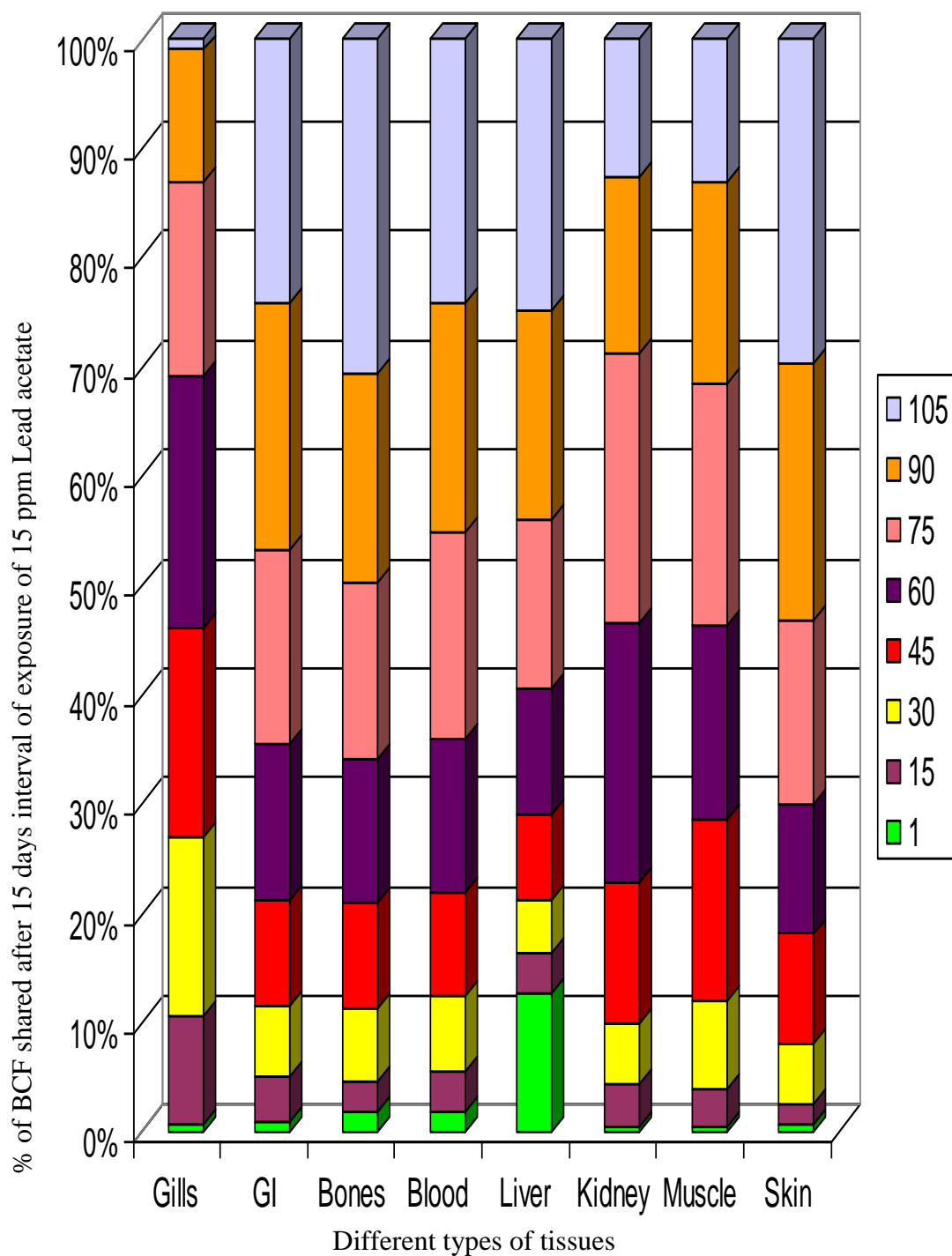
**Figure 3: Bio-Concentration Factor (BCF) of Lead in different tissues during chronic 105 days of exposure 0f 15ppm Lead Acetate.**
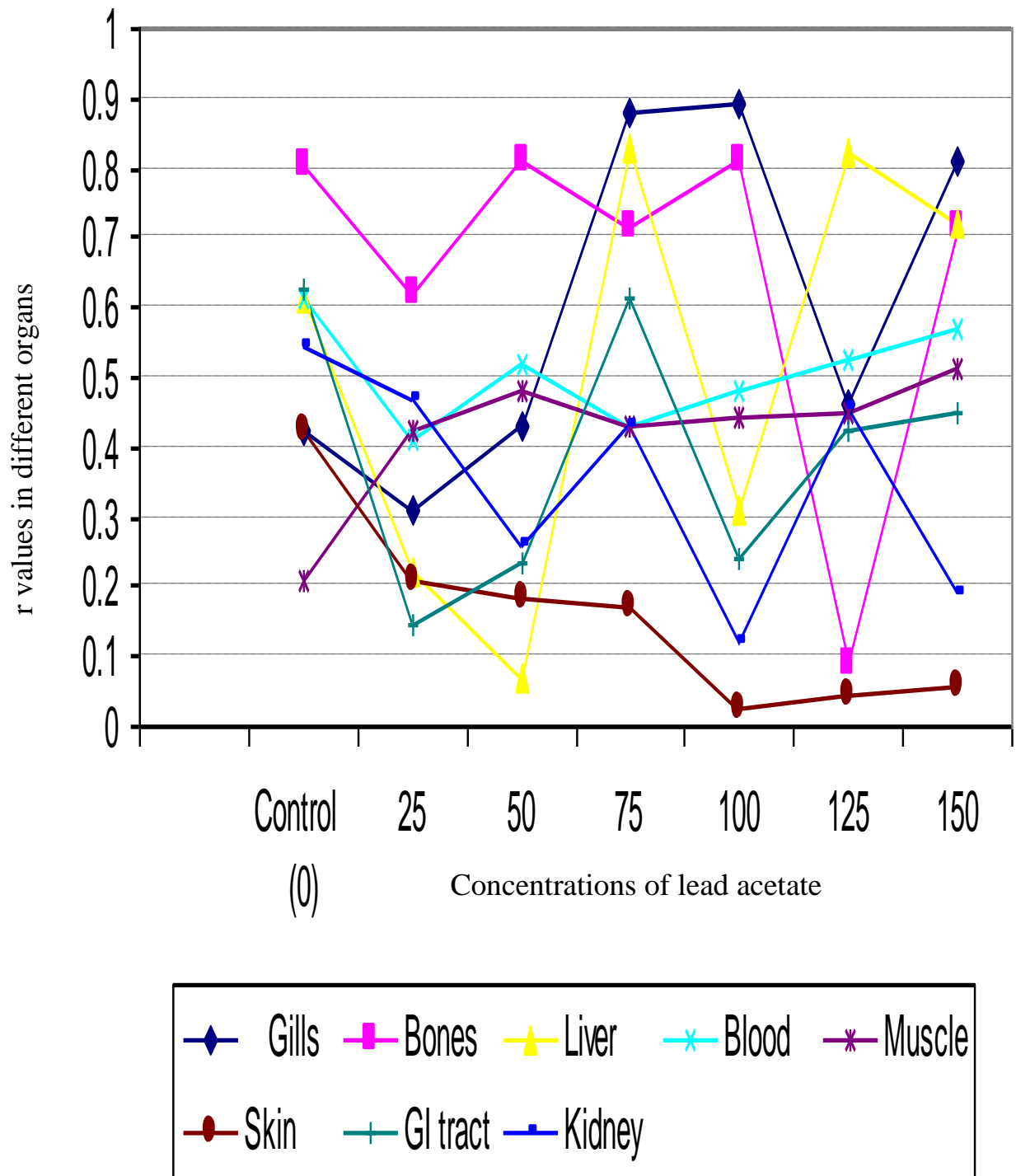


**Figure 4: Co-rrelation Co-efficient ('r') in different tissues between Lead treatment and Lead accumulation in *Clariasbatrachus* after 3 days of exposure to different concentrations of Lead Acetate.**
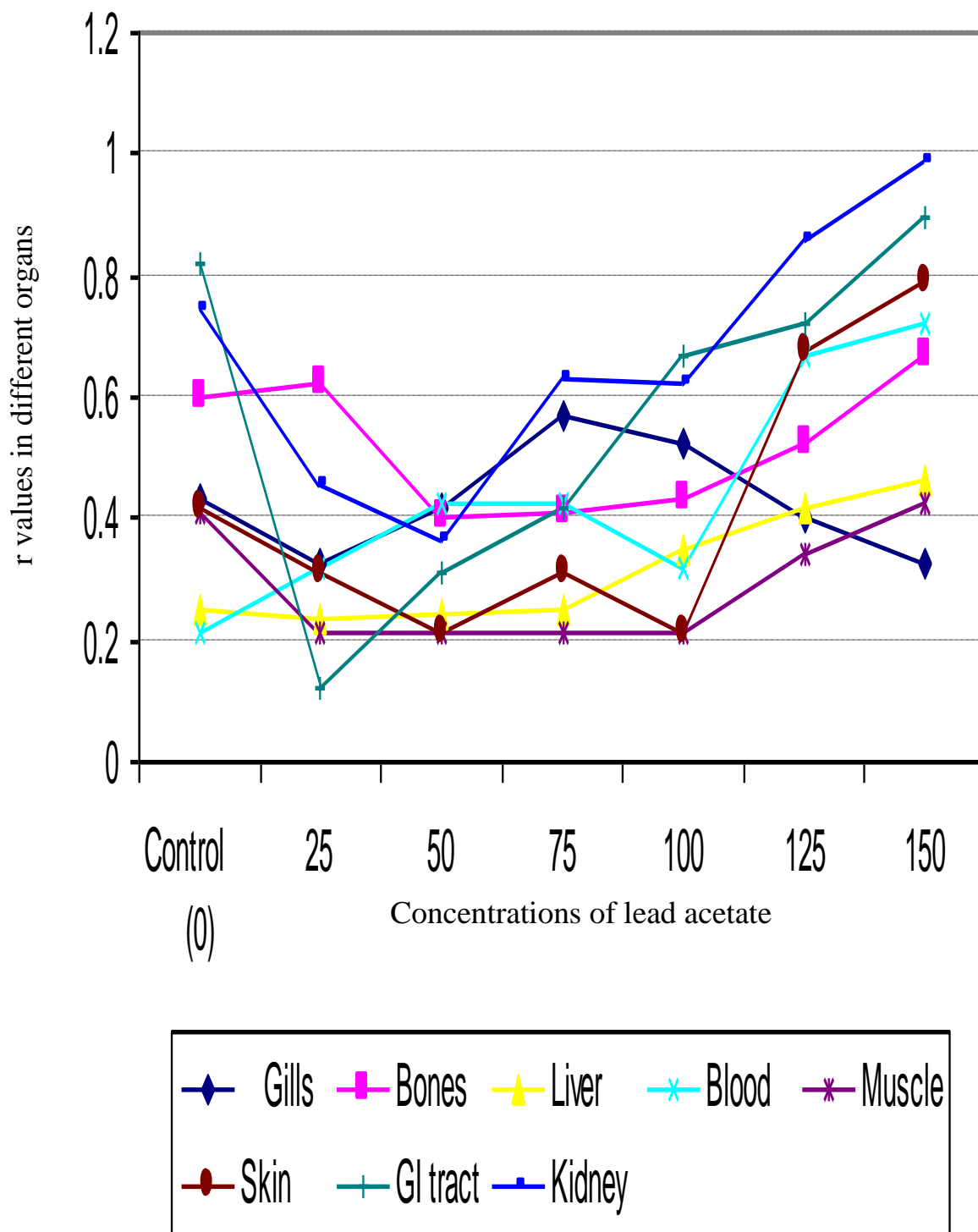
**Figure 5:Co-rrelation Co-efficient('r') in different tissues between Lead treatment and Lead accumulation in Clarias*batrachus* after 7 days of exposure to different concentrations of Lead Acetate**
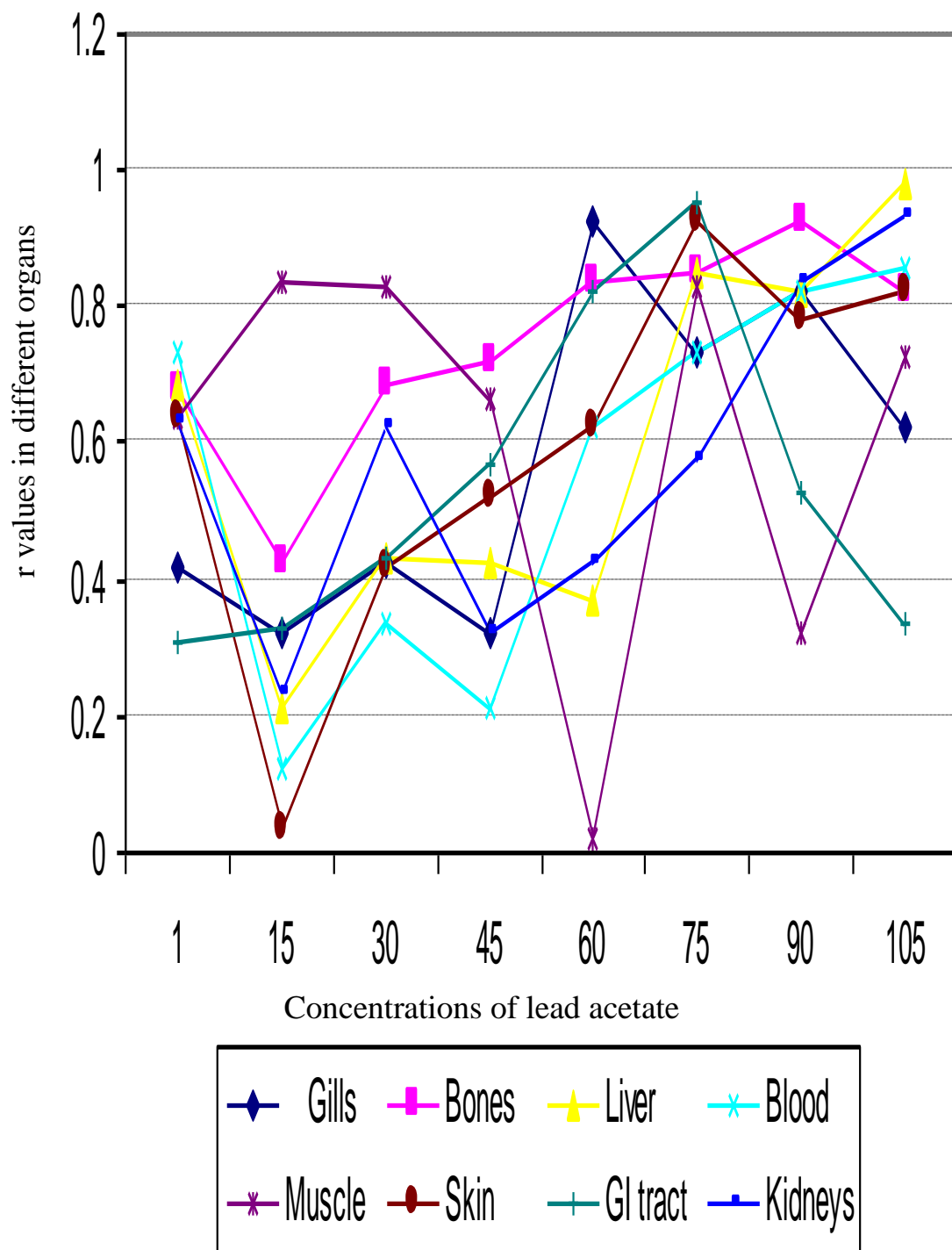
**Figure 6: Co-rrelation Co-efficient in different tissues ('r') between Period of exposure and Lead accumulation in** *Clariasbatrachus* **during 15 ppm chronic exposure Lead Acetate for 105 days.**

## IV. DISCUSSIONS

The kinetics of lead can be discussed as under:

-Absorption

-Distribution

-Elimination and excretion

The absorption of lead from water to blood of the model fish *Clariasbatrachus* involves mainly three different routes, via the respiratory, dietary and dermal. The gills being major organ for respiration, has two processes, the deposition of water borne lead, on the gill lamellae and absorption and a very limited animal studies confirm that there is almost complete absorption of lead . A significantly increase in gill lead content in all the sets of subacute and chronic exposure is dose dependant as well as on the period of exposure (Sakr et.at. 2005). A decline of lead concentration after both days during chronic treatment indicates hyperplasia and necrosis of the soft gill lamellae.

In *Clariasbatrachus*, lead absorption by the gastrointestinal tract comes from the same source of water along with food. As reported earlier the food supply to the fish was live earthworm whose lead content has been analysed to be < 0.01 ppm in their muscle. Hence, the food when supplied is taken along with water of the experimental aquaria having measured lead concentration. The lead intake however increases after fasting (Abassi et.al. 1998). A dose dependent increase in lead accumulation may be a linear process that the decline in BCF from lower concentration of lead content to high concentration is equivocal with the statement that, absorption of lead in the GI tract is a saturable process. With increase in doses, lead absorption as a % of dose decrease in dietary studies. The accumulation in this case is not the highest in intestine as reported by Gupta and Bakre (1996) in case of *Pilaglobosa* But this amount certainly contributing to the absorption in to blood stream. The deposition of lead on skin is also significant. It is both dose dependent ( Tables I, & III )as well as on period of exposure (Table-V). The BCF is high in chronic cases. The results however shows that the dermal absorption is minimal as on also verified earlier by Abassi et.al.(1998). Apart of from mucus secretions the skin generally lowly permeable to lead. A good amount of accumulation lead may be shared from internal uptake mechanisms.

**4.2.1. The relationship of internal lead exposure to blood lead concentration:**

In the fish all these three routes provide their way to lead concentration in blood. External exposures are sum of the quantities of lead consumed from all sources.

Historically, these are two lines of approach in under study the lead exposure and blood lead relationship (WHO-1995) most have been empirical and measured environmental lead and PbB levels either at one time or repeatedly with these observed correlations and with no assumptions about how lead moves inside the body, many reasonable predictions is optimum when only one source dominates. Some of these only on linear functions, while others have specified non-linearity's, especially, over very wide range of lead exposures. However when multiple sources are considered these predictive models have been less satisfactory.

Blood is the compartment in which lead is most often measured as a marker of exposure. The lead concentration with either increase in dose or period is curvilinear. A number of biological factors may explain the curvilinear relationship such as increased renal clearance with high PbB as advocated by Chamberlin (1985), distributuional non-linearities due to differences in lead finding sites in different tissues, or a sizeable pool of mobile lead in bone maintained more or less independently of uptake.

**4.2.2. Distribution:**

The initial distribution of lead in the body may depend upon the rate of delivery of blood to various organs. However it would appear that distribution occurs in a similar manner regardless of the route of absorption. The results from short-term subacute

and seven days subacuteexposures show that accumulation in Liver, Kidney, and bones is considerably more significant than muscle apart from blood as previous by found in other animal models. The level of significance is very high in all these tissues during chronic exposure up to 105th day. About 90% lead is stored in bone which is visible under X-ray photography. The amount of lead accumulation as in bone > Skin > Muscle > Liver > Kidney with high BCF. The results obey the studies of Rabinwitz et.al. (1976) and Aufderheide (1992) showing three different pools of biokinetic movements of lead. These three pools are blood, bone and soft tissues in human beings show distinct half-lives of lead. Blood lead is most labile with a half-life of about 36 days, bone lead is the most stable with about 27 years and lead in soft tissues has a half-live of approximately 40 days. Until recently it had been assumed that bone lead is metabolically insert and with a little heath-risk assessment. Current evidence is that bone comprises and is a target for toxicity. These factors complicate bone lead kinetics as applied to long term modelling; the toxicity of bone lead to blood is import. In the 1st day liver showed high lead content probably reflecting its role in detoxification of the xenobiotic.

Two physiological compartments appear to exist for lead in cortical and trabecular bone (ATSDR, 2005).

• the inert component stores lead for decades

• the labile component readily exchanges bone lead with the blood.

Under certain circumstances, however, this apparently inert lead will leave the bones and reenter the blood and soft tissue organs.

• Bone-to-blood lead mobilization increases during periods of pregnancy, lactation, menopause, physiologic stress, chronic disease, hyperthyroidism, kidney disease, broken bones, and advanced age, all which are exacerbated by calcium deficiency.

• Consequently, the normally inert pool poses a special risk because it is a potential endogenous source of lead that can maintain BLLs (Blood Lead Levels)long after exposure has ended.

Because lead from past exposures can accumulate in the bones (endogenous source), symptoms or health effects can also appear in the absence of significant current exposure.

• In most cases, toxic BLLs reflect a mixture of current exposure to lead and endogenous contribution from previous exposure.

• An acute high exposure to lead can lead to high short-term BLLs and cause symptoms of lead poisoning( UNEP, 2010).

• It is important that primary care physicians evaluate a patient with potential lead poisoning, examine potential current *and* past lead exposures and look for other factors that affect the bio-kinetics of lead (such as pregnancy or poor nutrition).

#### 4.2.3. Elimination and Excretion:

In both humans and experimental animals, lead is eliminated from the body in both urine and faeces. About 85% of lead ingested lead excreted of it about 90% comprise faeces. But in our model fish, *Clariasbatrachus*. kept in the aquaria containing lead acetate, the excreted lead again reenters into the fish body. However, the significant amount of lead during subacute (short-term and 7days) exposure is accumulated reflecting retention of lead in the intertubular as (Jana 1998) reported earlier (Gennart and Lauwerys 1992) leading to intratubular spaces as it is Fanchoni syndrome.

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# Performance Appraisal: Building Trust among Employees or not-the Dilemma Continues

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***Abstract-*** Performance appraisal has increasingly become part of a more strategic approach to integrating HR activities and business policies and may now be seen as a generic term covering a variety of activities through which organizations seek to assess employees and develop their competence, enhance performance and distribute rewards (Fletcher, 2001). Thus, both practice and research have moved away from a narrow focus on psychometric and evaluation issues to developmental performance appraisal (e.g., Fletcher, 2001; Lefkowitz, 2000; Levy and Williams, 2004; Waal, 2003), which may be defined as any effort concerned with enriching attitudes, experiences, and skills that improves the effectiveness of employees (Boswell and Boudreau, 2002). Performance appraisal is a widespread, very expensive, counterproductive exercise. It is typically conducted with good intentions to manage and improve the performance of individual employees, and lead to enhanced overall organizational efficiency, effectiveness, and productivity. Unfortunately it is an exercise in futility. This paper explores why formal performance appraisal and performance pay fail in their objectives as components of an organization's performance management program, and why they should be abolished .In recent years it is necessary to find more scientific, effective & fair assessment method, to examine the current performance appraisal for the success & failure of the organization.

***Index Terms-*** Performance appraisal, performance management, organizational efficiency, employee.

## I. INTRODUCTION

Performance appraisal has been considered as the most significant and indispensable tool of an organization. It is highly useful in making decisions regarding various personal aspects such as promotion and merit increase. Performance measures also link information gathering and decision making process which provide a basis for judging the effectiveness of personnel's functions. In the eyes of the employees, the purpose of performance appraisal system is to describe their level of performance to determine the required output from them and also to provide them constructive suggestions which eventually improves their performance. From the organization's view point, one of the most important reasons for having a system of performance appraisal is to establish and maintain the 'principle of accountability'. Performance appraisal system was started as a method for the justification of salary and wages. Every organization desires to develop a performance appraisal system, which consists of an established procedure for evaluating the work of employees on a regular basis. In simple terms, appraisal may be understood as the assessment of an individual's performance in a systematic way, the performance being measured against such factors as job knowledge, quality, and quantity of output, initiative, leadership abilities, supervision, dependability, co-operation, judgment, versatility, health, and the like. Assessment should not be confined to past performance alone. Potentials of the employee for future performance must also be assessed. A formal definition of performance appraisal is: "**It is the systematic evaluation of the individual with respect to his or her performance on the job and his or her potential for development.**"It is a structured formal interaction between a subordinate and supervisor, that usually takes the form of a periodic interview (annual or semi-annual), in which the work performance of the subordinate is examined and discussed, with a view to identifying weaknesses and strengths as well as opportunities for improvement and skills development. Performance appraisal is the process of obtaining, analyzing and recording information about the relative worth of an employee. The focus of the performance appraisal is measuring and improving the actual performance of the employee and also the future potential of the employee. The purpose of the performance management system is to ensure that the work performed by employees is in accordance with the established objectives of the organization. Employees should have clear understanding of the quality and quantity of work, expected from them and should also receive the information about how effectively they are standing with the expected standard. Due to effective performance management system opportunities for employee development are identified and it encourages and facilitates employee development also resolves performance pay disputes. Performance appraisal is intended to engage, align, and coalesce individual and group effort to continually improve overall organizational mission accomplishment. It provides a basis for identifying and correcting disparities in performance. Thus, it is activities oriented. It also may provide the basis for other personnel actions which typically include: (1) performance pay, (2) training and career development, (3) promotion and placement, (4) recognition and rewards, (5) disciplinary actions, and (6) identifying selection criteria. Its success depends primarily on the (1) system and measures (criteria), (2) culture, and (3) the perceived attitudes and needs of participants—i.e., their degree of "engagement" with their jobs. (Vance, 2006).

Some perceive that performance appraisal typically directs focus on the wrong things, at the wrong time, in the wrong way and as a result serves to increase costs and lower organizational efficiency and productivity. The wrong things are: **(1)** "performance pay" based on individual performance rating, rather than group coordination and organizational productivity (Kerr, 1995; Kohn, 1993); **(2)** individual weaknesses, rather than

the net combination of an individual's strengths and contributions to the team and organization (Buckingham, 2005**).**
**b.** The wrong time is at scheduled periodic intervals (e.g. anniversary date), rather than on-going and at project completion (Lee, 2006).**c.** The wrong way is supervisory judgement using a standard form and criteria, rather than mutual involvement with the employee and coaching for improved performance and contribution (Lee, 2006). Additionally, performance appraisal presumes a behavioralist view of extrinsic motivation, i.e., that people will improve to attain rewards. Further, it is based on the assumption that if you merely tell employees what they are doing wrong, they can and will want to correct their performance in order to receive more money, recognition or a promotion. It accepts the idea that people want to be bribed and held hostage. It ignores the impact of intrinsic motivation—the idea that people ultimately want to feel good about themselves; they want to learn, grow, and master their craft, which generally also means earning the respect of their peers (Herzberg, 1968). Extrinsic motivation generated through performance pay can decrease the intrinsic motivation from, and interest in, doing the job itself (James, 2003).Virtually all performance appraisal programs have the following characteristics:

**1. outside Judgment**. Using the performance standards, each employee's individual actual work performance, behaviours, production, or traits are compared with the performance standards by someone other than the employee.

**2. Specified Time Period.** Employee ratings, judgments, and assessments relate to a specific time period rather than a particular work product or project (typically quarterly and/or annually).

**3. Standardization**. The process is systematically applied to all employees or class of employees.

**4. Mandatory.** The process is typically mandatory although certain upper-level executives may be excluded.

**5. Documented.** The results of the ratings, judgments, or assessments are recorded and preserved by someone in the organization other than the rated employee.

## II. PURPOSES OF APPRAISAL: WHY DO IT?

(1) to promote organizational efficiency and effectiveness; (2) to enhance individual employee performance and satisfaction; (3) to simplify administrative processing(4) to ensure management retains control of employee behaviours and attitudes .(5) To review the performance of the employees over a given period of time. (6)To judge the gap between the actual and the desired performance. (7)To help the management in exercising organizational control.(8) Helps to strengthen the relationship and communication between superior – subordinates and management – employees.(9) To diagnose the strengths and weaknesses of the individuals so as to identify the training and development needs of the future and also to provide feedback to the employees regarding their past performance. (10)Provide information to assist in the other personal decisions in the organization. (11)Provide clarity of the expectations and responsibilities of the functions to be performed by the employees in order to reduce the grievances of the employees.(12)To judge the effectiveness of the other human

resource functions of the organization such as recruitment, selection, training and development.

Everyone must play their assigned roles for the organization to function as prescribed by the top managers.

**To control performance**: Essentially management really does not trust the capability or commitment of employees to carry out their assigned duties without providing them a clear job description and performance standards, and then holding them accountable for performance—with clear consequences.

**Because everyone else does it**. It's "tradition." It is "scientific management," the industrial era thinking promoted by Frederick W. Taylor (1911). Even when one privately sees its folly and high financial and psychological costs, one is very reluctant to contest its use publicly in the face of its wide acceptance and company policy. Because people have been conditioned to believe it works and is the best way to manage people.

## III. PURPOSES OF PERFORMANCE APPRAISAL

Performance appraisal of employees is needed for the following two broad purposes:
(A) Administrative purposes
(B) Self-improvement/Self-development of employees.

### (A) ADMINISTRATIVE PURPOSES

**(1) Promotion and Placement of Employees**: One major administrative purpose of performance appraisal is to promote employees as per their competence and performance in the previous period. Quality of performance serves as a base for promotion particularly when promotions are given by merits. Appraisal indicates whether the employee can contribute still more at a higher level job and accordingly decision about his promotion is taken. This promotion on appraisal basis is in the *interest* of both-the management and employees. Performance appraisal is useful for the selection of right person for the right type of promotion. This is because it clearly distinguishes between effective and ineffective performers of jobs assigned Placement of an employee in the right department and also at the right position is possible through performance appraisal as such appraisal suggests the position at which an employee can give his best performance.

**(2)Transfers and Demotions:** In an organization, certain personnel actions such as transfers, demotions, disciplinary actions and discharges are required to be taken by the management. Such actions need to be taken in a fair and impartial manner. Here, performance appraisal reports can be used for taking final decisions.

**(3) Wage and Salary Payment**: Wage/salary payment is normally linked with the performance appraisal. Wage increase (yearly increment or special increments) is based on the performance appraisal reports. It also provides the rational foundation for the payment of wages, bonus, and etc.It is also useful for allocating rewards to deserving employees.

**(4) Training and Manpower Development Programmes:** Performance appraisal indicates the strengths and weaknesses of an employee. It acts as a performance feedback of employees which can be used for different purposes. This information can

be used fruitfully for formulating a suitable training and manpower development programmers to improve the performance of employees in their present jobs. Such appraisals also suggest the areas of skills where numerous employees are not up to the mark.

**(5) Personnel Research**: Performance appraisal serves as a feedback to the management in the field of personnel research. It serves as a base for the conduct of research activities in personnel management.

**(6) Favourable Impact on Employees**: Performance appraisal creates a favourable impact on the employees. It serves as an incentive to the employees who feel assured of the management's continued interest in them and of their continuous possibility to grow/develop. Employees feel that they are given attention by the management.

**(7) Miscellaneous Administrative Purposes:**
(a) To confirm the services of probationary employees after the completion of probationary period successfully.
(b) To improve internal communication. It provides a format for dialogue between the superior and subordinates.

## (B) SELF IMPROVEMENT OF EMPLOYEES:

Along with the administrative purposes, performance appraisal facilitates self improvement and self development (career development) of an employee. In fact, this purpose is more important as it relates to human resource development in an organization. Such appraisal suggests the weaknesses and shortcomings of the rates. It serves as a feedback to the employee. This is followed by discussion between the rater and the ratee in a spirit of co-operation and mutual understanding. Counselling of employees for improving their performance is always through such post appraisal interviews. This gives opportunity to an employee to overcome his weaknesses and to improve his skills, abilities, performance, and behaviour and so on. Guidance is offered to an employee for his self-development and also for improving his overall performance in the job assigned.

## IV. IMPORTANCE OF PERFORMANCE APPRAISAL IN TODAYS ORGANISATION

Performance appraisal should be a positive experience and contribute to the overall welfare of the organization. If done properly, performance appraisal is a very effective tool to improve performance and productivity and for developing employees. It helps individuals to do better, raises self-esteem and motivation. Above all it strengthens the management/subordinate relationship and fosters commitment. Performance evaluation is not a process to be avoided; rather it should be implemented in all organizations and promoted as a key management activity. The benefits to be realized from a proper evaluation system far outweigh the time and effort required to develop, implement and maintain the process. There is much research to show that individuals have a strong need to know how they are doing and where they stand in the eyes if their supervisor. Recognizing the importance of performance feedback, it follows that discussions of performance should take place more than once a year. Frequent, regular discussions of performance should occur on an on-going basis and be seen as an opportunity for useful communication between the individual who assigns work and those performing it. These regular meetings serve to provide feedback so good performance is recognized and performance problems are nipped in the bud. The more formal periodic reviews can then simply be a summary of what has occurred throughout the reporting period recorded on the official performance evaluation form. Performance appraisal is a most valuable human resource tool. It is a vital component for the development of company as well as for individual employee. The system of performance appraisal motivates the sincere employees and in certain cases it punishes the dishonest employees. This is benefited to employees as well as for the organization. Productivity increases if there is a fair performance appraisal system implemented in the organization. Performance appraisal plays critical role in organizations ability to achieve its strategic goals. Organisation and the HR department have to design and implement Performance appraisal system in an organization is a core managerial function. The challenges faced by the present day's organization are absolutely depending on the effectiveness of its performance management system which ultimately acts as a catalyst for Employee's effective performance. The true goal of performance appraisal is employee's development & organizational improvement. Ultimately competitive asset of any organization is it human resources, thus organization should develop employee competencies which should be aligned with the organizations business goals. This can be achieved through performance management system which also acts as behavioural change tool and it can also enable performance management system which can improve overall organizations performance.

## V. CONFLICTS INHERENT IN PERFORMANCE APPRAISAL

Performance Appraisal is an important, if not essential, managerial responsibility. Yet all too often it is not done well if at all. There are a number of reasons why performance appraisal is not as effective as it could be. The first is that many organizations do not have clearly established corporate objectives for undertaking performance reviews. Many managers, particularly in large organizations, routinely complete the required forms which are then filed and the subject not mentioned again until the next review period, usually a year hence. To be effective, there should be clear objectives for doing performance appraisals and everyone in the organization should understand why it is being done. Performance appraisal, as a process, will fail if it is not linked to a common philosophy of good personnel management and its purpose is not clear. The effort should do more than meet the need of a Personnel Department's view of a sound personnel management practice; it has to be of value to the organization as a whole. Another problem in many organizations is that the process of performance evaluations lacks credibility. This is usually due to the failure of management to spell out clearly what aspects of the job are to be evaluated and to define the standards against which performance is to be measured. It is simply unfair to appraise performance if it not made clear to employees at the start of the reporting period what aspects of the job will be rated and what standards will be used to measure performance. Lack of clearly defined

measurements can lead to intellectual dishonesty in the evaluation, unfair ratings and loss of credibility of management and the appraisal process.

**1. Employee Intrapersonal conflict.** There is a conflict between an individual's desire for personal growth and the wish to have one's self-image affirmed. People want to feel good about them; they naturally strive for personal excellence—for what they believe will work best for them. Individuals want constructive feedback about their performance (Lee, 2006). If the feedback is positive, it affirms their self-concept of competence and success. Positive

Feedback serves to reinforce the current performance. If the feedback is unfavourable, to minimize its importance they may engage in defensive behaviour: (a) not "hear" it (denial), (b) become demoralized, and (c) apportion blame elsewhere **2. Employee-Employee conflict.** With a system of few winners and many losers, interpersonal competition for limited "Outstanding" ratings necessarily reduces cooperation and organization citizenship behaviour (OCB). Attitudes are Contagious, so conflict and less than full cooperation spreads among employees. (James, 2003; Behn, 2000 and 2003.)

**3. Employee-Supervisor conflict.** Performance appraisal requires supervisors to simultaneously play two incompatible roles—judge (evaluator) and helper (developer). Supervisors want to maintain good relations with their employees;

They realize it ultimately depends on trust. They also believe they should honestly let people know where they stand and help them improve. But they also realize that giving employees critical feedback may seriously de-motivate them, as it Attacks their self-esteem. So supervisors may reluctantly withhold negative information from an employee because they would rather have a low producing worker than a demoralized one who could then spread dissatisfaction to others.

**4. Supervisor-Leadership conflict**. Performance appraisal is a tool designed to control the job behaviour of employees. It sets forth the expectations and standards for satisfactory performance of assigned job duties. It is designed to treat Employees as part of the productive machinery of the organization. It serves as a substitute for, and discourages leadership behaviour. If an organization desires and expects its supervisors to behave as leaders, it should abolish its formal performance appraisal program (Lebow & Spitzer, 2002).

**5. Employee-Organizational conflict.** In using performance appraisal, the organization establishes the conflicting objectives of (a) employee evaluation and (b) employee development. To develop employees, the organization wants them to be open to, and even supply, negative information about themselves so the organization can help improve their performance. But documenting this information ("keeping book") on the employee's performance evaluation may adversely impact the performance rating and hence any performance pay or promotion consideration, and consequently the employees self-esteem. . Performance appraisal ratings serve to set up competition (rather than cooperation) among employees and serve to label employees as winners or losers, not only for pay increases but also for training, development and promotion opportunities (Buckingham, 2005). Attitudes are contagious. As employee dissatisfaction spreads, a disaffected cultural climate

will grow and employees will leave the organization—even despite good supervision.

**6. Supervisor-Organizational conflict.** Performance appraisal disempowers and demotivates supervisors by requiring that they obtain employee performance through control and documentation rather than by leadership. As supervisors, they are also appraised by the system and experience many of the same conflicts as their own employees. They don't like conducting performance appraisals on their employees, and don't like having them conducted on themselves by their managers.

**7. 360-degree appraisals** are often viewed as a cure for many of the conflicts and concerns rose by traditional top-down appraisals. Unfortunately, upon closer examination, use of multi-raters typically serves to compound the conflicts and Concerns for validity and reliability

## VI.  PROBLEMS IN PERFORMANCE APPRAISAL

The performance appraisal systems tend to have several problems. Raters" evaluations are often subjectively biased by their cognitive and motivational states (DeNisi & Williams, 1988; Longenecker et al., 1987), and supervisors often apply different standards with different employees which results in inconsistent, unreliable, and invalid evaluations (Folger et al., 1992). In order to create better systems, researchers have traditionally focused on validity and reliability (Bretz et al., 1992) by designing newer "forms" of performance appraisals (e.g., behavioral-based systems that better define specific essential job functions of employees or 360-degree feedback mechanisms that allow for cross-validation via multiple raters). However, despite these recent advances in evaluation design, critics continue to argue that performance appraisal systems are not consistently effective (Atkins & Wood, 2002; DeNisi & Kluger, 2000).Thomas and Bretz (1994) argue that evaluations are often perceived by employees and supervisors with "fear and loathing." Two possible explanations for the fear and loathing are the absence of a "sense of ownership" and an absence of rewards for properly completing the process. Cardy (1998) describes the appraisal process as "a difficult and error-ridden task." However, Cardy also points out that it is an important task that affects both the individual and the organization. As suggested by Drenth (1984), evaluation is a sensitive matter, often eliciting negative psychological responses such as resistance, denial, aggression, or discouragement, particularly if the assessment is negative. Thus high perceptions of evaluative performance appraisal use may result in negative feelings about the appraisal. The employee reactions to appraisals can be an important condition to improve the employee's performance. Recently, scholars have begun to argue that employee emotions and perceptions are important in determining the efficacy of performance appraisal systems. In fact, appraisal reactions such as satisfaction, acceptability, and motivation to use feedback, are cited as an important trend in the appraisal research during the past ten years in a recent review of that literature (Levy and Williams, 2004).

## VII. OUTCOMES OF EFFECTIVE PERFORMANCE APPRAISAL

Common outcomes of an effective performance appraisal process are employees' **learning about themselves**, employees' **knowledge about how they are doing**, employees' learning **about 'what management values'** (Beer, 1981). According to Stephan and Dorfman (1989) outcomes of effective performance appraisal are improvement in the accuracy of employee performance and establishing relationship between performance on tasks and a clear potential for reward. Dobbins, Cardy and PlatzVieno (1990) told five outcomes i.e. use of evaluations as feedback to improve performance, reduced employee turnover, increased motivation, existence of feelings of equity among employees, linkage between performance and rewards. Nurse (2005) viewed provision of information for the development of managerial strategies for training and development as an outcome. Teratanavat, Raitano and Kleiner (2006) found outcomes like reduced employee stress, review of overall progress, linkage between current performance and employee's goals, and development of specific action plans for future.

## VIII. DETRIMENTS TO EFFECTIVENESS OF PERFORMANCE APPRAISAL

Literature uncovered following aspects that can make harm to the effectiveness of performance appraisal: exemptions to the highly visible employees, conduct of performance appraisal to punish the low performers, rewards on non-performance, doubts in the mind of performers about appraisal's after effects, organization's politics that leads to disturb performance of targeted employee (Deluca, 1993); use of fundamentally flawed appraisals, focus on encouraging individual, which automatically discourages teamwork/collaboration, inconsistencies in setting and applying appraisal criteria, focus on extremes (exceptionally good or poor performance), appraisal's focus on achievement of short-term goals, support to autocrat supervisors, subjectivity of appraisal results and creation of emotional anguish in employees (Segal, 2000); use of vague qualities and irrelevant measurement criteria, use of useless checklists for evaluation, monologues instead of dialogues in feedback sessions, reluctance of appraisers to offer feedback, supervisor's misguidance to appraiser (Nurse, 2005); inaccuracies at supervisor/organization's end (Horvath & Andrews, 2007).

No evaluation system will achieve its objective unless there is some consequence to the evaluation. It is of no value, and simply adds to the administrivia of any organization, to evaluate employee performance, record the information on a form and file it away. This is the norm in many organizations and is a waste of time. Unfortunately the participants often believe they are doing the right thing. Yes an evaluation was done on each employee - but to what end? If an employee is rated outstanding for example, what is the consequence of that effort? Does it result in a raise, a promotion, and increased responsibilities? Also if an organization rewards high performers, an effective evaluation process is needed to differentiate those high achievers from others in a credible way. Similarly, if an employee is rated as a marginal performer, there must be some consequence to that low

standard of performance. Ignoring poor performance or assigning higher than earned ratings to avoid unpleasantness is poor management and does a great disservice to the organization and to the individual concerned. Communicating performance in an interview is an essential part of the process. Anyone who directs the activities of others should be capable of conducting an effective performance review meeting. An appraisal interview should not be adversarial nor meaningless chit chat. It should be approached by managers and subordinates as an opportunity for a serious discussion about present performance and future goals. It should be a planned structured event and follow a prescribed agenda.

## IX. RECOMMENDATIONS

Here are some of the recommendations that can provide for developing an effective performance appraisal system:
**1)** The program is well thought out and tailored for the firm**. 2)** The managers are trained in the appraisal process. **3)** The appraisal process must be viewed as a continuous activity rather than a one-a year event. **4)** Performance expectations and actual performance must be discussed often and regularly.**5)** Employees must be given specific instruction on how performance can be improved and must have short- and long-term goals set to show incremental improvements. **6)** Management expectations should be realistic; problem employees do not become star performers in a matter of weeks**.** 7) Performance expectations and developmental targets and activities should be set through mutual agreement with employees. **8)** Employees should be full participants in the performance appraisal process. **9)** During the feedback session, the appraiser should make sure that the employee has the resources required to do his job and must understand the nature of the existed barriers that might prevent the employee success. **10)** A 360 degree feedback could be an interesting performance appraisal approach especially for the most senior levels.**11)** Gain support of both human resources and top management.**12)** Use qualitative versus quantitative criteria. **13)** Allow for input when developing performance standards and criteria. **14)** Make sure the performance appraisal system is not outdated; Ensure managers take ownership of the performance appraisal system. **15)** Attempt to eliminate internal boundary spanning by creating direct reporting relationships where possible. **16)** Utilize performance targeting (Halachmi, 1993) to appraise PMs.**17)**Be aware and act on environmental forces as they affect the organization. **18)** Improve self-efficacy and motivation (Margolis & McCabe, 2006; Livingston, 1969). **19)** Mutually set learning goals rather than outcome goals so people focus attention on discovering effective strategies to attain and maintain results desired (seijts & Latham, 2006). **20)** Recognize that individuals succeed based on their unique combination of strengths, despite their weaknesses. So focus on finding, developing, and capitalizing on people's unique traits. Focus on strengths, not weaknesses (Buckingham, 2005).**21)** Clarifying organizational goals, objectives, and progress by openly posting them and degrees of achievement (numerically where possible), along with individual accomplishments (where they can be clearly identified). This serves to focus attention on organizational objectives and outcomes, and to engage all employees in coaching one another toward improvement

(Latham, 2004).**22)** Building an organizational culture of openness, honesty, and fairness to facilitate good communication.**23)** "Poor performers" are often competent people in the wrong jobs or organizational setting. Educate supervisors on origins of poor performance and importance of good fit (with strengths) and ways to work with people in need of special help—and ways to document unacceptable performance.**24)** Adverse and disciplinary action should be based on a "corrective discipline" approach with written documentation specifically developed to support the corrective action necessary. Use corrective discipline rather than progressive discipline for misconduct (Campbell et al, 1985; Huberman, 1964 and 1975).**25)** Base pay should be fair and reflect individual competence. **26)** Bonuses, company stock awards, and/or profit sharing should be based on group/team/unit accomplishments to promote employee cooperation, organizational citizenship behaviour, and alignment with overall organizational goals and objectives (Organ, 1988).**27)** Focus on the system. Make continuous improvement an everyday matter. Engage employees in a collaborative network focused on improving the systems of production. Major efficiencies and production breakthroughs come primarily through systems improvements, where everybody wins. (Crosby, 1984; Deming, 1994; Juran, 1993.)**28)** Build a community culture based on honest, ethical treatment of all employees and managers. Promote an ethic of caring and good community citizenship. **29)** Performance appraisal represents a "push" and control approach. Develop an organizational culture with practices that present a "pull and empowerment" approach; one where managers engage in collaborative influence, not control, practices. The environment and system determine one's ability to maximize his/her behaviour and performance. **30)** Promote an organizational culture of leadership and coaching; one focused on developing people, not one of using people as instruments.**31)** Train and hold supervisory group reinforcement meetings to ensure common understanding and alignment; and ability to lead and coach employees

## X.   CONCLUSION

Performance appraisal is the process of reviewing employee performance vis-à-vis the set expectations in a realistic manner, documenting the review, and delivering the review verbally in a face-to-face meeting, to raise performance standards year over year through honest and constructive feedback. The principal purpose of an appraisal system should be to improve the employee and the organizational performance. The system must be based on a deep regard for people and recognize that employees are the most important resource. The system should first of all contribute to the satisfaction of all the employees. This tenet will require a continuous effort in counselling, coaching and honest, open communications between the employee and supervisors. Performance appraisal is very appealing in theory. But in practice, it typically does not produce the results intended and expected, and it is disliked by many employees and managers alike. Indeed, this paper presents evidence that performance appraisal, as commonly used, can reduce employee productivity, satisfaction, and engagement. Improving the organization's techno-structure and implementing the

suggestions proposed above will prove far more effective than individual performance appraisal in improving individual and organizational performance. Performance appraisal looks to the past, not the future.

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# Impact of Internal Communication on Employee Engagement – A Study at Delhi International Airport

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***Abstract-*** The study was conducted at Delhi International Airport during 2010-2011 for finding out the ways for improving employee engagement. The reason behind the study was the warning signal received during a routine six monthly employee engagement survey. As per the result of survey indicates there was a significant reduction in the level of employee engagement. Earlier surveys were conducted during the airport project implementation phase and this was the first survey conducted after airport went to operational phase. The result of this survey was alarming and it was decided to start immediate remedial measures. Then different committees were formed and many brainstorming sessions were carried out to find out various drivers which are contributing towards employee engagement. These drivers were analyzed to see which will be the proper one to be addressed by considering the cost of implementation and the one which was worst affected due to the changes undergone during the transition of airport from project to operation phase. "Communication" was identified by experts and top management as the factor which is to be addressed immediately.  So it was also decided to find out scientifically whether there is a relationship between internal communication and employee engagement. The results of the scientific study had shown the existence of positive relationship between them. The study was focused on the main characteristics of the engaged employees such as commitment, meaningfulness of their (employee's) work and discretionary effort. Based on these results action plans were formulated and implemented for immediate improvement in the level of employee engagement.

***Index Terms-*** Commitment, Discretional output, Drivers of engagement, Employee engagement, internal communication.

## I. INTRODUCTION

Airport is a service oriented entity where the full-hearted commitment and efforts of employees are essential for its successful and safe operation. The passenger's safety and satisfaction are entirely depends on the employees and the functioning of airport systems manned by them. As this is the fact, it is important to keep monitoring the employee's readiness to deliver the expected results or far beyond the expected results. It is paramount important to keep the employees engaged so that they will deliver their discretionary effort. On basis of this understanding employee engagement surveys are regularly conducted at the airport. There was a sudden fall in the level of employee engagement just after airport went into live operation on completion of the project implementation phase. The decision was taken to improve the level of engagement through focusing on the exact driver of engagement and synthesizing this driver into sub drivers and finding out the correlation of these with employee engagement factors before implementing any action plans. To find out an effective turnaround several brainstorming sessions and discussions among senior management team and airport operation experts were carried out. The main focus of these meetings was to find out the way forward to improve the level of employee engagement. The outcome of this endeavor was the identification of the drivers of employee engagement and also the to single out the driver which is to be addressed immediately to improve the engagement level by considering the low financial burden, and the worst affected driver due to transition of the airport from project to operation phase. The results of all meetings have indicated that the **internal communication** is the driver to be addressed for getting the best result. It was important to find the correlation of the internal communication with employee engagement before advancing in this direction. The Karl Pearson product moment correlation coefficient was used to study the strength of correlation between the sub drivers of internal communication and factors of employee engagement.

**Need for study**

By considering the skills and competencies requirements for human resources in the airports for its successful and most effective operation by delivering the maximum possible output a factor like employee engagement is very important. It is a deciding factor which makes an organization an excellent one with the voluntarily involvement of its human resources. Commitment of an employee towards the work and organization is very important. As airport is coming under the service sector, the regular interaction between the employees who are providing services and the customer (passengers) are quite normal. The employees provide the required services to the passengers to make their journey through the airport comfortable. Companies can always get benefits of the engaged employees in all situations. Engaged employees are always the great asset to the company. The employee engagement is essential in practice for an organization to excel. Apart from this there have been many studies/research works in different organizations on employee engagement, but there were no such studies have been carried out in International Airports, this study is intended to fill such research gap as well.

## II. IDENTIFY, RESEARCH AND COLLECT IDEA

**Review of literature**

**What is Employee Engagement?**

Employee Engagement describes employees' emotional and intellectual **commitment** to their organization and its success. Engaged employees experience a compelling purpose and **meaning in their work** and give their **discrete effort** to advance the organization's objectives. Engagement at work was conceptualized by Kahn (1990) as the "harnessing of organizational members' selves to their work roles. In engagement people employ and express themselves physically, cognitively and emotionally during role performance. Hewitt Associate (2006) defines employee engagement as those who say, speak-positively about the organization, stay-desire to be an effective member and strive - continue to perform beyond minimal requirements for the organisation. Engaged employees are not just committed but passionate about their work. Engaged employees are more profitable, productive, focused, have fun and less likely to leave the company because they are engaged (Gallup Organization, USA, 1999).Engaged employees are

concerned about the future of the organization and are willing to invest discretionary efforts to organization. Studies on employee engagement (Tower Perin, USA 2003, 2007) linked the same to customer impact and financial results. They suggested that there exists a close relationship between high levels of employee engagement and lower staff turn-over rates, higher customer satisfaction and loyalty. Emotionally bound employees feel passionately and commit towards delivering the best performance, it is defined as the way an individual contributes and relates to the organization for which the employee works. The employee engagement can be considered as the extent which employees put the discretionary effort into their work in the form extra time, brain power and energy. Employee engagement is closely linked to employee turnover, customer satisfaction, loyalty, productivity, safety and profitability criteria (Harter, Schmidt and Hayes, 2002).The need to create development and career growth opportunities, appropriate leadership styles and work- life balance were deemed important to attract, retain and engage employees.

## Why is Employee Engagement important?

Employees are an asset to an organization. Using the organization's intellectual capital has become an important source of competitive advantage (Harter,1994, Becker and Huslid,2000,Buckingham and Vosburgh,2001).In the present era of talent war the employees are considered as the most valuable asset. An organization can acquire most of assets similar to its competitor but cannot copy the skill and talent of the human resources of the competitor. Now the situation is very alarming as many organizations target the pool of talented and experienced employees across the world. The employees are in very strong bargaining position as the demand increases for them. In this scenario the concept of employee engagement is very important. Engaged employees are passionate about the work they do. Passion is always accompanied by excitement, enthusiasm and productivity (Kroth and Boverie, 2013). The engaged employees not only contribute more but also are more loyal and therefore less likely to voluntarily leave the organization. Each individual has control over the amount of discretionary effort available to organisation from him or her (Catlette and Hadden,2001).To prosper and survive today's challenging environment there is a need of engaged employees. Now modern organisation concentrate on human capital management, In words of Dave Ulrich ( 1997:125), a famous HRM expert – "Employee contribution becomes a critical business issue because in trying to produce more output with less employee input, companies have no choice but to try to engage not only the body but the mind and soul of every employee". An engaged employee will consistently outperform and achieve new standards of excellence (Harter, Schmidt and Hayes,2002).

Emotionally and rationally binding the employee to the work is the major characteristic of the employee engagement by virtue of these employee retention period increases. As a matter of fact the increase in retention period of the employee leads to cascading effect of reduction in repeated recruitment and related expenditure. Employee engagement makes employees motivated and they are passionate and enthusiastic in their involvement. When employees are passionate they can invest more energy on performance. Employee Engagement makes the employees to know how their deliverables are connected to organization's objectives and it makes them more focused on the relevant activities with full commitment. Managers can trust them and they will deliver more. An engaged employee will exhibit not only better performance but also will be intrinsically motivated. They will have strong commitment and willingness to contribute more voluntarily. The employees themselves become strong brand ambassadors and work towards strong relationships with clients, business partners and the customers. Engaged employees take more initiative and put an extra effort in their task oriented activities and this is very important in the area **like airport** as it is a part of **service industry** which is dealing with customers (passengers) with varying culture and social backgrounds. Building loyalty across the talent base and getting everyone on board is very important and hence employee engagement.

## What is Internal Communication?

Internal communication is operationally defined as the exchange of information both informal and formal between management and employees within the organization. Communications are operationally defined as technology and systems used for sending and receiving messages. Communications may include newsletter, circulation materials, surveys, emails, suggestion boxes etc. Organizational communication focuses on connecting individual employees, groups and organization as a whole to facilitate realization of common interest and spontaneous cooperation (A.S. Hatch 1964; Clampitt and Downs,1992). According to De Ridder (2004), 0rganisational communication is instrumental in facilitating supportive employees. Organizations are first and foremost communicating entities ( Clegg, Kornberger and Pitsis 2005). The study conducted by Watson Wyatt (2007-08) has been quoted by Bill Trahant (2008) shows a strong correlation between effective employee communication and superior organisational performance.

In a study that explores the management of psychological contract, Guest and Conway (2002) report that their results justify stressing the importance of communication that is directly related daily work, the accuracy of instructions or quality of feedback about an employee's work. The management can bring the employee commitment to organization by improving the quality of communication. Communication satisfaction implies effective response to the fulfillment of expectations in message exchange processes and which translate into an enjoyable, fulfilling experience (Down & Hazen, 1997; Clampitt and Downs ,1992;Muller and Lee ,2002). Heron in 1942 wrote "sharing information with employees and added goals, attitudes, and criteria for effective communication". He is most known for introducing the new world of organizational communication to implementing two-way communication between employees and management and encouraging an environment of open and honest communication.

## Objectives of the study

1) To find out the level of the employee engagement of employees at Delhi International Airport.
2) To identify the drivers of the employee engagement and most affected driver.
3) To determine in what way internal communication affect engagement level of employees (Their commitment, discretional effort and meaningfulness in their work).

## Hypotheses

The study had broad hypotheses which proposed the impact of internal communication on employee engagement at Delhi International Airport. The study aims to provide insight into the relationship between the internal communication and employee engagement and his components like commitment, discretional effort and meaningfulness in their work.

Testing of **hypothesis H1**

The hypothesis H1 proposes the influence of internal communication on employee engagement which comprises of three characteristics like commitment, discretional effort, and meaningfulness of the work. The sub hypothesis H1a to H1c has been listed below

**H10 :** Internal communication has **no significant** impact in influencing employee engagement comprising of the "**commitment, discretional effort** and **meaningfulness in their work".**

**H1 :** Internal communication has **significant** impact in influencing employee engagement comprising of the "**commitment, discretional effort** and **meaningfulness in their work".**

**H1a0 :** Internal communication has **no significant** impact in predicting **commitment** of employees and influencing employee engagement.

**H1a :** Internal communication has **significant** impact in predicting **commitment** of employees and influencing employee engagement.

**H1b0 :** Internal communication has **no significant** impact in predicting **discretional effort** of employees and influencing employee engagement.

**H1b :** Internal communication has **significant** impact in predicting **discretional effort** of employees and influencing employee engagement.

**H1c0 :** Internal communication has **no significant** impact in predicting **meaningfulness in their work** of employees and influencing employee engagement.

**H1c :** Internal communication has **significant** impact in predicting **meaningfulness in their work** of employees and influencing employee engagement.

## Scope of the study

The study was confined to identify the important drivers which affect the level of employee engagement in respect of Delhi International Airport. Next focus was to identify the cost effective and most affected driver during the project to operation transition period. This was the driver **"internal communication"**. Then it was decided to find out the impact of internal communication on the employee engagement. The three factors or characteristics of employee engagement "**commitment**, **discretional effort** and **meaningfulness** in their (employees) work" were taken as base for studies. The study covered 300 employees from different areas of airport operation and they were selected based on random sampling. The employee engagement surveys in the airport is regularly (on half yearly basis) are carried out by using UWES (Utrecht Work Engagement Scale-statements)- "Appendix-1" for finding the level of engagement.

## Delhi International Airport

DIAL is a joint venture consortium of GMR Group, Airports Authority of India, Fraport and Malaysia Airports Holdings Berhad (MAHB). In March 2010, DIAL has completed the construction of integrated passenger terminal (Terminal 3). The first phase of the airport is designed and capable to handle 60 MPPA. This development was the first phase of the airport expansion. In subsequent stages, the airport will be further developed with the increase in passenger demand and more terminals and runways would be added in a modular manner to form a U shaped complex with an ultimate design capacity of 100 MPPA. Delhi Indira Gandhi International airport has become India's and south Asia's largest and one of the most important hub with current capacity of handling more than 46 MPPA and aimed at handling more than 100 MPPA by 2030. The airport has been spread over an area of 5130 acres and it is world's 8th largest passenger terminal. This airport is also 34th busiest airport in the world with 34,729,467 passengers handled, registering a 17.8% growth in traffic over the previous year. Airport is the second best airport in world based on the Airport Service Quality.

## Research Methodology

Method followed for conducting the study and to fulfill the objectives are shown below.

## Data Collection

For fulfilling the abovementioned objectives, both primary and secondary data were used. The reason for the study was fall in employee engagement level noticed in the routine half yearly survey. The half yearly employee engagement survey was regularly conducted using UWES (Utrecht Work Engagement Scale). This tool was used to measure the work engagement level of employees from different areas or functions. Instead of giving full details of this instrument, the result of the survey is given. The next stage was to identify the important drivers of employee engagement. This was done by brainstorming session conducted with airport operation experts and top management team. The study also used secondary data from the records available in HR department, magazines, journals, business dailies and web sources.

Different meetings and brain storming sessions identified eight most important drivers, they were 1) Communication 2) Rewards and Recognition 3) Training 4) Regular Feedback 5) Co-workers and work place relationship 6) Growth opportunities 7) Job satisfaction 8) Learning organisation. Further, it was analysed and found out the most affected driver during the transition of airport from project stage to operation as the **"internal communication".**

**Construction of questionnaire**

The study was conducted through self-administrated questionnaire. To collect data on **"internal communication"** at airport, Dennis' Communication Climate survey instrument (Appendix 2) was used with slight reorientation of questions. Important part of the instrument was used and following factors were taken into consideration in the survey. 1. Superior- subordinate communication 2. Quality of information 3. Superior openness 4.Opportunities for upward communication and 5. Reliability of communication.  The survey followed a five-point Likert scale from "strongly disagree" to "strongly agree" at the extremes.

To measure the **"employee engagement"** at airport two instruments were combined such as  Mowday, Steers, and Porter (1979) **Organisational Commitment Questionnaire(OCQ)**  with 15 questions which used for focusing the employee's perceptions of their level of **"commitment"** & **"willingness to exert discretional  effort"** and the part of **Spreitzer (1995) Empowerment scale**  with 3 questions to measure **"meaningfulness of the work".** The survey followed a five-point Likert scale from "strongly disagree" to "strongly agree" at the extremes. (Employee engagement survey instrument – Appendix 3).

A pilot survey was conducted with draft questionnaire wherein it was served to twenty experts (drawn from airport) prior to general survey which resulted in deletion and modification and also inclusion of some services or area.

**Sample Design**

The sample frame would represent employees of Delhi International Airport. In selecting the sample respondents, multi-stage and random sampling techniques were used. In the first stage, the whole population was divided into different groups based on the function or area of operation and then selected randomly from the group proportional to the strength of the group. Sample size was 300. The questionnaire assessed the state of participant's work place internal communication and measured their level of engagement as an employee. The instrument measured the presence, quality and effectiveness of internal communication as well as the presence and level of employee engagement.

## III.   STUDIES AND FINDINGS

**Analysis and interpretation of data**

The data collected from the employees through questionnaire were analysed to draw out the inference regarding the impact of internal communication on the employee engagement. Five factors from the Dennis' Communication Climate survey were used in the study. They are 1. Superior- subordinate communication 2. Quality of information 3. Superior openness   4.Opportunities for upward communication and  5. Reliability of communication.

1. Superior-subordinate communication:  This is inferred from the response for the 14 questions in the part 1 of Dennis' Communication Climate questionnaire. These questions are in 4 parts 1A, 1B, 1C, and 1D.The questions 1A concentrate on subordinate supervisor understanding and 1B exclusively for the positive supervisor communications which is a part of supervisor subordinate communication. Questions in 1C are used in both subordinate-supervisor communication and supervisor openness factor and response for questions in 1D is exclusively used in evaluating the factor superior openness. This factor superior- subordinate communication reflected statements of positive communication between a subordinate and their superior because it covered exchanges of encouragement, understanding, and fairness between two these individuals.

2. Quality of information: There are twelve questions (2A and 2B) in this part of questionnaire. There are two sub-factors in this such as effective communication and open communication in the organisation. As far as quality of communication is concerned, it reflected employees who are pleased with the way management communicated the sources they used to communicate, the rewards they received, and clear understanding of organisational goals and job requirements. This also reflected top-down communication transparency. The factor looked at employee satisfaction with the information and the explanations they received from management, the candidness across the organisation and integrity of messages.

3.  Superior openness: To understand this factor the response for questions from 1C, 1D and 2B are used. This is mainly connected to management level or superior level functioning. The factor gives the how the subordinate feels about their managers in the area of providing the information. How honest and open they are in sharing information.

4. Opportunities for upward communication: This factor is inferred through the three questions in part 3 of the questionnaire. This factor reflected employee feelings about their views and opinions being heard and integrated into their day to day work.

5. Reliability of information: The study was done on this factor by using two questions in the Part 4 of questionnaire. They represent the opinion of employees regarding the reliability of information received from management and from their colleagues.

Employee engagement questionnaire is a combination of Mowday, Steers, and Porter (1979) "Organisational Commitment questionnaire and Spreitzer (1995) Empowerment survey questionnaire. There are 18 questions in total  and response to these questions reflect the three factors of the employee engagement like **Commitment** is related to questions 1,2,4,5,6,7,8,10,12,13,14,15,17 and 18 , the factor **meaningfulness in their  work**  is connected to questions 1,3,4,8,10 and 16 , the factor **discretional effort** is represented by the response to questions 3,9,11,13 and 14. The first hypothesis predicted **communication** with employees would be positively related to employee **commitment**. **Pearson Product Moment Correlation statistics** were used to determine the relationship between communication and commitment.  The independent variables for communication were comprised of Superior – Subordinate communication, Superior openness, Opportunities for upward communication, Quality of information and Reliability of the information. The dependent variable was organisational commitment. Five correlations were found. A fair degree of relationship was found between commitment and both superior openness (r =0.40, p<0.01) and opportunities for upward communication (r = 0.47,p< 0.01). A slight relationship was found between super-subordinate communication and commitment(r = 0.25,p< 0.01) and a chance relationship was found to exist between quality of information and commitment (r = 0.18,p< 0.01), and between reliability of communication and the commitment (r = 0.19,p< 0.01)    As all are having a positive significant relationship H1a supported.

The second hypothesis predicted **communication** with employees would be positively related to employee **discretional effort**. Pearson Product Moment Correlation statistics were used to determine the relationship between communication and discretional effort. The independent variables for communication were comprised of Superior – Subordinate communication, Superior openness, Opportunities for upward communication, Quality of information and Reliability of the information. The dependent variable was organisational discretional effort. Five correlations were found. A fair degree of relationship was found between discretional effort and Superior openness (r =0.38, p<0.01), upward communication (r = 0.48,p< 0.01) and reliability of communication (r = 0.45,p< 0.01) . A slight relationship was found between super-subordinate communication and discretional effort (r = 0.24,p< 0.01) and  quality of information and discretional effort (r = 0.22,p< 0.01). As all are having a positive significant relationship H1b supported.

The third hypothesis predicted **communication** with employees would be positively related to **meaningfulness in their work** of employees. Pearson Product Moment Correlation statistics were used to determine the relationship between communication and **meaningfulness in their work** of employees. The independent variables for communication were comprised of Superior – Subordinate communication, Superior openness, Opportunities for upward communication, Quality of information and Reliability of the information. The dependent variable was **meaningfulness in their work** of employees. Five correlations were found. A fair degree of relationships were found between **meaningfulness in their work** and super-subordinate communication (r = 0.39,p< 0.01), Quality of information (r = 0.38,p< 0.01), and Reliability of communication (r = 0.35,p< 0.01). A slight relationship was found between meaningfulness in their work and opportunities for upward communication (r =0.22, p<0.01) and chance relationship was found between meaningfulness in their work and superior openness.(r = 0.14,p< 0.01). As all are having a positive and significant relationship H1c is supported.

This study emerged due to reduction in the level of employee engagement at Delhi international airport. As a normal practice, in every six month the survey is conducted at DIAL by using the tool "Utrecht Work Engagement Scale (UWES)". There are 17 statements and the employees are asked to respond to each question. The employees are grouped as per the functional area and there are 10 areas. This survey is conducted in January and July of every year. A sample size of 300 is collected from the employees from all 10 areas proportional to the strength of employees working in that area. The mark allotted to each questions are as follows. Never = 0, Almost Never = 1, Rarely = 2, Sometimes = 3, Often = 4, Very often = 5, Always =6.Then weighted average of the response for all questions and all samples are found out to arrive the "Employee Engagement Level" ,and is tabulated as follows.

Table 1: Employee engagement level – Based on half yearly employee survey

| Employee Engagement Level | | | | | |
| --- | --- | --- | --- | --- | --- |
| | | | | | |
| Month-Year | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | 3.6 | 3.7 | **2.9** | | |
| July | 3.7 | 3.8 | 3.7 | | |

## IV. CONCLUSION AND SUGGESTIONS

Background of the study, there was a reduction in engagement level of employees at Delhi international airport when it was moved from project phase to operation phase. Then high level team constituted to find out the economical way of regaining its previous level of engagement. The team perceived the internal communication as one major driver caused this fall in level of engagement. Then it was decided to scientifically find out whether there is relationship between the internal communication and employee engagement and also how deep is the relationship. Study done based on the factors of employee engagement and factors of internal communication. The main factors of engagement like commitment, discretional effort and meaningfulness in the employees work were considered in statistical survey. The communication has its five important factors like superior-subordinate communication, superior openness, opportunities for upward communication, reliability of communication, and quality of communications were studied. The Pearson Product Moment Correlation method was used to find out the correlation between the factors of communication and factors of engagement. There were fair, slight and chance relationships between different factors. And it was concluded statistically, overall there is significant positive correlation between    internal communication and employee engagement. Based on this study different action plans were formulated and implemented. Even though this part is not in the scope of this study, for academic interest it can be mentioned that, the implementation of the action plans for improving the internal communication, was able to bring back the level of employee engagement better than the previous one. The detail about correlation between the factors is given in the Appendix-4.

## V. LIMITATION

The study was conducted only taking the worst affected driver "internal communication" as it was decided to have an immediate recovery with low financial expenditure. There were other drivers which would have impacted on the level of employee engagement and were not considered as the impacts of these drivers were not much influenced by the process of transition of airport. But definitely this can be considered as limitation.

## VI. FUTURE RESEARCH

In future a study can be conducted taking all 8 drivers identified at the initial stage of the study. Also now Delhi Airport has become world's 2nd best airport based on the ASQ (Airport Service Quality) rating for which customer feedback is a main deciding factor. There are numerous studies indicating that customer satisfaction really depends on the level of employee engagement. As Delhi international Airport is keen to become world's 1st best airport by the year 2014, it should conduct a detailed study considering all drivers of engagement into account. The similar study can be undertaken by any other organization which is facing a fall in level of engagement or wish to improve the level of engagement.

## APPENDIX

**Appendix-1:  Utrecht work Engagement Scale (UWES)**

| Utrecht Work Engagement Scale ( UWES) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| The following 17 statements are about how you feel at work. Please read each statement carefully and enter cross mark (X) in appropriate place as per your opinion | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |

| Sl no | Statement | Factor | Never 0 | Almost never 1 A few times a year or less | Rarely 2 Once a month or less | Sometimes 3 a few times a month | Often 4 Once a week | Very often 5 A few times a week | Always 6 Every day |
|---|---|---|---|---|---|---|---|---|---|
| 1 | At work, I feel busting with energy | Vigor | | | | | | | |
| 2 | I find the work that I do full of meaning and purpose | Dedication | | | | | | | |
| 3 | Time flies when I am working | Absorption | | | | | | | |
| 4 | At my job, I feel strong and vigorous | Vigor | | | | | | | |
| 5 | I am enthusiastic about my job | Dedication | | | | | | | |
| 6 | When I am working I forget everything else around me | Absorption | | | | | | | |
| 7 | My job inspire me | Dedication | | | | | | | |
| 8 | When I got up in the morning , I feel like going to work | Vigor | | | | | | | |
| 9 | I feel happy when I am working intensely | Absorption | | | | | | | |
| 10 | I am proud of the work that I do | Dedication | | | | | | | |
| 11 | I am immersed in my work | Absorption | | | | | | | |
| 12 | I can continue working for very long periods at a time | Vigor | | | | | | | |
| 13 | To me, my job is challenging | Dedication | | | | | | | |
| 14 | I get carried away when I am working | Absorption | | | | | | | |
| 15 | At my job, I am very resilient, mentally | Vigor | | | | | | | |
| 16 | It is difficult to detach myself from my job | Absorption | | | | | | | |
| 17 | At my work I always persevere even when things don't go well | Vigor | | | | | | | |

**Appendix -2**

**Dennis' Communication Climate Survey Instrument**

**Employee Communication questionnaire**

This questionnaire will ask you question concerning internal communication within an organisation. For the purpose of this study internal communication is defined as the exchange of information both informal and formal between management and employees.

**PART 1 A**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | Your superior is frank and candid with you | | | | | |
| 2 | You believe that your superior thinks he/she really understands you. | | | | | |
| 3 | You believe that your superior thinks that you understand him/her. | | | | | |
| 4 | You really understand your superior | | | | | |

**PART 1 B**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | Your superior makes you feel that things you tell him/her are really important. | | | | | |
| 2 | Your superior makes you feel free to talk with him/her. | | | | | |
| 3 | Your superior expresses his/her confidence with your ability to perform the job. | | | | | |
| 4 | Your superior encourages you to bring new information to his /her attention, even when that new information may be bad news. | | | | | |
| 5 | Your superior encourages you to let him/her know when things are going wrong on the job. | | | | | |
| 6 | Your superior makes it easy for you to do your best work. | | | | | |
| 7 | Your superior really understands your job problem | | | | | |
| 8 | Your superior really understands you. | | | | | |

**PART 1 C**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | Your superior is willing to tolerate arguments and to give a fair hearing to all points of view. | | | | | |
| 2 | Your superior has your best interests in mind when he/she talks to his/her boss. | | | | | |
| 3 | Your superior is really competent, expert manager. | | | | | |
| 4 | Your superior listens to you when you tell him/her about things that are bothering you. | | | | | |
| 5 | You can communicate job frustrations to your superior. | | | | | |
| 6 | You think you are safe in | | | | | |

| | communicating "bad news" to your superior without fear of retaliation on his/her part. | | | | | |
|---|---|---|---|---|---|---|

**PART 1 D**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | It is safe to say what you are really thinking to your superior. | | | | | |
| 2 | You can tell your superior about the way you feel he /she manage your department. | | | | | |
| 3 | You are free to tell your superior that you disagree with him/her. | | | | | |

**PART 2 A**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | You think that people in this organisation say what they mean and mean what they say. | | | | | |
| 2 | People in top management say what they mean and mean what they say. | | | | | |
| 3 | People in this organisation are encouraged to be really open and candid with each other. | | | | | |
| 4 | People in this organisation freely exchange information and opinion. | | | | | |
| 5 | You are kept informed about how well organisational goals and objectives are being met. | | | | | |
| 6 | Your organisation succeeds in rewarding and praising good performance. | | | | | |
| 7 | You receive information from the sources that you prefer (Example: from your superiors, department meetings, co-workers, newsletters). | | | | | |
| 8 | You are notified in advances of changes that affect your job. | | | | | |
| 9 | Your job requirements are specified in clear languages. | | | | | |

**PART 2 B**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | Top management is providing you with the kinds of information you really want and need. | | | | | |
| 2 | You are pleased with the management's effort to keep employees up-to-date on recent developments that relate to the organisation's welfare-such as success in competition ,profitability, future growth plans etc. | | | | | |
| 3 | You are satisfied with explanations you get from top | | | | | |

| | management about why things are done as they are. | | | | | |
|---|---|---|---|---|---|---|

**PART 3**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | Your opinions make a difference in the day-to-day decisions that affect your job. | | | | | |
| 2 | You believe your views have real influence in your organisation. | | | | | |
| 3 | You can expect that recommendations you make will be heard and seriously considered. | | | | | |

**PART 4**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | You think that information received from management is reliable. | | | | | |
| 2 | You think that information received from your colleagues (co-workers) is reliable. | | | | | |

**Appendix – 3**

**Employee Engagement Survey Instrument**

**Employee Commitment, Discretional effort and Meaningfulness of the work.**

This questionnaire will ask you question concerning how you feel about your organisation and also about the work. Indicate your choice by placing an (X) under your preferred answer.
-------------------------------------------------------------------------------------------------------------------- -------……………………..

**PART 1 A**

| SL NO | QUESTIONS | STRONGLY DISAGREE | DISAGREE | NEUTRAL | AGREE | STRONGLY AGREE |
|---|---|---|---|---|---|---|
| 1 | I am willing to put in a great deal of effort beyond that normally expected in order to help this organisation be successful. | | | | | |
| 2 | I talk up this organisation to my friends as a great organisation to work for. | | | | | |
| 3 | I feel very little loyalty to this organisation. | | | | | |
| 4 | The work I do is very important to me. | | | | | |
| 5 | I would accept almost any type of job assignment in order to keep working for this organisation. | | | | | |
| 6 | I find my values and the organisation's values are very similar. | | | | | |
| 7 | I am proud to tell others that I am part of this organisation. | | | | | |
| 8 | My job activities are personally meaningful to me. | | | | | |
| 9 | I could just as well be working for | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | a different organisation as long as the type of work was similar. | | | | | |
| 10 | This organisation really inspires the very best in me in the way of job performance. | | | | | |
| 11 | It would take very little change in my present circumstances to cause me to leave this organisation. | | | | | |
| 12 | I am extremely glad that I chose this organisation to work for over others I was considering at the time I joined. | | | | | |
| 13 | There's not much to be gained by staying with this organisation indefinitely. | | | | | |
| 14 | Often, I find it difficult to agree with this organisation's policies on important matters relating to its employees. | | | | | |
| 15 | I really care about the fate of this organisation. | | | | | |
| 16 | The work I do is meaningful to me. | | | | | |
| 17 | For me this is the best of all possible organisations for which to work. | | | | | |
| 18 | Deciding to work for this organisation was a definite mistake on my part. | | | | | |

**Appendix – 4**

**Correlation**

| HYPOTHESIS | ENGAGEMENT |
|---|---|
| **Communication and commitment** | |
| Communication factors | Commitment |
| Opportunities for upward communication | (r =0.47, p<0.01) |
| Superior openness | (r =0.40, p<0.01) |
| Superior –Subordinate communication | (r =0.25, p<0.01) |
| Quality of information | (r =0.18, p<0.01) |
| Reliability of communication | (r =0.19, p<0.01) |

| HYPOTHESIS | ENGAGEMENT |
|---|---|
| **Communication and discretional effort** | |
| Communication factors | Discretional effort |
| Opportunities for upward communication | (r =0.48, p<0.01) |
| Superior openness | (r =0.38, p<0.01) |

| Superior –Subordinate communication | (r =0.24, p<0.01) |
|---|---|
| Quality of information | (r =0.22, p<0.01) |
| Reliability of communication | (r =0.45, p<0.01) |
| HYPOTHESIS | ENGAGEMENT |
| **Communication and meaningfulness in their work** | |
| Communication factors | Meaningfulness in the work |
| Opportunities for upward communication | (r =0.22, p<0.01) |
| Superior openness | (r =0.14, p<0.01) |
| Superior –Subordinate communication | (r =0.39, p<0.01) |
| Quality of information | (r =0.38, p<0.01) |
| Reliability of communication | (r =0.35, p<0.01) |

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# Studies on Copper Dynamics in Zooplankton from Bay of Bengal and Andaman Sea

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*Abstract-* The current study focused to evaluate one of the important trace metal concentrations in mixed zooplankton from the waters of Bay of Bengal and Andaman Sea. The average concentration of copper from northern Bay of Bengal, central Bay of Bengal, southern Bay of Bengal, and eastern Bay of Bengal on dry weight basis was reported as 65.36 $\mu g.g^{-1}$, 58.54 $\mu g.g^{-1}$, 48.86 $\mu g.g^{-1}$, 43.50 $\mu g.g^{-1}$ respectively and average surface sea water copper concentration from the northern Bay of Bengal, central Bay of Bengal, southern Bay of Bengal, and eastern Bay of Bengal was reported as 1.33 ppb, 1.30 ppb, 1.02 ppb, and 0.84 ppb respectively. The copper concentration in the mixed zooplankton from the waters of the Andaman Sea ranged from 36.25 to 58.32 $\mu g.g^{-1}$ with an average of 43.14 $\mu g.g^{-1}$ and its surface seawater concentrations ranged from 0.78 to 1.29 ppb with an average of 0.93 ppb.

*Index Terms*- Atomic absorption spectrophotometer, Zooplankton, Copper, and trace metal.

## I. INTRODUCTION

Zooplankton accumulate metals by direct absorption from water and also by assimilation through food substances (Couture and Kuman, 2003; Chen *et al*., 2000). Along the East Coast of India, several large rivers (Brahmaputra, Ganges, Mahanadi, Godavari, Krishna and Kaveri) drain into the coastal waters and contribute to the terrestrially derived trace metal loads. These rivers deliver large quantities of sediment that are constantly moved north or south, depending on the direction and angle of wave approach with respect to the coast (Alagarsamy and Zhang, 2005; Kumar, *et al.,* 2006). Spatial studies of metal concentrations in surface zooplankton from the Indian Exclusive Economic Zone (EEZ) of the Arabian Sea and Bay of Bengal have revealed particularly high metal concentrations at river mouths, upwelling zones, and eddy mixing zones, in comparison to other areas (Rejomon, 2005; Rejomon *et al.,* 2008). The excellent investigations dealing with trace metal levels in plankton were documented all over the world Oceans (Gajbhiye *et al*., 1985; Govendaswamy *et al.,* 1999 and Rejomon *et al.,* 2008).

So far, a single report is available on the distribution of trace metal concentration in the zooplankton from the waters of the Bay of Bengal (George and Kureishy (1979) and the Andaman Sea (Kureishy *et al*., 1983), though these waters are receiving huge quantities of freshwater with metal load of terrestrial and anthropogenic inputs along the east coast of India, Bangladesh and Myanmar. Therefore, the author has undertaken to investigate on the distribution and comparison of Copper in the mixed zooplankton and in the ambient seawater from the waters of the Bay of Bengal and the Andaman Sea.

## II. MATERIALS AND METHODS

The study area includes the Bay of Bengal ($4^0$ to $23^0$N latitude and $80^0$ to $93^0$E longitude) from northeastern part of the Indian Ocean. The Andaman Sea $6^0$ to $14^0$N latitudes and $91^0$ to $94^0$E longitudes) is small and partially isolated portion of Northeastern Indian Ocean.

**Metal analysis**

Atomic absorption with or without flame is a versatile technique for the determination of trace elements in natural waters, plants and biological materials and particulate samples.

**Metals in Zooplankton**

Dried and powdered zooplankton samples were used to estimate metal concentration in copper. Powdered samples were digested in Teflon bombs with concentrated HNO3, the volume of the sample solution made up to 25 ml with 4N HNO3 solution. The concentration of the metals was determined by Flame Atomic absorption spectrophotometer (microprocessor controlled Varian Atomic absorption spectrophotometer). The metal concentrations were determined by using the formula

Metal concentration in the sample (ppm) = Metal concentration in solution ×V/Weight of the sample. Where Vis the volume of the sample solution.

Jan and Young, 1978 method is used for the analysis of metals in sea water.

## III. RESULTS

Concentrations of copper in the mixed zooplankton and in the ambient seawater from the waters of the Bay of Bengal and the Andaman Sea and a detailed station wise variation of copper in the mixed zooplankton and in the surface seawater from these waters is shown in (Table 1).

**Table 1: Concentration of copper in the mixed zooplankton ($\mu g.g^{-1}$ dry weight) and in the surface seawater (ppb) from the waters of the Bay of Bengal and the Andaman Sea Bay of Bengal (premonsoon season)**

| St. No. | Northern Bay of Bengal | | St. No. | Central Bay of Bengal | | St. No. | Southern Bay of Bengal | |
|---|---|---|---|---|---|---|---|---|
| | Zooplankton | Surface seawater | | Zooplankton | Surface seawater | | Zooplankton | Surface seawater |
| 1 | 78.52 | 1.48 | 5 | 60.51 | 1.33 | 9 | 56.23 | 1.13 |
| 2 | 61.62 | 1.31 | 6 | 61.35 | 1.38 | 10 | 50.40 | 1.11 |
| 3 | 60.92 | 1.28 | 7 | 59.10 | 1.25 | 11 | 48.51 | 0.98 |
| 4 | 60.40 | 1.23 | 8 | 53.20 | 1.23 | 12 | 40.32 | 0.86 |

**Andaman Sea (northeast monsoon season)**

| St. No. | Eastern Bay of Bengal | | St. No. | Andaman Sea | |
|---|---|---|---|---|---|
| | Zooplankton | Surface seawater | | Zooplankton | Surface seawater |
| 1 | 38.35 | 0.64 | 7 | 36.25 | 0.88 |
| 2 | 40.32 | 0.75 | 8 | 38.36 | 0.83 |
| 3 | 41.36 | 0.88 | 9 | 40.26 | 0.84 |
| 4 | 44.72 | 0.89 | 10 | 40.95 | 0.78 |
| 5 | 46.16 | 0.91 | 11 | 58.32 | 1.29 |
| 6 | 50.11 | 0.98 | 12 | 44.71 | 0.95 |

The concentration of copper in the mixed zooplankton from the waters of the northern Bay of Bengal varied from 60.40 to 78.52 $\mu g.g^{-1}$ with an average of 65.36 $\mu g.g^{-1}$ dry weight and its concentration in the surface seawater ranged from 1.23 to 1.48 ppb with an average of 1.33 ppb. The concentration of copper in the mixed zooplankton from the waters of the central Bay of Bengal ranged from 53.20 to 61.35 $\mu g.g^{-1}$ with an average of 58.54 $\mu g.g^{-1}$, its surface seawater concentration, ranged from 1.23 to 1.38 ppb with an average of 1.30 ppb, and the concentration of copper in the mixed zooplankton from the waters of the southern Bay of Bengal ranged from 40.32 to 56.23 $\mu g.g^{-1}$ with an average of 48.86 $\mu g.g^{-1}$ and its surface seawater concentration ranged from 0.86 to 1.13 ppb with an average of 1.02 ppb.

Copper concentrations in the mixed zooplankton from the waters of eastern Bay of Bengal varied from 38.35 to 50.11 $\mu g.g^{-1}$ with an average of 43.50 $\mu g.g^{-1}$ and its surface seawater concentration ranged from 0.64 to 0.98 ppb with an average of 0.84 ppb. The copper concentration in the mixed zooplankton from the waters of the Andaman Sea ranged from 36.25 to 58.32 $\mu g.g^{-1}$ with an average of 43.14 $\mu g.g^{-1}$ and its surface seawater concentrations ranged from 0.78 to 1.29 ppb with an average of 0.93 ppb.

## IV.  DISCUSSION

The copper concentrations in the mixed zooplankton observed in the present study is similar to those reported in the zooplankton from the sea waters elsewhere. Nicholls *et al*., (1959) reported copper concentration in the marine plankton in the range 13 (coelenterates) to 2700 ppm (molluscs). The copper concentration in the bivalves from the Tasman Bay, New Zealand varied from 1 to 131 ppm dry weight (Brooks and Rumsby, 1965). Martin (1970) reported copper concentration in

the zooplankton from the surface waters of southwest Puerto Rico, in the range 30 to 270 µg.g$^{-1}$ dry weight. George and Kureishy (1979) reported the copper concentration in the mixed zooplankton from the coastal and inshore waters of the Bay of Bengal, varied from 3 to 228 ppm dry weight. Romeo and Laumond (1980) reported copper concentration in the surface zooplankton from the Bays of Villefranche, Nice, and Cannes of N.W. Mediterranean, in the range 5.9 to 129.1 µg.g$^{-1}$ dry weights. The copper concentration in the zooplankton from the near shore waters of Bombay, west coast of India, varied from 16.25 to 305 ppm dry weight (Gajbhiye et al., 1985). Romeo and Nicolas (1986) reported copper concentration varying from 12.6 to 28.9 µg.g$^{-1}$ dry weight in the planktonic crustaceans from the east coast of Corsica.

The concentration of copper in the zooplanktonic copepods ranged from the 14 to 160 µg.g$^{-1}$ from the Fram Strait and the Greenland Sea (Ritterhoff and Zauke, 1997). Govindasamy et al., (1999) reported copper concentrations in the zooplankton from the coastal waters of Coromandel Coast, east coast of India ranged from 25.80 to 306.50 µg.g$^{-1}$. Kahle and Zauke (2003) reported the copper concentration in Antarctic copepods, ranged from 6 to 52 µg.g$^{-1}$ from Weddell Sea (Antarctica). Fang et al., (2006) reported the copper concentration in the copepods from the ocean outfall area off the northern Taiwan coast, ranged from 14 to 160 µg.g$^{-1}$. Rejoman et al., (2008) reported the copper concentrations in the zooplankton from the coastal and offshore waters of the eastern Arabian Sea and the western Bay of Bengal, ranged from 3.40 to 65.50 µg.g$^{-1}$ for the coastal water zooplankton and from 3.40 to 30.9 µg.g$^{-1}$ for the offshore water zooplankton of the Arabian Sea, while in the zooplankton of the Bay of Bengal, the respective copper concentrations are from 8.20 to 42.30 µg.g$^{-1}$ and from 9.2 to 34.2 µg.g$^{-1}$.

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# An Exploratory Study on Internet Banking Usage in Semi - Urban Areas in India

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**Abstract-** Internet banking or online banking has revolutionized an integral activity of our modern twenty first century lives – 'banking'. Internet banking is conducted through a PC, PDA, a hand-held communication gadget or any mobile device offering Internet connectivity but with the development of Hi-Tech asynchronous technologies and secured electronic transaction technologies, however, more banks have come forward to use Internet banking both as a transactional as well as an informational medium. Even after having so many advantages, still some factors are there, which affects its usage. There are some of the psychological and behavioral factors which affect the adoption of any new innovation such as Internet banking include consumer awareness, ease of use, security, accessibility, techno phobia or simply reluctance to change, preference for personalized services and cost of adopting the innovation. This research paper was focused on to identify the factors that are the barriers for the usage of internet banking services and also to study the perception of customer about internet banking. The study was exploratory in nature and sample size considered for the study was 100 respondents, those were having account in that banks, which provide the Internet Banking facility, but they are not using it. The primary data was analyzed by factor analysis and identify the nine factors i.e. cost, reliability, processing barriers, security issues, technological incontinence, lack of infrastructure, conventional approach, risk and resistance, which were the barriers in the usage of Internet Banking services in the semi-urban areas.

**Index Terms:** Internet banking, online banking, mobile device, consumer awareness, Internet Banking facility, Internet Banking services, semi-urban areas, processing barriers, security issues, technological incontinence, lack of infrastructure, conventional approach, psychological and behavioral factors.

## I. INTRODUCTION

O ne of the technologies which really brought information revolution in the society is Internet Technology and is rightly regarded as the third wave of revolution after agricultural and industrial revolution. Advent and adoption of Internet by the industries has removed the constraint of time, distance and communication making globe truly a small village. Financial sector being no exception, numerous factors such as competitive cost, customer service, increase in education and income level of customers, etc. influence banks to evaluate their technology and assess their electronic commerce and internet banking strategies. In the last three decades, the Internet has grown to become one of the most amazing technological and social accomplishments of the last century. Millions of people, most of them are not computer coordination researchers or experts, now they are using this complex, interconnected network of computer. The computers are located in almost every country of the world. Every year, billions of dollars change hands over the Internet in exchange for all kinds of products and services. All of this activity occurs with no central point or control, which is especially ironic given that the Internet began as a way for the military or maintains control while under attack. The opening of the Internet to business activity helped dramatically increase the growth, however there was another development that worked hand in hand and with the commercialization of the Internet to spur its growth. That development was the World Wide Web (Schneider, 2007). The Internet is rapidly turning out to be a tool of world wide communication. The increasing use of Internet earlier promoted producers and entrepreneurs to sell their products online. It has also become an important source of information and knowledge. Due to this, many banking and finance organizations have come up with the idea of Internet banking or online banking.

Internet banking allows banking from anywhere, anytime and is used for transactions, payments, etc. over the internet through a bank, a credit union or society's secure website. Internet banking, a client has one-to-one interaction with the bank's website, and in such a situation it is essential on the part of bank to provide high quality services over the internet. As compare to traditional banking, Internet banking involves non-human interactions between customers and online bank information system. Customer satisfaction, customer retention and new customer acquisition are the key factors in Internet banking system (Khan, Mahapatra and Sreekumar,2009). Internet Banking is a term used to describe banking transactions that are performed via a secured Internet application. These transactions include such things as paying bills, transferring funds, viewing account statements and paying down loans and mortgages. Although Internet Banking has been popular among young Internet-savvy people for many years, its popularity is expected to grow rapidly as Internet usage grows internationally and people discover the many advantages that it provides. Internet Banking can be defined as a facility provided by banking and financial institutions that enable the user to execute bank related transactions through Internet. The biggest advantage of Internet banking is that people can expend the services sitting at home, to

transact business. Due to which, the account holder does not have to personally visit the bank. With the help of Internet banking many transactions can be executed by the account holder. When small transactions like balance inquiry, record of recent transaction, etc. are to be processed, the Internet banking facility proves to be very handy. The concept of Internet banking has thus become a revolution in the field of banking and finance. (Scholasticus) .In India all the large banks has introduced  Internet banking services, but adaption of this service is less because access to the Internet was limited, high-speed Internet connection were rare and e-business applications were clunky. Customer has discovered that they are able to pay bills, transfer funds and check transactions 24 hours a day from the comfort of their homes.  Many banks provided financial incentives to encourage clients to adopt self-service banking channels over "at the teller" full service banking.  In addition to Internet Banking, this included the use of Automated Teller Machines (ATM) and Interactive Voice Recognition (IVR) telephone banking services. From the perspective of banking products and services being offered through Internet, Internet banking is nothing more than traditional banking services delivered through an electronic communication backbone, viz, Internet. But, in the process it has thrown open issues which have ramifications beyond what a new delivery channel would normally envisage and, hence, has compelled regulators world over to take note of this emerging channel. Some of the distinctive features of  internet banking are: it removes the traditional geographical barriers as it could reach out to customers of different countries / legal jurisdiction, it has added a new dimension to different kinds of risks traditionally associated with banking, heightening some of them and throwing new risk control challenges, and security of banking transactions, validity of electronic contract, customers' privacy etc., which have all along been concerns of both bankers and supervisors have assumed different dimensions given that Internet is a public domain, not subject to control by any single authority or group of users.

## II.   LITERATURE REVIEW

Almost everyone who you come across these days seems to be using Internet banking and the traditional customer bank manager relationship has been replaced by a password. Internet banking is not only convenient for customers, it also negates the need for keeping some bank branches open for 24 hours a day to provide unparalleled customer service. In addition to that providing the Internet banking option for a bank may require some amount of initial investment, but the costs can be covered soon due to the speed with which customers can be handled and the cut backs on overtime and establishment costs. Internet banking also reduces the amount of administrative work that is otherwise required to manage a bank branch. Based on the large number of people who are turning towards Internet banking, future plans of opening branches across cities can be curbed to some extent, making large investments unnecessary. In fact, today everything is possible on Internet banking starting from request of a new check book, statement downloads, transfer of monies, e-payments and more. Added to that is the freedom from travelling all the way to the branch and avoiding the traffic are reason enough for the customer to choose Internet banking over traditional banking options. The i-banking, now is more of a norm rather than an exception in many developed countries due to the fact that it is the cheapest way of providing banking services (Arunachalam and Sivasubramanian, 2007). Internet banking is a new delivery channel for banks in India. The i-banking channel is both an informative and a transactional medium. However, i-banking has not been popularly adopted in India as expected (Ravi et al., 2007).

The findings of this study shown that the level and nature of customer participation had the greatest impact on the quality of the service experience and issues such as customers' zone of tolerance, the degree of role understanding by customers and emotional response potentially determined, expected and perceived service quality (Broderick and Achirapornpuk,2002). This study suggested that consumer perceptions of transaction security, transaction accuracy, user friendliness and network speed are the critical factors for success in Internet banking ( Liao and Cheung,2003).

## III.   RESEARCH OBJECTIVE

- To explore the factors impeding the usage of Internet Banking in semi urban area.
- To study the importance of Internet Banking in Indian scenario.

## IV.   RESEARCH METHODOLOGY

*The Study*: The study was exploratory in nature to identify the factors that are the barriers for the usage of Internet banking in the semi-urban areas.

*The Sample*: For the study sample size was 100 respondents and resident of  17 semi urban areas of Madhya Pradesh and out of these 20 responses were rejected due provided incomplete information. The respondents considered for the study were those are having their account in bank which providing Internet banking facility, but they were not user of it. The respondent profile was as 60 male and 20 female. The study was conducted during the period of January to May, 2011.

***Tools for Data Collection***: The study was based on the primary data. To collect primary data a self-designed structured tool at five point Likert's scale (in which '1' stood for strongly agree and '5' for strongly disagree. was developed with 32 items related to barriers in usage of Internet banking in semi-urban areas. At five percent level of significance total 31 significant items were identified for the study.

***Tools for Data Analysis***: The collected data was analyzed in two steps i.e., in first step collected data was tabulated and in second step factor analysis was employed.

## V.   RESULTS AND DISCUSSION

As the result of factor analyses following nine factors were emerged as the barriers in the usage of Internet Banking services in semi urban area (Table 1).

**Table 1: Identified factors for barriers in usage of Internet Banking**

| Factor | Name of the Factor | Factor Load |
| --- | --- | --- |
| Factor 1 | Cost | 3.255 |
| Factor 2 | Reliability | 2.462 |
| Factor 3 | Processing Barriers | 1.982 |
| Factor 4 | Security Issues | 2.563 |
| Factor 5 | Technological Inconvenience | 3.000 |
| Factor 6 | Lack of Infrastructure | 1.588 |
| Factor 7 | Conventional Approach | 2.185 |
| Factor 8 | Risk | 0.77 |
| Factor 9 | Resistance | 0.617 |

***Factor 1: Cost –*** This factor emerged out with maximum factor load of 3.255. It was comprised of five items related barriers in usage of  Internet banking in semi-urban areas with the load of i.e. addition cost (0.849), no personal need (0.783), billing cost (0.643), hidden cost(o.537) and not convenient(0.443). In this factor item load shows that customer having the fear towards cost related and due to this they were not using the Internet banking services in semi-urban areas.

***Factor 2: Reliability –***   This factor had 2.462 factor load.  This factor was constituted of four items with the specific loads i.e. trust on transaction with bank authentication (0.736), no one will take responsibility of loss (0.621), believe in presence of human being as compared to machine  (0.575) and does not provide physical evidence (0.530). In this factor customer preferred traditional banking approach due to provides physical authentication and evidence, having perception that in case of any loss of money no one is responsible and preferred to human being presence as compared to machine.

***Factor 3: Processing Barriers -*** This factor had 1.982 factor load. It was comprised of three items with there load i.e. difficult to retain username and password (0.843), believe in traditional banking (0.596) and influenced by peer group suggestion to no use of Internet banking (0.543). This factor identified the perception of customers in semi-urban areas were not able to retain username and password or any other information related to Internet Banking and believe only on traditional approach and relay on peer group suggestions to not usage of Internet banking

***Factor 4: Security Issues -*** This factor comprised of four items with the factor load of 2.563. In this factor items considered by the customer for barriers of usage of Internet banking in their areas were loss of money due to by mistake select incorrect option(0.820), money will be lost if website is crashed (0.809), virus can affect account information (0.480) and someone can access account information (0.454).

*Factor 5: Technological Inconvenience -* This factor emerged out with factor load of 3.000. It was comprised of four items with the item load i.e. bank website is very complex (0.823), bank server are always down (0.760), bank does not provide any training session (0.712), virus can affect account information (0.705). This factor indicated that customer were having technological inconveniences for the use of internet banking to access of the website for a particular bank is difficult and not provided any training session to learn the use of internet banking.

*Factor 6: Lack of Infrastructure -* This factor comprised of two items with the factor load of 1.588. In this factor items considered by the customer for not usage of the Internet banking in there areas were i.e. frequently electricity shutdown (0.839) and due to conventional option available they don't need of this facility in their area (0.749). This factor indicated that the major problem in semi-urban areas were irregular supply of electricity and because of that customer having fear in their mind to face problems for any transaction and due to conventional bank option is available so they don't feel the need of Internet banking services

*Factor 7 : Conventional Approach –* This factor emerged out with factor load of 2.185. It was comprised of three items impeding the usage of Internet banking in semi-urban areas with the load i.e. peer group does not use Internet banking (0.806), there is no direct interaction with bank employee at the time problem face (0.694) and enjoy traditional banking to help develop personal networking (0.685). In this factor item load shows that customer having the fear towards cost related and due to this they were not using the Internet banking services in semi-urban areas. In semi-urban areas customer's perception toward barriers in usage of Internet banking was due to most of the peer group members also not use this facility, and they feel that during the transaction if they face any problem, in this situation at that time availability of responsible employee is must to solve their problems or can guide to them.

*Factor 8: Risk -* This factor had 0.77. It was comprised of three items with there load i.e. bad past experience (0.797), bank employee can misuse account information (0.526) and bank not provide guarantee for security (0.499). In semi-urban areas customer has mind set based on to bad past experiences shares by other users. And also have a risk factor for misuse of their account information by bank employee and no guarantee provided by the bank for any security issues.

*Factor 9: Resistance -* This factor emerged out with factor load of 0.617. It was comprised of three items with the item load i.e. don't want to use anyway (0.661), time consuming process (0.586) and they think internet banking is only for urban people (0.542). This factor indicated that customer's of semi-urban areas were having resistance towards usage of Internet banking, anyway they don't want to use it or not ready to accept the changes and feel that technological facilities are useful only for urban customer . And have perception of time consuming process as compared to conventional process.

## VI.   CONCLUSION

Internet banking can be considered a remarkable development in the banking sector. The ability to carry out banking transactions through the Internet has empowered customers to execute their financial transactions within the comfort of their homes. Internet banking provides benefits both bankers and customers alike. For the bankers this system is cost-effective, as it has considerably reduced the administrative costs and paperwork related to the transactions. Besides, banks can also cater to the needs of thousands of customers at the same time.Conventional banking has always been slow and time consuming. But, Internet banking has tremendously reduced the time required to process banking transactions, thereby making banking faster and convenient. With many other advantages the greatest advantage of Internet banking lies in the fact that customers are no longer required to wait in those long and wearisome queues of the banks to request a financial transaction or statement. With the help of Internet banking, customer can access any information regarding their account and transactions, any time of the day. Therefore, customer can regularly monitor their account as well as keep track of financial transactions, which can be of immense help in detecting any fraudulent transaction. In addition to this, fund transfers, both national and international, have also become faster and convenient. There are lots of advantages of Internet Banking services like; time saving, minimum efforts, cost saving, easiness and many more. But, most of the people in India especially in the rural and semi-urban areas are not using these services. This study was focused on to semi-urban areas customer's perception towards impeding the usage of Internet banking and in this study identified nine factors i.e. cost, reliability, processing barriers, security issues, technological incontinence, lack of infrastructure, conventional approach, risk and resistance. To increase the use of Internet banking in semi-urban areas carrying out Internet banking properly, a basic knowledge of computers and the Internet is required, which limits the number of people willing to avail this facility as till date 60% of india population still stay in village where internet development is moving at very steady rate hence it is most important to develop Internet Banking services in remote areas of India. Many people, who are not comfortable with computers and the Internet, often find it difficult to use internet banking. Therefore, for beginners, Internet banking is really time consuming process. In addition to this, people also find a difficulty in trusting a completely mechanized system like Internet Banking, in case of financial matters. In many instances, a simple mistake, like clicking a wrong button, may create a big problem. However, this uneasiness can be avoided by printing the transaction receipt and keeping it with oneself, until the bank statement is received. However, with the advances in technology, many banks have taken the adequate measures to ward off any problems related to the security of internet banking and providing easy way to access it.

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# Novel Multi Level Clustering Approach to Reduce Energy Consumption during Clustering Process in Wireless Sensor Networks

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*Abstract-* The rapid growth of network utilization raises a new concept as wireless sensor networks (WSN). Sensor networks consist of spatially distributed autonomous sensor to monitor physical or environmental conditions (i.e. temperature, sound pressure etc.) to develop area monitoring, air quality monitoring, and forest fire detection kind of applications. The major design constraint with WSN is resources utilization. Subsequently, work need to perform clustering and routing using node's information for data transmission. The work propose a novel multi cluster policy to reduce energy consumption during clustering process and overcome routing overhead on routing nodes. The proposed policy also avoids frequent election process during clustering by developing seniority table. The approach also investigates network traffic and nodes energy condition before head selection to develop dynamic clustering policy. Furthermore, work also proposed that, any variation in the network can be intimated through fault tolerant message.

*Keywords-* Wireless Sensor Network, Energy Efficiency, Network Lifetime, Cluster Head, Routing Protocol.

## I. INTRODUCTION

In the sensor approach are equipped among a small battery, a tiny microprocessor, a radio transceiver, and situate of transducers that used to congregation information that description the changes in the environment of the sensor node. In order to achieve high energy efficiency and assure long network lifetime, sensor nodes can be organized hierarchically by grouping them into clusters. In clustered sensor networks, the sensor nodes do not transmit their collected data to the base station (BS), but to designated cluster heads which aggregate the data packets and send them directly or via multi-hop communication to the BS. For directly communication, the nodes furthest away from the BS are the most critical nodes, while in multi-hop communication; the nodes closest to the BS are burdened with a heavy relay traffic load and die first. The cluster head role is usually periodically rotated among the nodes to balance the load. Although rotating the cluster head role ensures that sensors consume energy more uniformly, the main problem described above cannot be completely avoided. Thus, choosing the appropriate sizes and number of clusters is essential for the performance of the network lifetime. If the cluster's radius is too large, it will host many nodes and a lot of energy is wasted due to inter-cluster collisions. On the other hand, if the radius is too small, a large number of clusters are required to cover the observation area and many of them will have to transmit their data over a large distance to the sink. As one possible solution to this problem, we will first completely analyze the basic distributed clustering routing protocol LEACH (Low Energy Adaptive Clustering Hierarchy). We will implement local recovery mechanism in order to reconstruct routes when a link failure occurs in the path and it allows the orphan and new deploy nodes to join the network without any interference in the clustering transmissions. We will propose a protocol using the proper node scheduling (ACTIVE and SLEEP) in the individual clustering of the whole network, compare it with the normal LEACH protocol and a model with heterogeneous wireless sensor nodes with its topology to have good energy efficient and increasing lifetime network may be investigate.

## II. RELATED WORK

A WSN is required to be energy efficient and have to be intelligent raise network life time. It should guarantee with the aim of every the nodes in the network stay alive as long as achievable. A variety of technique have been described to ensure that battery power could be exploit as efficiently as achievable in all the phases of network operation (i.e. Clustering, Routing, Information Processing and Forwarding)

[1] They propose a transmission controller that utilizes different "grades" of channel side information to schedule packet transmissions in an optimal way, while meeting a deadline constraint for all packets waiting in the transmission queue. The wireless channel is modeled as a finite-state Markov channel (FSMC). They were specifically interested in the case where the transmitter has low-grade channel side information that can be obtained based solely on the ACK/NAK sequence for the previous transmissions. Our scheduler is readily implementable it is based on the dynamic programming solution to the finite-horizon transmission control problem. Also calculate the information theoretic capacity of the finite state Markov channel with feedback containing different grades of channel side information including that, obtained through the ACK/NAK sequence and illustrate that our scheduler achieves a given throughput at a power level that is fairly close to the fundamental limit achievable over the channel.

Ifrah Farrukh Khan at al[2], In this research, the working of few routing protocols has discussed, which are energy aware and some of them also provide reliability in data transmission. Of various protocols has been presented through simulation results that

have been reported by leading researchers for the purpose of their comparison. The challenges faced by wireless sensor networks are also discussed in the research. These challenges (i.e. coverage holes, routing holes, jamming holes, black/sink holes and worm holes) affect the performance of routing protocols.

G.H. Raghunandan at al[3], They presented a comprehensive survey of routing techniques in wireless sensor networks. Overall, the routing techniques are classified based on the network structure into three categories: flat, hierarchical, and location based routing protocols. They also highlight the design tradeoffs between energy and communication overhead savings in some of the routing paradigm, as well as the advantages and disadvantages of each routing technique. Although many of these routing techniques look promising, there are still many challenges that need to be solved in the sensor networks. Highlighted those challenges and pinpointed future research directions in this regard.

In [4] author classified different types of clustering protocols for WSN their advantage and drawbacks. The protocol presented here are concerned on how to increase WSN lifetime and to make efficient use of critical resources located at sensor nodes by creating intelligent clustering schemes.

Clustering technique is one of the effective approaches used to save energy in WSNs [12]. Clustering means organizing sensor nodes into different groups called clusters. In each cluster, sensor nodes are given different roles to play, such as cluster head, ordinary member node, or gate way node. A cluster head (CH) is a group leader in each cluster that collects sensed data from member nodes, aggregate, and transmits the aggregated data to the next CH or to the base station [13,14]. The role of ordinary member node is to sense data from the environment they deployed.
Gate-way nodes are nodes belonging to more than one clusters and their role is to transmit data between two clusters.

Furthermore, many different traditional clustering algorithms for wireless ad-hoc networks have been pro-posed by [15-17]. These clustering algorithms are not suitable for sensor networks because in ad-hoc networks, the primary concern is quality of service (QoS) and energy efficiency is the secondary. But in WSNs, the primary concern is the energy efficiency in order to extend the utility of the network [17].

## III. REQUIREMENTS

In current years, there has been an increasing awareness in WSN. One of the most important issues in wireless sensor network is developingan energy-efficient routing protocol. Since the sensor nodes have limited available power, energy conservation is a significant issue in wireless sensor network for nodes and network life. Most of the existing routing protocols for sensor networks don't turn off the radio frequency completely. They speed up the energy consumption. LEACH (Low Energy Adaptive Clustering Hierarchy) is a clustering-based protocol that non-cluster-head nodes will turn off their RF completely until their pre-allocated time slot. However, LEACH has a drawback that the cluster is not evenly distributed due to its randomized rotation of local cluster-head. In this research we propose a MECH (Maximum Energy Cluster Head) routing protocol. It has self-configuration and hierarchical. We will propose architecture can be use inside the clusters between cluster head nodes and also between sink nodes if necessary allowing the effective coverage of large sensing areas. The routing table structure along with the time bounded structure of the protocol, provides efficient upstream and downstream traffic management and allows a wide range of constrained applications for WSN's and implement local recovery mechanism in order to reconstruct routes when a link failure occurs in the path and it allows the orphan and new deploy nodes to join the network without any interference in the clustering transmissions.

## IV. SECURITY FLAWS

Individual sensor nodes in a WSN are inherently resource constrained. They have limited processing capability, storage capacity, and communication bandwidth. Each of these limitations is due in part to the two greatest constraints — limited energy and physical size. The design of security services in WSNs must consider the hardware constraints of the sensor nodes:

- Energy: energy consumption in sensor nodes can be categorized into three parts.

- Energy for the sensor transducer.

- Energy for communication among sensor nodes.

- Energy for microprocessor computation

The study in [2, 3] found that each bit transmitted in WSNs consumes about as much power as executing 800–1000 instructions. Thus, communication is more costly than computation in WSNs. Any message expansion caused by security mechanisms comes at a significant cost. Further, higher security levels in WSNs usually correspond to more energy consumption for cryptographic functions. Thus, WSNs can be divided into different security levels, depending on energy cost.

- Computation- The embedded processors in sensor nodes are generally not as powerful as those in nodes of a wired or ad hoc network. As such, complex cryptographic algorithms cannot be used in WSNs.

- Memory- Memory in a sensor node usually includes flash memory and RAM. Flash memory is used for storing downloaded application code and RAM is used for storing application programs, sensor data, and intermediate computations. There is usually not enough space to run complicated algorithms after loading OS and application code. This makes it impractical to use the majority of current security algorithms. With an Intel Mote, the situation is slightly improved, but still far from meeting the requirements of many algorithms.

- Transmission Range- The communication range of sensor nodes is limited both technically and by the need to conserve energy. The actual range achieved from a given transmission signal strength is dependent on various environmental factors such as weather and terrain

## V. PROPOSED METHODOLOGY

This e scope of multi cluster-head policy in wireless sensor networks interactions to cluster-head and avoids redundant exchange of messages among sensor nodes. Moreover, clustering can stabilize the network topology at the level of sensors and thus cuts on topology maintenance overhead. Sensors would care only for connecting with their cluster-head and would not be affected by changes at the level of cluster-head. The cluster-head can also we will implement optimize management strategies to further enhance the network operation and prolong the battery life of the individual sensors and the network lifetime. A cluster-head can schedule activities in the cluster so that nodes can switch to the low-power sleep mode and reduce the rate of energy consumption. Furthermore, sensors can be engaged in a round-robin order and the time for their transmission and reception can be determined so that the sensors reties are avoided, redundancy in coverage can be limited, and medium access collision is prevented this work improve proposes energy efficient multilevel clustering schemes for wireless sensor networks are extremely energy constrained with a limited transmission range. Due to large area of deployment, the network needs to have a multi-level clustering protocol that will enable far-off nodes to communicate with the base station using the proper node scheduling (ACTIVE and SLEEP) in the individual clustering of the whole network, compare it with the normal LEACH protocol and a model with heterogeneous wireless sensor nodes with its topology to have good energy efficient and increasing lifetime network may be investigate.

The routing algorithm used in the wireless sensor network features the clustering method to reduce the amount of data transmission from the energy efficiency perspective. However, the clustering method results in high energy consumption at the cluster head node. Dynamic clustering is a method used to resolve such a problem by distributing energy consumption through the re-selection of the cluster head node. Still, dynamic clustering modifies the cluster structure every time the cluster head node is re-selected, which causes energy consumption. In other words, the dynamic clustering approaches examined in previous study involve the repetitive processes of cluster head node selection. This consumes a high amount of energy during the set-up process of cluster generation. In order to resolve the energy consumption problem associated with the repetitive set-up, In This research we will proposes a novel multi cluster policy that prompts a single set-up process with a high level of energy consumption. The novel multi cluster policy balances energy consumption among the sensor nodes by fixing a constructed cluster and selecting a cluster head node within the cluster based method. Furthermore, an abnormal node is eliminated when the cluster head node is we will modify using a fault-tolerant message.

- This work will completely analyze the basic distributed clustering routing protocol LEACH (Low Energy Adaptive Clustering Hierarchy).

- The objective of this work is to minimize the energy consumption and balance the energy in the network.

- This work will propose an architecture that can be used inside the clusters, between cluster head nodes and also between sink nodes if necessary allowing the effective coverage of large sensing areas. The routing table structure along with the time bounded structure of the protocol, provides efficient upstream and downstream traffic management and allows a wide range of constrained applications for WSN's.

- Our proposed work will implement the local recovery mechanism in order to reconstruct routes when a link failure occurs in the path and it allows the orphan and new deploy nodes to join the network without any interference in the clustering transmissions.

- Our proposed work will perform a new power-aware formulation and also define in order to enhance the cluster head selection and performance comparison with LEACH algorithm.

Developing a clustering protocol in WSN must be such that it is energy efficient and increases the network life time as a whole of doing so we must see that all the nodes lasts for as long as possible. Various approaches have been previously described so as the battery power is used as efficiently as possible in all these phases. Some of the previous protocols suggested were:- LEACH[4]:-It's a cluster-based protocol which includes distributed cluster formation. In this a randomized rotation of the cluster head's role is allowed for reducing energy consumption within a cluster and to distribute the energy load evenly among the sensors in the network. HEED [2] has been developed to overcome the drawbacks of LEACH by giving weight to cluster heads by their residual energy and node degree. In [3] they have classified different types of clustering and their advantage & drawbacks. The protocols presented here are concerned on how to increase the WSN lifetime and to make efficient use of critical resources located at sensor nodes by creating

intelligent clustering schemes. Various clustering schemes that are developed for different types of networks i.e. active and proactive networks are:-

a) Proactive Networks: - LEACH, LEACH-C

b) Active Networks:- TEEN,  Out of which LEACH and HEED are more promising for further modification that can be used to create a more optimal and efficient protocols for WSN used for major of application. Consider that we have set of set sensors dispersed in an area which is a type of environment which need continuous monitoring and the environment is such that it keeps on changing all the time continuously. So here we are considering a large scale WSN. For example: - forest fire detection, air conditioning sensors, environmental monitoring. We have assumed that sensor network has following properties:-

a) The nodes similar i.e. having same initial battery power and are identical capabilities with all other sensors.

b) Links are symmetrical.

c) Sensors are stationary.

d) Nodes are unattended.

e) Nodes have fixed number of transmission power levels.

Some points we have to keep in mind is that clustering should be uniform throughout the area, should have efficient processing capability and the cluster heads are uniformly distributed to have proper load balancing.

Some challenges we have worked on is :- Low complexity and low power design, robustness and zero maintenance, data fusion,MAC layer design, node duty cycle, connectivity etc. As we have distributed our whole clustering process into 3 step  there's time allotted for each and every phase and this phase is periodically rotated as there is a network change and also for load balancing so as to increase the life time of the whole system.

In this work we have proposed an approach, which is self adaptive multi cluster-head policy in wireless sensor networks. The fact of sensor network is that the total energy consumed by a network to cater for data gathering and storing is not in one instance rather it is in phases. The phases in clustering where energy is being used is-

a) Cluster formation.

b) Data aggregation within cluster

c) Routing of aggregated data to base station.

The communication between clusters and between cluster and base station is also energy dependent with definite time frame and access protocols. The three Step involved are as follows.

**Step I-** For this Step that is initial cluster formation and this Step is repeated periodically for which any change in environment is incorporated in our clusters so that our clusters are formed for getting information for useful and efficiently keeping the lifetime of the network as long as possible. For this we use self adaptive algorithm i.e. after a time $T_{TH}$ the cluster recursively calls its cluster formation algorithm. In the cluster formation algorithm at initial stage all the nodes sends its information to its neighbors  its node degree and residual energy by this all nodes knows the status of its neighbors the one which greater residual energy and node degree contends for cluster head slots after which the winner node sends one confirmation signal and all other nodes with closer vicinity (in terms of greater received power) replies to this signal by indicating its participation in this cluster here nodes having more than 1 hop away from the CH also become a part of cluster unless they have no other CH node satisfying their requirement  also as environment is varying traffic also varies accordingly so we develop varying duty cycle listen and sleep mode as synchronized by the CH to its member nodes which is decided accordingly by some predictive approach.

**Step II-** In this step mainly deals with steady state i.e. data aggregation phase here data is aggregated from all the nodes in cluster to cluster heads and the data from nodes more than one hop away transfers data by multi-hop method by internal
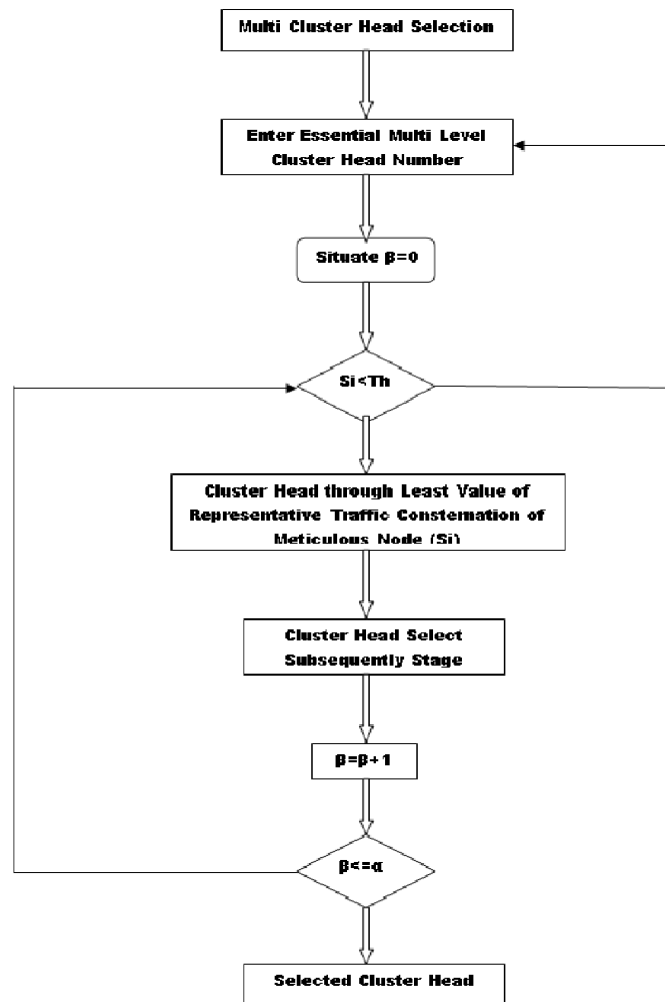
Fig. 1 - Flow Chart of Proposed Protocol

chain based clustering i.e. data from nodes don't directly contact with CH and is transferred to neighboring nodes and it takes turn in transferring to CH as different routes exist within a single cluster. To acquire load balancing and increase network lifetime. In [7] similar method has been proposed but here we using it for within a cluster. In this phase we create a multi cluster-head policy in wireless sensor networks i.e. data from the cluster heads are aggregated to 2nd level of cluster heads and so on. Cluster heads of all lower level of hierarchy aggregate their data to higher level to create a multi cluster-head policy in wireless sensor networks. The criteria for creating multilevel is as follows:- As traffic increases in an changing environment the cluster head can't be used for routing as it may create Over burden on single node. Multi cluster-head policy in wireless sensor networks clustering by traffic as main criteria for creating it. This higher level of hierarchy is created by incorporating a high level traffic area and rather low traffic areas which is in close vicinity and choose the cluster heads which is at low traffic area as the higher level cluster heads. The traffic is measured i.e. number of messages exchanged by neighboring nodes exceeds the threshold value .The cluster head in the traffic area are given a constant number $T_{TH}$ which indicate the level of traffic more the number the cluster head is in mire traffic prone area. Higher layer of clusters are formed by keeping in mind that there is good balance between both types of cluster heads. .

**Step III-** This approach deals with routing of all aggregated data in the highest level of hierarchy to the base station. In this intra-clustral routing can also use the approach used in so that neighboring nodes can take turn in transmitting to BS rather than following same path and increase the network life time as a whole.

## VI. IMPLEMENTATION

The research is based on the Wireless sensor network power simulation on the tools of NS2. The result obtained on the NS2 is further processed on the MATLAB, which is one of prominent engineering tool. In this work the multi layer cluster network is under study. The simulation is based on the different design of the cluster WSN.In the simulation each of the nodes is having variations like the data rate, amount of data, distance of the nodes, the cluster leader and the sink specifications. The first simulation is based on the following cluster WSN. The detailed settings of the each of the node are finalized at the later stage of the project execution.
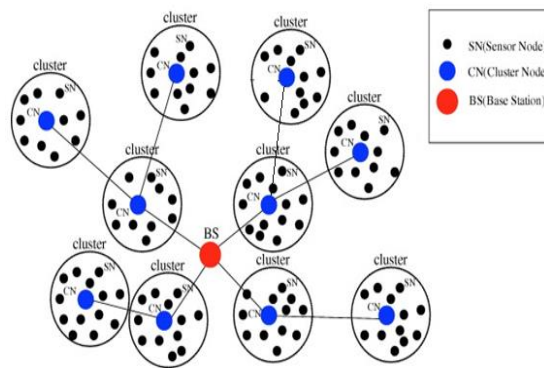
Fig. 2 - The WSN Implementation for the Simulation

The above figure shows a typical WSN network with 10 clusters and having one base station. The links between cluster head and the base station in some cases is not direct, and in some cases direct. There are different sensor nodes in Cluster, which actually sense the data. Each wireless sensor is assumed to have different data length and the transmission frequency; it depends on the type of the sensor and the variation rate of the sensed data. In the simulation we assume the 10 power level and actual power level use in the particular node is depends on the distance and other conditions, which required setting for the simulation.

## VII. TESTING STRATEGY

This work will propose a protocol using the proper node scheduling (ACTIVE  and SLEEP) in the individual clustering of the whole  network, compare it with the normal  LEACH protocol and  a model with heterogeneous  wireless sensor nodes with its topology to have good energy efficient and increasing lifetime network may  be investigate. Compare our propose protocol with ACTIVE, SLEEP, LEACH protocol. Prove that our propose protocol effective another protocol like ACTIVE, SLEEP AND LEACH.Our proposed system require network simulator to perform the simulation of wireless nodes in order to prove that our proposed mechanism improve the energy saving WSN Node network Simulator (ns2) will be used to perform simulation. Our system will be tested for 50 WSN nodes in 760*670 $m^2$ region, created in Ns2. Network Simulator (ns2) is a name for series of discrete event network simulators. Ns2 is used primarily in research and academics. The core of ns-2 is written in C++, but the C++ simulation objects are linked to shadow objects in OTcl and variables can be linked between both language realms. Simulation scripts are written in the OTcl language, an extension of the Tcl scripting language. Ns-2 has a companion animation object known as the Network Animator, nam-1, originally written by Mark Handley, used for visualization of the simulation output and for (limited) graphical configuration of simulation scenarios. It runs on Linux, FreeBSD, Solaris, Mac OS X and Windows 95/98/NT/2000/XP. It is licensed for use under version 2 of the GNU General Public License.

**Energy Efficiency-** Since nodes are power-sensitive devices whose power sources are often on-board batteries, network quality can suffer if some or all nodes exhaust their energy reserves prematurely. Any overhead energy consumption must be minimized, such as the running of self-test programs. To do this, several energy-saving techniques are introduced which can reduce test energy consumption and test time:

- Test Optimization – Test time is decreased by selecting the most efficient set of instructions to achieve the same test quality.
- Test Combination – There is an inherent overlap in testing separate systems on the same node. The coverage of each test is analyzed and redundancy eliminated.
- Test Concurrency – By reordering and rescheduling tests, test energy and test time can be reduced.
- Test Program Compression – Compressing test programs reduces communication and, in turn, the energy required to perform testing.  By taking this approach, we address WSN quality issues that are currently impediments to correctly operating, reliable, available, and energy-efficient networks.

## VIII. CONCLUSION

In this paper our proposed policy also avoids frequent election process during clustering by developing seniority table. The approach also investigates network traffic and nodes energy condition before head selection to develop dynamic clustering policy. Furthermore,. All the collected statistics, models and surveys shows that there's a greater need in WSNs for addressing issues on energy consumption to extend their life time of WSN. Routing and data collection are the main activities of a WSN and which consumes most of the energy of a nodes during their lifetime. In literature many routing protocols have been introduced to address the problem of energy consumption to an extent and still there's a need for Energy efficient routing protocols which tries to optimize the

overall energy consumption. We will compare our implementation leach algorithm and we proved that our proposed approach more effective.

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# ENVIRONMENTAL CONSCIOUSNESS: AN INDICATOR OF HIGHER CONSCIOUSNESS

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*Abstract:* Wrong attitudes, beliefs and values are adversely affecting the natural environment today. In this research work the attitude towards the environment of two groups of people living in suburban and urban environments is examined and categorized as biospheric, altruistic and egoistic. The data obtained from questionnaires given to participants is used for correlation studies between the environmental attitudes of participants and the higher order values they uphold. Results show that urban respondents exhibit egoistic attitudes while suburban participants who are in close contact with nature show biospheric attitudes. Significant correlations are seen between egoistic attitude and value of self-enhancement (0.73) in case of urban participants and between biospheric attitude and the value of self-transcendence (0.59) for suburban participants. This is probably because the value of Self transcendence is a form of environmental consciousness which may develop into Higher Consciousness.

*Index Terms*: egoistic and biospheric attitude, values of self-enhancement and self-transcendence, environmental consciousness.

## I. INTRODUCTION

The Earth today is experiencing a global environmental crisis. World peace is threatened not only by the arms race, regional conflicts and continued injustice among peoples and nations but also by a lack of due respect for nature. The environmental crisis of the twenty-first century is the result of rapid growth in consumerism and unprecedented human-induced climate change, without taking into account issues of values and ethics. This crisis is actually a spiritual and moral crisis of alienation from the natural world resulting in man's domination and exploitation of natural resources. Science and technology alone cannot prevent the calamity befalling the environment.

*"We can pierce the ozone, poison fresh water, walk on and litter other planets and alter the climate. But a radical reverent 'new way of thinking' and acting – more humble and more loving towards the Earth-is essential 'if mankind is to move to high levels', indeed if we are to survive"*

Echlin (2004).

A spiritual, ethical and moral view of the relationship of humans with nature must be taken into consideration. This leads to the concept of Environmentalism. Environmentalism is a question of values or general (primitive) beliefs on the relationship between human beings and the environment (Dunlap et al. 2000; Van liere and Dunlap 1981; Dunlap and Van liere 1978). A theoretical approach to distinguish between different types of environmental attitudes has been proposed by Stern and his colleagues. They identify three types of attitudes which they label egoistic, social-altruistic, and biospheric attitudes. They also state that these attitudes towards environmental issues are based on the relative importance that a person places on themselves, other people and plants and animals and are derived from value orientations such as power, benevolence and universalism (Stern et al., 1993; Stern & Dietz, 1994; Schultz, 2001, Hansla et al, 2008).

The term environmental values refer to those values that are specifically related to nature or that have been found to correlate with specific environmental attitudes or concerns (Schultz et al., 2004). According to earlier studies environmental values are abstract guides to what is important in one's environment (Rohan, 2000; Roccas, 2005). Values appear to be universal across different cultures with people having similar values although to different degrees (Schwartz and Bardi, 2001). Values are desirable, trans-situational goals, varying in importance and serving as guiding principles in people's lives (Feather, 1975, 1999, 2004. ). The personal norms that guide conduct and increase feelings of self-efficacy are essentially triggered by information. However, different attitudes and levels of information depend on the nature of the behaviour (Stern, 2000). People who show high values in the affective dimension of environmental consciousness, or those who have environmental information identify with ecological beliefs about human-environment interaction. They have an altruistic or biospheric attitude and express feelings of moral obligation and engage in pro-environmental behaviours (Fig.1) to a greater extent than those who have an egoistic attitude.
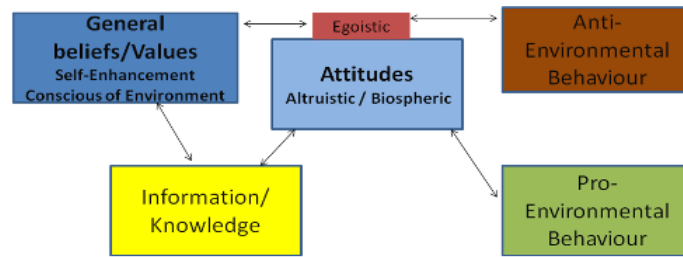
**Figure 1: Pathway to Pro-Environmental Behaviour**

According to Zelezny and Schultz (2000), 'environmental consciousness' refers to specific psychological factors related to an individuals' inclination to engage in pro-environmental behaviours of various kinds. This leads to a 'change of heart' such that the individual now views the Earth to restore it through his experience and education rather than as a resource to be exploited. The process of change in outlook is called ecological conversion. The individual understands that human estrangement from the natural world has given rise its destruction without conscience. The individual realises the need for renewing and restoring the Earth because it belongs to God, because it is our home and provider of our needs and must not be exploited. This leads to the development of an intimate interconnectedness, balance and harmony with nature. The observation of the Earth and Universe as sacred and acknowledging the beauty, complexity and fragility of the Earth with awe and wonder is Higher Consciousness.

## II.   METHOD

 A study carried out on how different types of environmental attitudes are oriented around valued objects namely self, other people and thirdly plants and animals was based on statements from Schultz's (2000) work. The study deals with environment-related attitudes and values associated with human behaviour.  The environmental attitudes studied are:
Egoistic attitude: implying personal concern,
Altruistic attitude: implying concern for others,
Biospheric attitude: implying concern for environment.
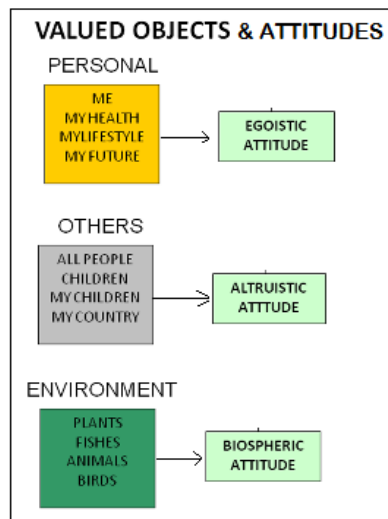


**Figure2: Environmental Attitudes Oriented Around Valued Objects**

Further the relationship between these environmental concerns and Schwartz's higher order values are determined in different populations of suburban and urban people using ESS (European Social Survey version) on this population. Two Higher Order Values of Schwartz (1992) are used:
Value of Self-transcendence implies qualities of understanding, appreciation, benevolence, tolerance. Protection of the welfare of people and nature lead to higher consciousness. Value of Self-enhancement implies power, social status, prestige, achievement, personal success, control or dominance over people and resources leading to materialism.
The relationship between egoistic, altruistic, and biospheric environmental attitudes and Schwartz's value dimensions of self transcendence and self-enhancement scales is examined.

*Hypothesis*
 It is hypothesized that socio-altruistic and biospheric attitudes of individual predict their possessing the value of self transcendence while egoistic attitude of individuals predict possession of the value of self enhancement.

*Participants*

Sixty individuals participated in the study. Thirty participants are from suburban areas and connected to nature and thirty are urban people, whose daily lives - their work, travel, eating habits, recreation and maintaining social relationships has been influenced by technology and who live in an urban environment. The other basic information such as age, sex, education level, and the environment in which they reside: suburban or urban is collected. Table I shows summary statistics for the survey.

**Table I: Statistics of Demographics of Participants**

| | |
|---|---|
| Number of participants | 60 |
| Male/Female | 30 males and 30 females |
| Age of participants | 21 to 69 years |
| Minimum education | Under-graduate |
| Environment – suburban culture  (SU) | 30 |
| urban culture         (U) | 30 |

*Questionnaires*

Participants are given structured questionnaires to rate their concern for animals, birds, plants, marine life, all people, people in my country, children, my children, my health, my future, my lifestyle and me through statements. They also answer queries which assess the values of self-transcendence or self-enhancement. The Questions given to participants are on various aspects of attitudes and human values. Measures include statements like 'My life is still fruitful if I live for myself,' or 'What is good for the society is good for the individual,' or 'Trees must be saved to preserve natural resources for the future,' or 'It is important for me to be successful at any cost,' or 'It is important for me to help the people around me.'
Throughout the questionnaire the respondents answer on a five point scale choosing from five options, Definitely Yes, Yes, Maybe, No, Definitely No.  The response scale was 1 (Definitely No) to 5 (Definitely Yes).

*Analysis*

The returned questionnaires are scored and analyzed statistically. To identify the values associated with different attitudes Pearson's correlations are run between different types of environmental attitudes and values using SPSS. In this analysis personal concern, concern for others, concern for environment, value of self-transcendence and value of self-enhancement are known to be associated with human behaviour of the two groups and are included in the data base. Factor analysis is carried out on the data collected for the two individual groups (SU) and (U), with Varimax rotation considering Eigen values >1, using the SPSS PC + version 6 software. The analysis identified the factors and their percent contribution to the total variance. These results are presented in table form, but only loadings > 0.5 are considered statistically significant. The analysis identifies the percentage of factors that contribute to total variance. The grouped loadings in each factor could be attributed to biospheric, altruistic/socio-altruistic and egoistic attitudes towards the environment.

## III.   RESULTS AND DISCUSSION

*Suburban Group (SU)*

It is observed that suburban respondents rate most of the statements pertaining to environmental issues as 'Definitely Yes or Yes' scoring 4 or 5. In the group 95% who had a high score are those who expressed concern for environment because they had a responsible attitude towards natural resources. Environmental attitudes differ as a result of differences in the importance given to environment as against social relationships. The results show that in this group most respondents seem to have pro-environmental behaviour. Pearson's correlations are determined using SPSS to examine the relationship between environmental attitudes and values of self-transcendence and self-enhancement.

  Table II below shows positive significant correlations between self-transcendence and attitude towards environment (0.59), and negative correlations between self-transcendence and others (0.38) and self (-0.06). It may be said that those SU people who display a positive attitude towards environment have transcended the self and are protective and concerned about welfare of nature and all people. It is likely that the SU people feel more connected to nature as they spend time in natural environments. A similar study done earlier shows that the amount of time spent in nature is a predictor of emotional affinity and interest in nature (Kals et al., 1999; Vining et al., 2008). Further Mayer and Frantz (2004) report that amount of time spent outdoors is positively related to how connected an individual felt with nature. The positive correlation value of self-transcendence indicates that SU participants probably believe that man must take up the responsibility of caring for the Earth and save it. Their attitudes reflect an underlying concern for plants and animals, and their broad outlook includes other people, and self, within the notion of nature. Similar findings have also been reported where people who are concerned for the status of the environment in future do not waste environmental resources and make saving the earth their main aim in life (Corral-Verduro et al., 2006).  Such suburban participants could be called eco-friendly because they have a biospheric attitude towards environment.

**Table II: Correlations between attitudes and values of Suburban (SU) Participants**

| Values | Towards Environment | Towards Family & friends | Towards Self |
|---|---|---|---|
| self-transcendence | 0.59* | 0.38 | -0.06 |
| self-enhancement | -0.50 | 0.23 | 0.28 |

Note: ** signifies p<.001; * signifies p<.01

Moderate correlations exist (Table II) between self-enhancement and others (0.23) and self (0.28). Negative correlations are seen between self-enhancement and environment (-0.50) indicating their lack of understanding of nature. Schultz (2002b) suggests that two people could be equally concerned about environmental problems, but for very different reasons. This becomes clear in this exercise with SU respondents when correlation is seen between the value of self enhancement and attitude towards personal issues or towards family and friends for this group, the reason being their attitude of understanding, appreciation and tolerance of their fellow beings rather than nature. The moderate correlations between values of self-enhancement and attitudes towards other people and self can be attributed to an attitude towards fellow human beings which is neither egoistic nor totally altruistic.

Factor analysis carried out on the data for SU respondents ( Table III) to determine which attitudes and values club together, shows that their concern for environment may be predicted as biospheric(environment and self-transcendence), altruistic (other people and self) or egoistic (self and self-enhancement). Results reveal these three factors contributed to 82.2 % of total variance.

**Table III: Factor Analysis of Variables: Attitudes and Values (SU)**

| Variable | Factor 1 | Factor 2 | Factor 3 | Communality |
|---|---|---|---|---|
| Other People | -.14 | .94 | .05 | .90 |
| Environment | .85 | -.24 | -.20 | .82 |
| Self | .11 | .61 | .62 | .77 |
| Self-enhancement | -.43 | .02 | .81 | .78 |
| Self-transcendence | .87 | .08 | -.11 | .84 |
| Eigen Value | 2.23 | 1.3 | 1.1 | |
| % Variance | 44.6 | 25.4 | 12.2 | |
| Cumulative % | 44.6 | 70.0 | 82.2 | |
| Predicted Attitude | Biospheric | Altruist/ego | Egoistic | |

Table III indicates that Factor I has high loadings on attitude towards environment (.85) and self-transcendence (.87). This reveals that the pro-environmental attitude prompts people towards the value of self-transcendence and so factor I may be attributed to Biospheric concern. Factor II is loaded on attitudes towards other people (.94) and towards self (.61) but not on values of self-enhancement or self-transcendence. This factor may be attributed to Altruistic/egoistic concern. The third factor displays high loadings on value of self-enhancement (.81) and moderate loadings on attitude towards self (.62). This indicates that the attitude towards self of some SU respondents inculcated the value of self-enhancement in them attributing factor III to an Egoistic attitude. Parallel to the findings of this study, Schultz (2000) reported three clusters of environmental attitudes which represent egoistic, altruistic and biospheric concerns in a study done on college students. Earlier studies (Schwartz, 1992) have reported similar results. Self-transcendence (value type universalism and benevolence) has been found to be positively related to pro-environmental attitudes and behaviour. Self-enhancement (value type achievement and power) has been shown to be negatively related to pro-environmental attitudes and behaviour. Also similar findings earlier reported (Stern and Dietz, 1994) a 'tripartite conceptualization of environmental concerns grounded in clusters of valued objects'. Self-transcendence (universalism) can be assumed, according to Schultz, to "… reflect the degree to which a person includes other people and other living things in their notion of self" (Schultz 2001; Hansla et al., 2008).

*Urban Group*
The number of urban respondents showing attitudes towards environmental issues, issues regarding other people and personal issues when determined reveal that 80% of the urban respondents rate the statements pertaining to environmental issues as 'Definitely Yes'

or 'Yes' scoring '5 or 4' probably because they are clear about their concern for the environment. Most of the others give importance to issues of personal concern because they are highly influenced by the kind of environment in which they live or they are unsure about environmental issues probably because they have little direct connection with nature.

### Table IV: Correlations between attitudes and values of Urban (U) Participants

| Values | Attitudes | | |
|---|---|---|---|
| | Towards Environment | Towards Family& friends | Towards Self |
| Self-Transcendence | 0.41 | 0.17 | 0.04 |
| Self-Enhancement | -0.41 | 0.31 | 0.73** |

Note: ** signifies $p<.001$; * signifies $p<.01$

Pearson's correlation method is used to determine correlations between attitudes and values (Table IV). Correlation between self-transcendence and attitude towards environmental issues is found significant (0.41), implying that in spite of living in urban surroundings the attitudes of some urban individuals are eco-friendly. There is low correlation between self-transcendence and attitude of concern for others (0.17) and no correlation between self-transcendence and concern for self (0.04) in urban respondents. Similar findings are reported by Schultz (2001) about self-transcendence reflecting the degree to which a person includes other people and other living things in their notion of self. The value of self-enhancement shows significant correlation (0.73) with environmental attitude focused on self because the focus of the individual is towards personal success, and egoistic attitudes towards environment inculcating in him the value of self-enhancement. The urban respondents have little time for environmental issues and remain unaffected by environment. Their busy life-style may be a reason for lack of time and indifferent attitude towards everyone but themselves. This may be compared to a study done by Corral et al. (2003) who report that the time perspectives of 'present-oriented' individuals compel them to act in a non-eco-friendly manner. Earlier studies (Mayor and Frantz, 2004; Hirsh & Dolderman 2007) indicate that as group size increases, a feeling of indifference arises and each individual visualizes himself as only a small insignificant part of the group incapable of bringing about change. Moderate correlations (0.31) between self-enhancement and environmental attitudes focusing on other people are seen in individuals who have some inclination towards family and friends. Table IV indicates a negative correlation between self-enhancement and attitude towards environment (-0.41) because urban respondents probably believe that natural resources are for enrichment of life and environmental problems are not their concern and only lower the quality of life for themselves and everyone.

Factor analysis for Urban respondents (Table V) shows two significant factors namely egoistic (self and self-enhancement) concerns for environment and biospheric (environment and self-transcendence).

### Table V:  Factor Analysis of Variable Attitudes and Values (Urban)

| Variable | Factor 1 | Factor 2 | Factor 3 | Communality |
|---|---|---|---|---|
| Other People | .22 | .06 | .97 | .99 |
| Environment | -.46 | .73 | -.01 | .75 |
| Self | .84 | -.06 | .30 | .80 |
| Self-enhancement | .94 | -.03 | .09 | .89 |
| Self-transcendence | .15 | .91 | .07 | .86 |
| Eigen Value | 2.2 | 1.4 | 1.1 | |
| % Variance | 44.3 | 27.7 | 13.8 | |
| Cumulative % | 44.3 | 72.0 | 85.8 | |
| Predicted Attitude | Ego-istic | Bio-spheric | | |

Factor analysis (Table V) reveals two factors that contributed to 85.8 % of total variance. The first factor has high loadings on 'attitude towards self' (0.84) and self-enhancement (0.94). Egoism may be the contributing source to this factor and is attached to the value of self-enhancement. In the second factor, 'attitudes towards environment' (0.73) groups together with the value of self-transcendence (0.91). This factor is attributed to Biospheric attitude of some urban respondents similar to the suburban participants where self-transcendence and biospheric concerns group together. The third factor shows high loadings on 'other people' but not on either of the

values of self-transcendence or self-enhancement. Similar findings are reported in the study done by Schultz and Zeleny (1999) who states that biospheric concern for environment correlates positively with self-transcendence and negatively with self-enhancement.

## IV.  CONCLUSION

It may be stated that the purpose of this study to see the effect of attitudes on environmental values is fulfilled. It is seen from the results of correlation studies that for the suburban group of respondents significant correlations are made between biospheric attitudes towards the environment and value of self-transcendence, which motivates the individual towards transcendental goals. The study also shows that biospheric and altruistic attitude of suburban respondents is higher than their urban counterparts. Altruistic attitude towards environment also correlates significantly with self-transcendence. For urban respondents, correlations between egoistic attitudes towards environment and values of self-enhancement which brings the focus of the individual towards personal success are significant.
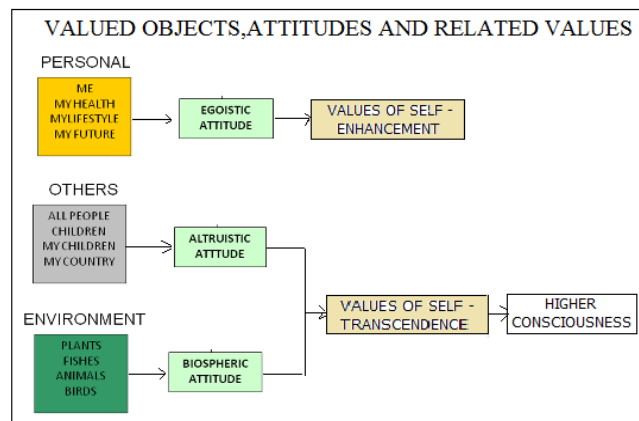


**Figure 3:  Values Underlying Environmental Attitudes towards Valued Objects**

As shown in Fig.3 the three-fold classification of environmental attitudes organizes around valued objects like self, other people and environment. When biospheric attitude and altruistic attitudes towards environment are significant the value of self-transcendence or environmental consciousness is reflected while when the egoistic attitude towards environment is high the value of self-enhancement is perceived. It can also be concluded that participants of suburban areas are more 'ecologically converted' and have a humble and loving way of thinking and manner of acting toward the Earth and are thus 'moving to higher levels' of consciousness.

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# An epidemiological investigation of influenza like illness (ILI) to confirm the A H1N1 among patients admitted to secondary and tertiary care hospital of Nagpur, central India

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*Abstract-* **Introduction:** In April 2009, a new strain of Influenza virus A H1N1, commonly referred to as "swine flu," began to spread in several countries around the world.  Maharashtra state, including the Nagpur region, also started monitoring and surveillance activities as soon as the positive cases were first reported in August.  We investigated these cases of influenza like illness (ILI) to confirm the A H1N1 among patients admitted in a tertiary care hospital.

**Methods:** The present study was a cross-sectional study of successive, suspected and confirmed H1N1 patients with respiratory complication admitted to swine flue ward and ICU of a tertiary care centre from January to December 2012 at Government Medical College and Hospital, Nagpur. All cases were RT-PCR confirmed at National Institute of Virology, Pune, Maharastra.

**Results:** A total of 22 (22.22%) samples from 99 patients were confirmed influenza A (H1N1) positive. None of the patients had a history of foreign travel. Overall, 13.13% of the patients came in contact with ILI in the family in last 2 weeks. Cases of A H1N1 reported throughout the year, however; there is sudden increase in number 66 (66.66%) of ILI in the month of September with A(H1N1) positivity rate (19.7%), later on AH1N1 positivity increased in the month of  October (33.3%) and November (42.9%).   Confirmed Cases of A (H1N1) transmission activity has increased since September 2012.  In this study only 21.21% of patients with ILI reported within 24 hours. Among 22 confirmed positive cases, 5 died yield a case fatality rate of 22.72%.

**Conclusion:** It can be concluded that the prevalence of Influenza A (H1N1) is high in the month of September month among middle aged population in central India.   This investigation provides hospital-based epidemiological information to arrive at a more precise and accurate understanding of Influenza A (H1N1).

*Index Terms*- A (H1N1), ILI, Influenza, Swine flue, tertiary care hospital, central India

## I. INTRODUCTION

In April 2009, a new strain of Influenza virus A H1N1, commonly referred to as "swine flu," began to spread in several countries around the world. In India, this pandemic started from August 2009, with index case reported from Pune, and this epidemic spread to other parts of the country quickly [1]. Influenza virus is a common human pathogen that has caused serious respiratory illness and death over the past century. It always had potential to cause widespread pandemics whenever a new type of Influenza strain appeared in the human population and then spread easily from person to person [2].  In one of the tertiary care hospital of Nagpur reported 27.0% positivity of AH1N1 among patients who were admitted for ILI from August 2009 to April 2011. It was associated with seasonal variations [3, 4]

The Ministry of Health and Family Welfare, Government of India  [5], started preparations regarding the management of infected patients as soon as the first case of 2009 pandemic H1N1 influenza was reported. Maharashtra state, including the Nagpur region, also started monitoring and surveillance activities as soon as the positive cases were first reported in August. Government Medical College and Hospital (GMCH), Nagpur is a Nodal Surveillance Centre for A H1N1.  Most cases of H1N1 influenza infection present as mild or subclinical pneumonia, but some present as severe community acquired pneumonia (CAP) and require admission to intensive care unit (ICU) usually  [6]. With this background, we investigated cases of influenza like illness (ILI) admitted in the year 2012 and assess the epidemiology of A H1N1 in a tertiary care hospital.

## II. MATERIAL AND METHODS

The present study was a cross-sectional investigation of successive, suspected and confirmed H1N1 patients with respiratory complication admitted to swine flue ward and ICU of a tertiary care centre from January to December 2012. All cases were RT-PCR confirmed at National Institute of Virology (NIV), Pune, Maharastra.

Laboratory confirmation of infection-A (H1N1) influenza virus was made with the use of RT-PCR assay in accordance

with the protocol from the US Centers for Disease Control and Prevention, as recommended by the WHO [7]. Persons suspected of being infected were investigated by taking two naso-pharyngeal swabs for detection of the virus by RT-PCR assay.

The Ministry of Health and Family Welfare, Government of India, started preparations regarding the management of infected patients as soon as the first case pandemic H1N1 influenza was reported in May 2009. Maharashtra state, including the Nagpur region, also started monitoring and surveillance activities as soon as the positive cases were first reported in August 2009. Nagpur city, the centre of India economic hub of the Vidarbha region, has several hospitals providing intensive care, including the Medical Colleges, Corporation Hospital and private hospitals. Majority of suspected patients were referred to Nodal Centre, Government Medical College and Hospital (GMCH), Nagpur which has all advanced life-saving support system in place. All of suspected H1N1 were managed at respective places; however their samples for confirmation were send to NIV, Pune through this Nodal centre at GMCH. Following the death of one confirmed case of H1N1 infection, the Government of Maharashtra made it mandatory to refer all ILI cases from private hospitals, medical college hospitals to Nodal Center, GMCH, Nagpur for laboratory confirmation. Immediately after admission of ILI case in swine flue ward or other secondary health care, this information was provided to established surveillance system. Accordingly rapid response team visited to place of admission and database was generated. Tracking of all confirmed cases of A (H1N1) was done by surveillance team at GMCH.

From January to December 2012, a total of 99 patients were admitted in different hospitals in Nagpur with influenza-like illness (ILI).They were tested for influenza A (H1N1) and included for analysis. Data collection: A team of health workers collected information from all the cases of ILI about the demographic details, residence, date of onset of illness, clinical details, results of laboratory investigations, history of travel within and outside the country and history of contact with positive case of influenza (H1N1). Patients with ILI were encouraged to get admission in the swine flu ward of study hospital for treatment. Patients (or their relatives) admitted in other nursing homes were also contacted using the addresses provided by them at the time of laboratory testing.

**Categorization of Influenza A(H1N1) case** [8].

The Ministry of Health and Family Welfare, Government of India, issued guidelines for the categorization of influenza A(H1N1) cases during screening for home isolation, testing, treatment, and hospitalization.

### III. CLINICAL CASE /SUSPECTED CASE DEFINITION

A suspected case was defined as an ILIs with a temperature of>37.5˚C and at least one of the following symptoms: sore throat, cough, rhinorrhea, or nasal congestion, and either a history of travel to a country where infection had been reported in the previous seven days or an epidemiologic link to a person with confirmed or suspected infection in the previous seven days. A confirmed case was defined by a positive result of a real-time reverse transcriptase polymerase chain reaction (RT-PCR) assay

performed at a laboratory operated under the auspices of the state government.

Standard clinical criteria was used to suspect and diagnose H1N1 and other related clinical conditions [WHO. The demographic, clinical, laboratory and radiological data were collected during the course of illness and analyzed]. All cases were treated with oral oseltamivir 75 mg bid, from the day of admission, in accordance with the WHO criteria [9].

All the patients were treated with broad spectrum antibiotics to cover co-infection/secondary bacterial infections and inotropic support for shock and ventilatory support given according to patient requirement. Approval by the institutional ethics committee was not required because this infectious disease fell under the jurisdiction of the Epidemic Disease Control Act (1897), which allows the collection of data on emerging pathogens when it is of public health interest, and was invoked by the state health department in August 2009 [10].

**Statistical analysis:** Categorical data like gender, morbidities, normal and abnormal laboratory values, and outcome were analyzed and presented as frequency and percentages. Quantitative data like age, was presented as SD with 95% CI, and median age with range. Chi Square test was applied to test association between clinical outcomes and categorical variables. The statistical test was considered significant at P< 0.05.

### IV. RESULTS

A total of 99 patients with suspected influenza A H1N1 were evaluated during the study period. Between first January and December 2012, a total of 99 patients were admitted to swine flu ward of GMCH, Nagpur and other secondary and tertiary care hospitals of Nagpur. Of them, 99 (100%) had symptoms of ILI and their swabs were sent to laboratory investigations. Out of total 99 ILI cases, majority 66 (66.66%) of them were reported in the month of September alone. A small peaks of ILI were also reported in the month of April (9.09%) and December (7.07%). So far as mortality is concern Influenza A (H1N1) virus infections was confirmed in 22 (22.22%) patients and 5 (5.1%) deaths were reported (Table 1, Figure 1). Influenza A (H1N1) positives were reported in the month of February, March, April, September, October, and November. Out of total 22 positive cases, 13 (59.0%) cases were reported in the month of September alone [Figure 2]. Out of 66 ILI, 13(19.7%) were confirmed cases of A (H1N1) were also reported in the month of September. It also reveals that out of 13 reported cases, 2 (15.38%) deaths were reported in the month of September but out of 7 ILI cases; 3 (42.9%) were positive of A(H1N1) and also 2 (66.66%) deaths were reported in the month of November. In spite of more confirmed A(H1N1) confirmed cases in the month of September, mortality in the month was only (15.38%) however, in the moth of November mortality due to A H1N1 was (66.66%).

Table 2 shows that no confirmed case of H1N1 was reported in age group less than14 years of age. Out of 32 cases of ILI in the age group 35-49 years; 8(25.0%) were confirmed for A (H1N1), out of 14 in the age group 50-60 years, 5 (35.7%) were H1N1 positive. However, in the other age groups proportion of positivity ranges from 16.0% to 35% over all the age groups. However, no significant trend was observed (P>0.05).

Out of 50 suspected males 13 (26.0%) and out of 49 females, 9 (18.36%) were H1N1 positive. This difference by gender was also not found to be statistically significant (P>0.05). More number of cases 15 (29.41%) of H1N1 were reported from urban residence as comparative to 7 (14.58%) cases reported from rural areas. This difference was not found to be statistically significant (P>0.076). Among 22 confirmed positive cases, 5 died yield a case fatality rate of 22.72%.

Table 3 shows: commonly prevalent symptoms associated with Influenza A H1N1 these were found to be : fever (100%), cough (79.80%), breathlessness in 82.83%, sore throat (24.24%, the most common presentations among ILI cases were fever and cold-like features, but not cough (21.20%); fever with shortness of breath with or without cold-like features (18.17%); fever with cold-like features (56.57%) and features of body ache, head ache were also reported in 31.31% and 44.44% respectively. Diarrhoea and vomiting was reported in (6.0%) and 4.04% respectively. Among the 99 cases of ILI, 13.13% had history of ILI in the family during last 2 weeks. Only 21.21% of the ILI cases reported to the nodal centre GMCH within 24 hours of illness.

## V. DISCUSSION

All 99 ILI cases from January 2012 to December 2012 reporting to the Influenza A H1N1 nodal screening center, swine flue ward and emergency department were included in this study. GMCH had cases from almost all districts of Vidarbha, Maharashtra, and near by Madhya Pradesh state, which may reflect the trend, morbidity and mortality of Influenza A H1N1 in this central part of India. Of these 99 ILI, influenza A (H1N1) virus infections was confirmed in 22 (22.22%) patients and 5 (5.1%) deaths were reported. A case fatality rate was reported to be 22.72%.

As of January 2010, in India, 134,116 persons had been tested for Influenza A H1N1 and 30,581 (22.80%) of them had been found to be positive, with a case fatality ratio of 4.9% (1501) [11]. While the positivity rate in this study is 22.22%, with a case fatality ratio of 22.72%. High prevalence and mortality may be attributed to the study population restricted to a small geographical area when compared against the entire country and sick patients referred from adjacent states having delay in essential medical care required, with loss of crucial time.

Age of ILI patient varied from 13 years to 76 years, with an average age (SD) of 38.39 (17.03) years. Mean age (SD) of A H1N1 male was 35.07 (12.45) years and in female it was significantly higher 39.66 (17.56) years. No A H1N1 positive case was reported in less than 14 years; however, positivity rate of A H1N1 was not significantly different than other age group. No mortality was reported in the age group less than 22 years. Of the total 22 cases, median age of infected women was 35 years (range Min 22-Max 76) and in male it was 35 years (Min18-Maxi 56).

Out of total 5 deaths; 3 (60% ) of mortality was observed in patients age group 23- 40 years of age, In this study H1N1 positivity rate ranges from 16-35% in the age group more than 15 years of age. A study (2009-2011) from Nagpur [3] shows that 15% of the AH1N1 belongs to less than 15 years of age group. Srikhande et all reported positivity rate 44 (65.67%) in male and

23 (34.32%) in female; however in the present study 13.1 % and 9.1% of males and female respectively reported to be positive. In the present study a total of 49.25% (n = 33) cases of ILI had associated medical ailments. In the present study Anemia and diabetes (8.95%) were the most common medical ailments associated with H1N1, followed by bronchial asthma (7.46%).

None of the patients had a history of foreign travel, whereas 13.13% of the patients gave history of ILI in the family in last two weeks. However, in another study from Nagpur [3] shows, 22.38% of the patients came in contact with proven cases of pandemic H1N1. According to a study, the prevalence of Influenza A (H1N1) in 2009 was greatest among children and young adults, although older patients and those with co-morbidities are more likely to experience worse clinical outcome [12]. Similarly, a study done in New Zealand concluded that, in 2009, Influenza A H1N1 predominantly affected young women with relative sparing of the elderly population [13]. According to a study done in Queensland, a large number of cases were reported in the 10-19 years age group (28%), followed by the 20-29 years age group (26%) [14].

Although the classical season of influenza is in winter, the peak of the cases reported in the month of September, October and November, which coincided with the rainy season at our study site. Earlier study [3] reported maximum cases in two months of August and September 2009-2011, which reported the largest block on cases, also witnessed the progressions of the rainy season and a high amount of relative humidity in the air. No cases of H1N1 were reported in October, which also witnessed a sharp fall in the amount of rain received locally in the region.

The most common symptoms with which patients presented were fever (100%), cough (79.80%), sore throat and nasal discharge (48.48%) and difficulty in breathing (28.28%). These findings are consistent with Kolkata study [15]. In a study done in mainland China, fever (81%), cough (40%) and sore throat (35%) were found to be most common symptoms in Influenza A H1N1[15,16,17] Fever (56%) was also reported to be the most common symptom, followed by cough (54%), sore throat (32%), rhinitis (17%) and difficulty in breathing (7%) in a study of the first 100 cases of Influenza A H1N1 in Saudi Arabia [18]. In a study conducted at Chile, fever was the most common presentation (83%), followed by cough (72%), odynopahgia (54%), myalgia (48%) and dehydration (4%) [19]. A study done in Japan described fever (87%) as the most common symptom, followed by cough (86.3%) and sore throat (65%) [20].

Although patients in this study comprised a sizeable proportion of ILI cases and less number of confirmed cases of AH1N1 from Nagpur and the adjoining state, the findings of this study need to be carefully extrapolated and cannot be generalized to a large population. GMCH received patients from all districts of Vidarbha, Maharashtra. However, 5 ILI and 2 A (H1N1) cases were from nearby Madhya Pradesh state.
This is one of the limitations of our study. Secondly, we restricted our study to only hospital; therefore, many cases of Influenza A H1N1 may have been missed. Not being a community-based study, we may not be able to calculate the exact measures of epidemiology. Thirdly, regional geographical conditions have not been accounted for, which may have a significant impact on prevalence and morbidity. There may be a

small number of cases that may have been missed out, although every attempt was taken to include all the cases, but this figure would not have been significant.

On the basis of the findings of this study, it can be concluded that the prevalence of Influenza A (H1N1) is high in the month of September month among middle aged population in central India. Fever, cough and sore throat are the most common symptoms with which the patients usually present to the nodal centre. This investigation provides hospital-based epidemiological information, but community-based wider studies are required to arrive at a more precise and accurate understanding of Influenza A H1N1 by epidemiological principles of time, place and person (TPP).

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**Table 1. Month wise distribute of Number of cases screened, Number of cases tested positive and Number of deaths among positives during the year 2012 in Vidarbha Region.**

| Month | No. screened | H1N1 Positive No. positive (Percentage) | | Deaths No. deaths. (Percentage) | |
|---|---|---|---|---|---|
| Jan | 3 | 0 | (0.0) | 0.0 | (0.0) |
| Feb | 2 | 1 | (50.0) | 0.0 | (0.0) |
| Mar | 1 | 1 | (100.0) | 0.0 | (0.0) |
| Apr | 9 | 3 | (33.3) | 1.0 | (33.33) |
| May | 2 | 0 | (0.0) | 0.0 | (0.0) |
| Jun | 0 | 0 | (0.0) | 0.0 | (0.0) |
| Jul | 2 | 0 | (0.0) | 0.0 | (0.0) |
| Aug | 2 | 0 | (0.0) | 0.0 | (0.0) |
| Sep | 66 | 13 | (19.7) | 2.0 | (15.38) |
| Oct | 3 | 1 | (33.3) | 0.0 | (0.0) |
| Nov | 7 | 3 | 4(2.9) | 2.0 | (66.66) |
| Dec | 2 | 0 | (0.0) | 0.0 | (0.0) |
| Total | **99** | **22** | **(22.2)** | **5.0** | **(22.72)** |

**Table 2. Proportion of influenza like illness (ILI) and confirmed cases of H1N1 by age group and gender.**

| Age in years | Suspected cases No | (Percentage) | Laboratory confirmed H1N1 cases No | (Percentage) |
|---|---|---|---|---|
| <14 | 3 | (3.0) | 0 | (0.0) |
| 15-24 | 25 | (25.3) | 4 | (16.0) |
| 25-34 | 15 | (15.2) | 3 | (20.0) |
| 35-49 | 32 | (32.3) | 8 | (25.0) |
| 50-60 | 14 | (14.1) | 5 | (35.7) |
| >60 | 10 | (10.1) | 2 | (20.0) |
| **Gender** | | | | |
| Male | 50 | (50.5) | 13 | (26.0) |
| Female | 49 | (49.5) | 9 | (18.36) |
| **Residence** | | | | |
| Urban | | | | |
| Rural | 51 | | 15 | (29.4) |
| | 48 | | 7 | (14.58) |

NS-   P>0.05

**Table 3. Clinical presentation among ILI and Epidemiological characteristics. (n=99)**

| symptoms | No | Percentage |
|---|---|---|
| Fever | 99 | 100 |
| Fever with Chills | 56 | 56.57 |
| Nasal discharge | 48 | 48.48 |
| Soar throat | 24 | 24.24 |
| Cough | 79 | 79.80 |
| Breathlessness | 82 | 82.83 |
| Expectoration | 28 | 28.28 |
| Headache | 31 | 31.31 |
| Body ache | 44 | 44.44 |
| Fatigue | 43 | 43.43 |
| Vomiting | 4 | 4.04 |
| Diarrhoea | 6 | 6.06 |
| **Epidemiological characteristics** | | |
| ILI in family in last 2 weeks | 13 | 13.13 |
| Reporting <24 Hours | 21 | 21.21 |
| Reporting >24Hours | 83 | 83.84 |

# Non-Extractive Spectrophotometric Determination of U(VI) Using 5-Bromo Salicylaldehyde Isonicotinoyl Hydrazone in Environmental, Phosphate Rocks and Fertilizer Samples

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*Abstract-* A highly sensitive and selective spectrophotometric method was developed for the determination of trace amount of uranium (VI) in water samples in aqueous DMF medium. The uranyl ion forms a pale yellow colored complex with 5-Bromo salicylaldehyde isonocotinoyl hydrazone (5-BrSAINH) in an acidic buffer of pH 5.0. The complex has an absorbance maximum at 395nm, was stable for more than 72 hours. The complex shows maximum absorbance at 395nm. Beer's law is obeyed in the range 0.119-1.071 $\mu gml^{-1}$. The molar absorptivity and sandell's sensitivity of the proposed method were found as 1.17 x $10^4$ $L.mol^{-1}cm^{-1}$ and $0.02\mu gcm^{-2}$,respectively.The pale yellow colored complex has 1:1 (Uranium (VI)- 5BrSAINH) Stoichiometry .The stability constant  of the complex was determined as  $1.80x10^5$  by Job's method. A sensitive and selective second order derivative spectrophotometry has also been proposed for the determination of U (VI). The interference of various cations and anions were studied. The developed methods were successfully employed in the determination of U (VI) in environmental, phosphate rocks and fertilizer samples.

*Index Terms*- Spectrophotometry, 5-BrSAINH, Determination of Uranium (VI),environmental samples, phosphate rocks and fertilizer samples.

## I. INTRODUCTION

Uranium finds extensive applications as nuclear fuel in atomic power plants and in the preparation of filaments of electric lamps, as an additive in special steels and in ceramic and glass, products as coloring agent. Uranium is a mobile element in surface,or near surface environments. It's geochemical exploration methods demand the measurement of the trace quantities of the metal ion in water samples collected for prospecting purposes. Uranium compounds are carcinogenic and hence there is a need for the development of low cost rapid methods for its determination in soil and water samples.

## II. DIFFICULTIES RAISED IN PREVIOUS METHODS

It is difficult to determine directly by uranium colorimetry due to its low concentrations in natural samples of minerals and water. The anions such as oxalate, fluoride, tartate and citrate interferry in many colorimetric methods. Many colorimetric methods reported earther for the determination of uranium with organic reagents. Many organic compounds react uranyl ion give colored complexes or precipitates. Sandell procedures using thiocyanate, peroxide, ferrocyanide and diethyl dithiocarbamate, as reagents in colorometric determination of uranium. However colorimetric methods are not sensitive and not well suited for the determination of many of these small amounts of the element. Several methods for colorimetric determination of uranium (VI), arsenazo[1], thiocyanate[2], dibenzoyl methane[3], perchloric acid[4] solutions have been reported as reagents for quantitative determination but lack selectivity. Uranium forms strong complexes with organic reagents, resultant effect on precipitation and interference, a direct spectrophotometric analysis in the presence of anions would be possible.

A wide variety of techniques are available for the spectrophotometric determination of uranium. It's solid phase extraction in surface water[5], determination in some synthetic matrices[6], river and saline water samples[7], spectrophotometric measurements of uranium in sea water by means of arsenazo (III)[8-11], simple spectrophotometry in aqueous solution[12-13] ,spectrophotometric determination of uranium (VI) in tap water ,well water, waste water samples[14] and  spectrophotometric determination of uranium (VI) with dyes in surfactant media[15-16]. In the present paper, a simple and sensitive method is developed for the spectrophotometric determination of trace amounts of uranium (VI) by complexing with 5-bromo salicylaldehyde isonicotinoyl hydrazone (5-BrSAINH). The reagent forms pale yellow colored complex with uranium (VI) in acid medium in the $p^H$ range 4.5-5.5  is stable for more than72 hours. Hence, a systematic study has been made to develop a spectrophotometric method for the determination of uranium in environmental, phosphate rocks and fertilizer samples.

## III. EXPERIMENTAL

Equimolar solutions of 5-bromo salicylaldehyde (Sd-fine) and isonicotinic acid hydrazide (Sd-fine) in water were mixed and refluxed for one hour on water bath and cooled. The light yellow solid formed  was separated by filtration, washed with water at room temperature. The product was recrystallized from aqueous alcohol. The product showed a melting point of 238-$240^0$c. $1x10^{-2}M$ solution of the reagent was prepared by dissolving  0.320gm of  the  reagent  in  100ml  0f dimethyformamide (DMF). Working solutions were prepared by diluting the stock solution with DMF.

5-bromo salicylaldehyde    Isonicotinicacidhydrazide    5-bromosalicylaldehydeisonicotinoy
I                  II                      lhydrazone
III
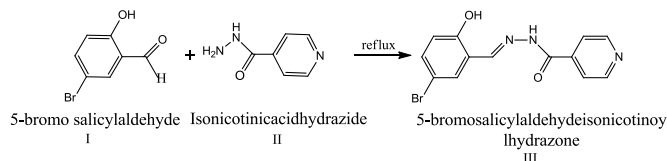
0 .01 M uranium (VI) solutions were prepared by dissolving appropriate amount of uranyl acetate (E-Merck) in 100ml distilled water. The stock solutions were diluted appropriately as required. Other metal ion solutions were prepared from their nitrates or chlorides. Buffer solutions were prepared by mixing appropriate volumes of 1M $CH_3COOH$ and 1M HCl, ($p^H$ 1.0-3.5) $CH_3COOH$ and $CH_3COONa$ ($p^H$ 4.0-7.0) $NH_4OH$ and $NH_4Cl$ ($p^H$ 8.0-10).

## Sample solutions
### Spiked saline water solution

Saline water sample solutions (3M Nacl) were spiked with uranium and the absorbance of each were measured at the appropriate wavelength.

## Water samples

Filtered environmental water samples (100ml) were analyzed for uranium. To samples, not containing U (VI) known amounts of U (VI) were added and remaining mixtures were analysed by the proposed procedure for uranium.

## Phosphate rock and fertilizer sample

The phosphate rock which is generally used as the raw material for manufacturing phosphate fertilizers, NPK and DAP were collected from a fertilizer industry, Anantapur. The collected samples were finely grounded and 10g of each sample was transferred separately into Erlenmeyer flasks containing 100 ml of 0.1M citric acid.

## IV.  PROCEDURE

Aliquots of solutions containing 0.1-1.0µgml$^{-1}$ of uranium (II) were transferred into a series of 10ml volumetric flasks. To these 5-BrSAINH ($5X10^{-4}$) was added and the contents were diluted to the mark with distilled water and mixed well. The absorbance was measured at 395nm against the reagent blank. The calibration graph was constructed by plotting the absorbance against the concentration of U(VI) ions. For the solutions as prepared above, the second derivative spectra  were recorded with reference to the reagent blank in the wavelength range 400-480nm. The derivative amplitudes were measured at wavelength 423nm and 463nm and were plotted against the amount of uranium (VI) to obtain the calibration plot. The absorbance and $P^H$ measurements were made on a Perkin Elmer (LAMDA 25) UV-Visible spectrophotometer (Model UV-160A) controlled by a computer fitted with 1cm path length quartz cell and an ELICO digital $p^H$ meter of (Model LI 613), respectively.

## V.  RESULTS AND DISCUSSION

The reaction of 5-BrSAINH with U(VI)    at room temperature gives a Pale yellow colored soluble complex. The U(VI) - 5-BrSAINH complex shows maximum absorbance at 395nm where the reagent blank does not absorb appreciably, shown in fig 1.  Therefore, subsequent analytical studies were carried out at 395nm using the reagent blank. The plot between absorbance and   $p^H$ reveal that the metal complex shows maximum $p^H$ of the experimental solution and stable constant absorbance in the $p^H$ range 4.5-5.5. Therefore, $p^H$ 5.0 was selected for further studies. The minimum amount of reagent acquired maximum color intensity with a given amount of U (VI) was evaluated from the absorbance measurements of the experimental solutions containing different amount of reagents. The results showed that a 25-fold molar excess of the reagent was required for the development of maximum color intensity with a given amount of Uranium (VI). The composition of the complex was determined using Job's continuous variation method and molar ratio method, the results indicate a 1:1 stoichiometry between the U(VI) and the reagent, was shown in fig 2. The stability constant of the complex was determined as $1.80x10^4$ by Job's method. From the calibration plot, it was observed that Beer's law was obeyed in the concentration range 0.119-1.071 µgmL$^{-1}$ of U (VI). The straight line obeys the equation $A_{395}=0.0645C+0.0078$. The molar absorptivity and sandell's sensitivity of the method were found as 1.17 x $10^4$ L.mol$^{-1}$cm$^{-1}$ and 0.02 µgcm$^2$, respectively. The effect of various anions and cations normally associated with U (VI) on the absorbance of the experimental solution was studied. The tolerance limits of the tested foreign ions which bring about a change in the absorbance by +2% were calculated. Almost all the tested anions possess high tolerance levels (>100 fold excess). The metal ions Ce (IV), V (III) and Fe (III), were tolerable up to 15-40 fold excess, and Ti (III) and Bi (III) interferes seriously presented in **Table 1.** The second derivative curves recorded(fig.3) for experimental solutions showed the derivative amplitudes were measured at 423nm and 463nm for different concentrations of U(VI) and plots were made between the amount of U(VI) and the derivative amplitude. The plots were linear and obeyed beer's law in the range 0.1297-9.52µg ml$^{-1}$  at 423 nm  and 0.2975-7.14 µg ml$^{-1}$ at 463nm respectively. The effect of various cations and anions on the derivative amplitude was studied and it was noticed that all the ions that did not interfere in the zero order determinations of U (VI) also did not interfere in second order derivative method. The metal ion with V(III) were interfered in 20 fold excess ,Ti (IV) and Bi (III) were interfered in 5-fold excess in zero order method, but second order derivative method V (III) were tolerable up to 35 folds. Further Ti (IV) and Bi (III) were interfere 5-fold excess in second order derivative method. The analytical results of both direct and derivative methods were summarized and are presented in **Table 2.**

## Applications

The direct spectrophotometric method was developed which were suitable for the determination of uranium in some environmental water samples and in phosphate rock and fertilizer samples. Suitable aliquots of the sample solutions were treated with required amount of the reagent and suitable buffer media

and the absorbances of resultant solutions were measured at appropriate wavelengths. The amount of metal ions present in samples were computed from the measured absorbance values .The results are shown in table 3,4and,5,which are in good agreement with the certified values and with the AAS method.
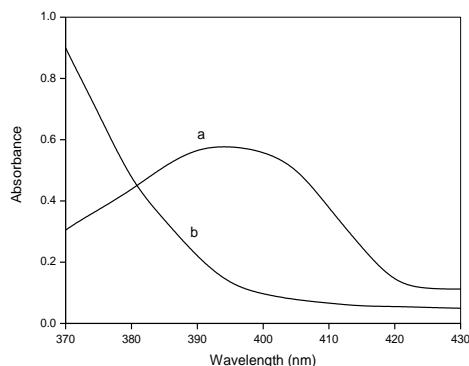


**Fig. 1. Absorption spectra of**
(a) [U (VI)–5-BrSAINH] Vs Reagent blank
(b) 5-Br–SAINH Vs Buffer blank
U (VI)] = $5 \times 10^{-5}$ M; [Br–SAINH] = $5 \times 10^{-4}$ M
pH = 5.0
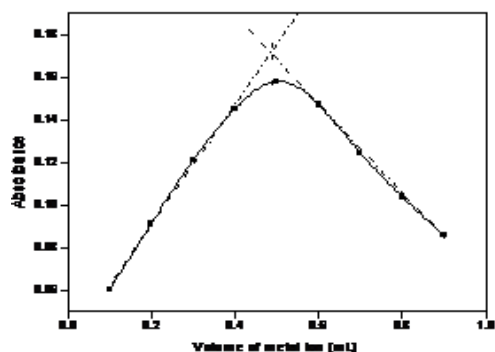


**Fig. 2. Job's method**
[U(VI)] = [Br–SAINH] = $1 \times 10^{-3}$ M
$\lambda_{max}$ = 395 nm
pH = 5.0
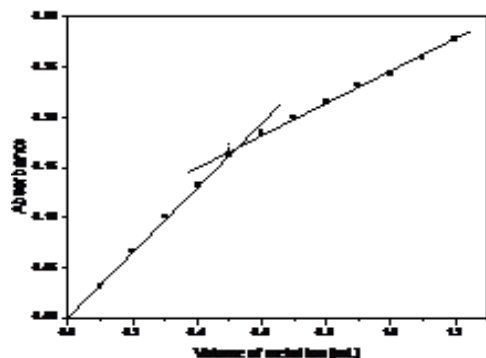


**Fig. 3. Molar Ratio method**
[U(VI)] = [Br–SAINH] = $1 \times 10^{-3}$ M
$\lambda_{max}$ = 395 nm
pH = 5.0
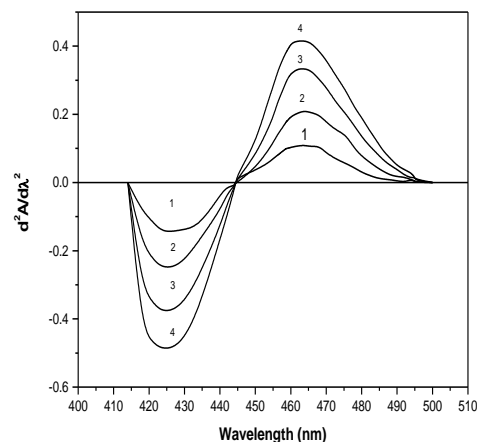


**Fig.4.** Second Order derivative spectra of U (VI)–5Br–SAINH Vs Reagent blank
U (VI) ($\mu$g mL$^{-1}$) = 1)0.119., (2)0.238; (3)0.317; 4) 0.476

**Table.1** Tolerance limits of foreign ions

| Foreign ion | Tolerance Limit ($\mu$gmL$^{-1}$) | Foreign ion | Tolerance Limit ($\mu$g mL$^{-1}$) |
|---|---|---|---|
| Iodide | 1,280 | Ca(II) | 1,120 |
| Sulfate | 960 | Mg(II) | 1070 |
| Bromide | 780 | Na(I) | 940 |
| Thiocyanate | 660 | K(I) | 780 |
| Nitrate | 570 | Zr(IV) | 660 |
| Thiosulphate | 480 | Ba(II) | 550 |
| Phosphate | 460 | La(III) | 420 |
| Chloride | 450 | W(VI) | 350 |
| Acetate | 310 | Se(IV) | 290 |
| Carbonate | 220 | Cu(II) | 250 |
| Urea | 180 | Mo(VI) | 230 |
| Oxalate | 100 | Al(III) | 130 |
| | | Fe(III) | 100 |
| | | Th(IV) | 80 |

| | | |
|---|---|---|
| V(III) | 50 | |
| Ti(IV) | 20 | |
| Bi (III) | 10 | |

*Amount of U(VI) taken = 5.95µg mL$^{-1}$, pH = 5.0

**Table 2:** Different Analytical parameters  concerned into the determination

| Parameter | Zero Order | Second derivative | |
|---|---|---|---|
| Analytical Wavelength (nm) | 395 | 423 | 463 |
| Beer's law range | 1.19-19.04 | 0.11297-9.52 | 0.2975-7.14 |
| Y-intercept(b) | 0.0645 | 0.22876 | 0.24771 |
| Correlation coefficient (r) | 0.9997 | 0.9995 | 0.9996 |
| Standard deviation (s) | 0.0998 | 0.10022 | 0.0923 |

**Table 3:**  Determination of U (VI) in Spiked Saline Water sample:

| Sample No | Amount of U (VI)  ( µg mL$^{-1}$) | | Recovery (%) |
|---|---|---|---|
| | Added | Found | |
| 1 | 2.0 | 1.80 | 90.0 |
| 2 | 1.0 | 0.887 | 88.7 |
| 3 | 4.0 | 3.12 | 78.0 |
| 4 | 2.0 | 1.82 | 91.0 |
| 5 | 3.0 | 2.78 | 92.6 |

**Table 4:**  Determination of U (VI) in environmental water samples

| Sample | Amount of  Uranium (µg mL$^{-1}$) ± SD | | Recovery (%) |
|---|---|---|---|
| | Added | Found | |
| Tap water | 0.5 | 0.505 ± 0.05 | 101.0 |
| | 2.5 | 2.39 ± 0.08 | 95.6 |
| | 5.0 | 4.90 ± 0.01 | 98.00 |
| Drinking water | 0.5 | 0.502 ± 0.02 | 100.4 |
| | 2.5 | 2.63 ± 0.012 | 105.2 |
| | 5.0 | | 102.4 |
| Surface water | | 5.12 ± 0.03 | |
| | 0.5 | 0.503 ± 0.02 | 100..6 |
| | 2.5 | 2.53 ± 0.014 | 101.2 |
| | 5.0 | 4.89 ± 0.06 | 97.8 |

**Table 5:** Analysis of phosphate rock solutions and fertilizer solutions for uranium content

| Sample | Uranium content(mg kg-1) | |
|---|---|---|
| | proposed method  ±SD (n=4) | AAS method ±SD(n=2) |
| Phosphate rock(India) | 30.25 ±0.02 | 32.26 ±0.013 |
| NPK fertilizer | 13.36 ± 0.014 | 15.65 ± 0.06 |
| DAP fertilizer | 46.52 ± 0.032 | 48..09 ± 0.017 |

## VI.   CONCLUSION

The reagent (5-BrSAINH) allows a simple method for the spectrophotometric determination of Uranium (VI). The developed spectrophotometric method does not involve any extraction or heating process and hence the use of the solvents was avoided. A second order derivative spectrophotometric method for determination of U (VI) also developed and was more sensitive than zero order method. The developed method was successfully employed for the determination of   Uranium (VI) in the spiked saline, environmental water samples and phosphate rocks and fertilizers.

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# Cadmium ion induced changes in the protein catabolism of *Oreochromis mossambicus*

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*Abstract-* The euryhaline fish *Oreochromis mossambicus* was exposed to three sub-lethal concentrations of Cadmium ion, for 7 days to evaluate the role of protein catabolism in fulfilling the immediate energy needs of fishes under Cadmium ion induced stress. The levels of tissue protein, free amino acid, plasma ammonia and the activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and glutamate dehydrogenase (GDH) were estimated in some of the vital tissues like gills, liver, kidney, muscle and blood of *O. mossambicus*. The rates of ammonia excretion, oxygen consumption and ammonia quotient (AQ) were also estimated. The significant (P< 0.05) decrease in the levels of proteins concomitant with remarkable increase in the level of free amino acids, ALT, AST and GDH activities in these vital tissues of fish species elucidated the protein catabolism as one of the main mechanism of meeting out the immediate energy demand of the fishes in condition of cadmium exposure. The AQ in treated fish increased significantly (P< 0.05), which indicate a marked increase in the catabolism of proteins during cadmium ions induced stress.

*Index Terms*- Aminotransferase, Cadmium, Catabolism, Glutamate dehydrogenase, *Oreochromis mossambicus*.

## I. INTRODUCTION

Heavy metals are one of the important environmental pollutant. The contamination of aquatic environments by heavy metals has become a global problem. Many estuarine and coastal aquatic environments have been sinks for industrial and agricultural effluents. Therefore, the aquatic organisms are at high risk of health. Out of the several heavy metals in the industrial waste streams, Cadmium is often used in environmental studies because it is a non-essential metal [1] and a non-degradable cumulative pollutant. It is highly toxic, widely distributed in the environment and can adversely affect organisms at relatively low concentrations [2]. Tobacco smoke is one of the most common sources of cadmium [3]. Cadmium is widely used in steel industry alloys, in batteries and in pigments used in paints, inks, plastic, and enamels [4].

Cadmium is well known for its toxic effect on aquatic organisms [5]. In fish, the heavy metals have adverse effect on growth and reproduction and cause osmoregulatory stress [6,7,8,9,10]. Cadmium-exposed fish may show skeletal deformities, alterations in several enzymatic systems, including those involved in neurotransmission, transepithelial transport and intermediate metabolism, variation of mixed function oxidase activities, abnormal swimming, changes in individual and social behaviour, and metabolic disorders [11, 12]. More recently, it has been shown that sub lethal Cadmium also causes important changes in the swimming activity of *C. carpio* in captivity [13,14]. The alterations in the metabolic rate, the excretion of ions (e.g., ammonium), respiration, food consumption, and growth rates are important among the biochemical and physiological effects by the exposure to heavy metals [15, 16, 17]. Teleost fishes use protein as the main source of energy for their metabolic processes. Amino acids provide 14 –85% of the energy requirements of teleost fish [18]. Because proteins are a major source in the metabolism of teleost fishes and heavy metals may be involved in the normal working of these molecules, it is important to study the changes in protein metabolism after metal exposure in detail.

The objective of the present study was to determine levels of total protein, free amino acids, and plasma ammonia and to investigate the response of AST, ALT, and GDH activities in tissues of *Oreochromis mossambicus* (Peters) exposed to sub lethal concentrations of cadmium ion for 7 days. In order to assess the changes caused by cadmium ion on protein catabolism, ammonia quotient, ammonia excretion and Oxygen consumption were also investigated in the study.

## II. RESEARCH ELABORATIONS

### Animals and Experimental Exposure

*Oreochromis mossambicus* (15±8 g) commonly known as Tilapia obtained from the culture ponds of Kerala University of Fisheries and Ocean Studies, Puduuvyppu were acclimatized to laboratory conditions, for about one month before experiments, in 5000L tanks where a continuous gentle flow of dechlorinated tap water was maintained. The physicochemical parameters of water were estimated daily [19]. The tap water had dissolved oxygen content of 7.8 ppm, pH 7.0 ± 0.32, temperature 26 ± 3$^0$C, salinity 0 ppt and hardness below detectable amounts and they were fed on a commercial diet *ad libitum*.

### Sublethal toxicity studies

The acclimatized fishes were sorted in to batches of six each for sub lethal toxicity studies. The bioassays were conducted in 60L tubs containing dechlorinated tap water. The *Oreochromis*

*mossambicus* were exposed to a concentration of 0.92, 1.84 and 3.06 mg L$^{-1}$ cadmium ions, ( equivalent to 1/10, 1/5 and 1/3 of 96 h LC50 values obtained in acute bioassays) for 7 days by addition of calculated amounts of Cd$^{++}$ from a 1M CdCl$_2$ stock prepared in deionised water. To maintain the quality of water as well as to prevent the degradation of cadmium chloride the water as well as the toxin were replenished at every 24 h intervals along with proper provision of aeration. The fishes were fed during the experiment once in a day. The feeding was stopped 24 h prior to their sacrifice. Suitable controls were maintained to nullify any other effect that likely to affect the fish.

Sampling of Tissues

Blood was drawn from the common cardinal vein in 1ml syringe. The blood was mixed with an appropriate amount of anticoagulant like ethylene diamine tetra acetic acid (EDTA). This preparation should be mixed immediately and thoroughly to avoid clotting. The solution was then centrifuged for 5-10 minutes at 2,000 rpm. The supernatant fluid was then separated and assayed.

Another set of treated fishes were sacrificed by pithing (by damaging the brain and severing the spinal cord between the head and trunk region using a sharp needle), dissected and different organs were surgically removed and the tissues viz. gills, liver, kidney and muscle were removed from its body. The tissues were wiped thoroughly using blotting paper to remove blood and other body fluids, washed in ice-cold 0.33M sucrose, and again blotted dry. Cell free homogenates (5% homogenates of gill, liver, muscle and 1% homogenates of kidney tissues), in 0.33M cold sucrose solution were prepared using Kemi Model-KHH1 homogenizer with Teflon coated pestle followed by centrifugation at 1000g for 15minutes in a refrigerated centrifuge (REMI-C24) for carrying out biochemical assays or stored at ⁻20$^0$C until further use. The homogenates were purified further as per the requirement of different methods. The spectrophotometric estimations were carried out by using Hitachi-2900 UV-Visible spectrophotometer with quartz cuvettes against the suitable blank.

Methods used for biochemical analysis

*a. Estimation of protein*

Protein concentrations of the sample were quantified according to Lowry et al. [20] using bovine serum albumin as standard. The soluble proteins were purified by precipitation with equal volume of 10% TCA and pellet obtained after centrifugation at 1000 rpm for 15 minutes were dissolved in 1ml of 0.1N NaOH.

*b. Estimation of Free Amino Acids (Ninhydrin Positive Substances)*

Total free amino acids also known as Ninhydrin positive substances were estimated by Ninhydrin method using leucine as standard [21].

*c. Assay of activities of transaminases (ALT and AST)*

The activities of alanine aminotransferase (ALT) (EC 2.6.1.2) and aspartate aminotransferase ((AST) (EC 2.6.1.1)) were estimated according to the method of Mohun and Cook [22]. Briefly, 0.5 ml of substrate either for ALT (0.1 M phosphate buffer, pH 7.4; 0.2 M DL- alanine; 2mM 2-oxoglutarate) or AST ((0.1 M phosphate buffer, pH 7.4; 1.0 M aspartic acid; 2mM 2-oxoglutarate) was taken and incubated in water bath at 37 $^o$C for 3 min. Thereafter, the substrate was mixed with 0.2 ml of enzyme solution (tissue homogenate). The reaction mixture was incubated at 37 $^o$C for 60 min (for ALT) and 30 min (for AST) with intermittent shaking. The reaction was stopped by the addition of 1 ml DNPH and was further incubated for 20 min. The intensity of the colour developed by the addition of NaOH (10 ml, 0.4 N) was monitored calorimetrically at 540 nm against the distilled water blank. The activities of ALT and AST were calculated in terms of µ moles of pyruvate liberated / min / mg protein.

*d. Assay of Glutamate dehydrogenase (GDH) (EC 1.4.1.2)*

For Glutamate dehydrogenase assay[23], the reaction mixture consisted of 2.1 ml phosphate buffer, 0.2 ml enzyme source, 0.1 ml NADH, 0.2ml Ammonium acetate, 0.2 ml EDTA and 0.1 ml Triton X-100. The above mixture was equilibrated at room temperature for 10 minutes. Started the reaction by adding 0.1 ml of 2-oxoglutarate, and the rate of change of extinction at 340 nm with time were noted ($\varepsilon$ NADH-6.3 $\times$ 10$^3$ litres mol$^{-1}$ cm$^{-1}$). The enzyme activity was calculated as micromoles of NADH oxidized / minute / mg protein.

*e. Estimation of plasma ammonia*

Ammonia in the serum sample was estimated using the method of Boltz and Howel [24]. One ml of deporteinized plasma was taken for the assay. The optical density was read at 625 nm against a blank. A set of standard ammonia solutions were also treated similarly. The values were expressed as micromole/L.

*f. Determination of rate of Ammonia excretion by Oreochromis mossambicus*

Ammonia in the sample was estimated using the method of Boltz and Howel [24]. Two litre water containing 0.92 mg/L, 1.84mg/L and 3.06 mg/L cadmium chloride each was taken in separate tanks. A tank containing tap water served as the control. One *O. mossambicus* with known weight was introduced to each tank. Immediately after the exposure, 1 ml of water sample was taken from each tank to determine the initial ammonia content in water. Samples were taken from each tank after a period of 1 hour and the final ammonia content in water was assayed. A set of standard ammonia solutions were also treated similarly.

*g. Determination of rate of Oxygen consumption by Oreochromis mossambicus*

Two-litre water containing 0.92 mg/l, 1.84mg/l and 3.06 mg/l cadmium chloride each was taken in separate tanks. A tank containing tap water served as the control. Each *O. mossambicus* with known weight were introduced in to the tanks. An even layer of liquid paraffin was poured over the water in the tanks to prevent further dissolution of atmospheric oxygen in to it. Immediately siphon water from each tank to the DO bottles taking all precautions to reduce contact of water with air to a minimum. Samples were taken again from each tank after one hour. The oxygen concentration in the sample was estimated using the Winkler's method.The experiment was repeated until concordant values were obtained.

Statistical Analysis

The statistical analysis was carried out using the software SPSS 13.0 package. One- way ANOVA followed by Tukey's test was carried out for the comparison between different

concentrations in each tissue and for determining the significant difference between different concentrations of toxin in plasma ammonia levels, ammonia excretion rates and oxygen consumption rates of the fish. Significance level (P-value) was set at 0.05 in all tests.

### III. RESULTS

*Cadmium ion induced alteration in the levels of Tissue protein*

The results shown in Fig 1 demonstrate significant decrease in the levels of total protein in all studied organs of the fish in response to the treatment of cadmium ions compared to control group.
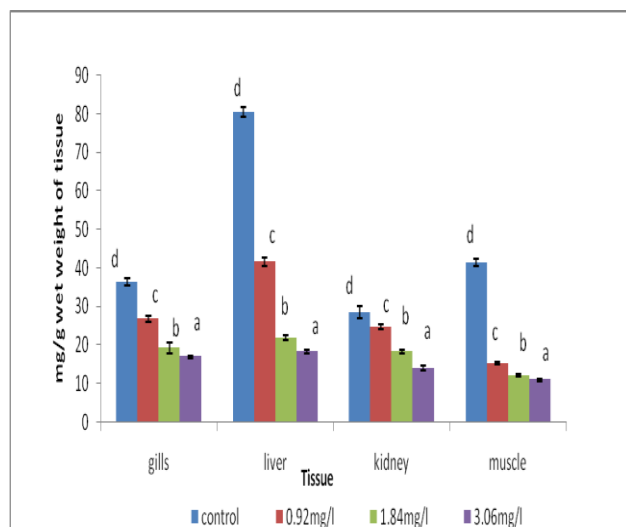


Figure 1: Protein content in the various tissues exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA)

*Alterations in the levels of free amino acid on cadmium treatment*

The levels of free amino acid were found to exhibit high degree of alteration in all studied organs on cadmium treatment (Fig 2). The levels of free amino acids were observed to show significant increase in all concentrations of cadmium ion. Maximum increase in free amino acids was observed in liver followed by kidney, muscle and gills
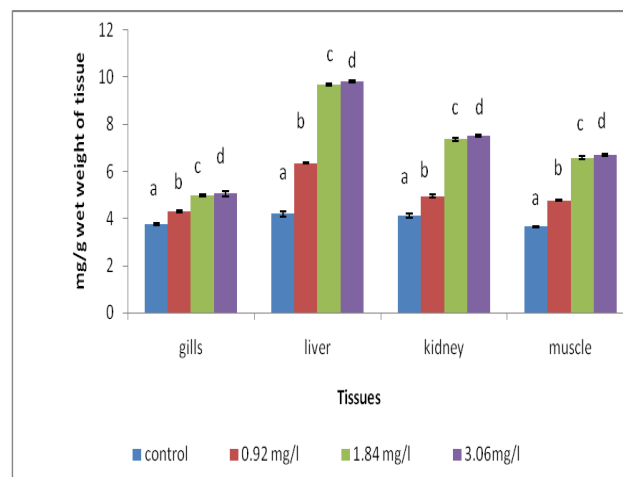


Figure 2: Free Amino acid content in the various tissues exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA)

*Cadmium ion induced changes in transamination and oxidative deamination.*

The results illustrated in Fig 3 show significant increase in the activity of alanine amino transferase (ALT) in gills, liver, kidney and muscle of the fish on treatment with cadmium ions. The maximum increase was seen in kidney followed by liver.

The data showed in Fig 4 display remarkable enhancement in the activity of aspartate aminotransferase (AST) in gills, liver, kidney and muscle of both fish species in response to cadmium. The maximum increase was observed in liver followed by kidney.

The results depicted in Fig 5 demonstrate that cadmium ions were able to cause notable variations in the activity of glutamate dehydrogenase (GDH) in liver, muscle and kidney of the fish). A statistically significant increase in Glutamate dehydrogenase (P<0.05) was observed in liver, kidney and muscle of the treated groups compared to control. No significant variation was observed in gills of the treated groups compared to control.
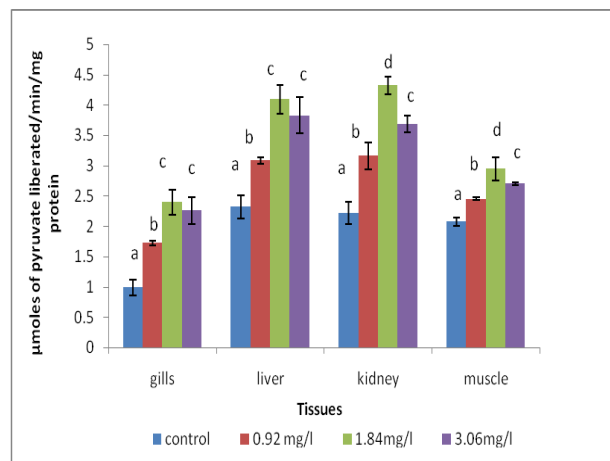


Figure 3: Effect of different concentrations of Cadmium chloride on the ALT activity of various tissues of *O.*

*mossambicus.* Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA).
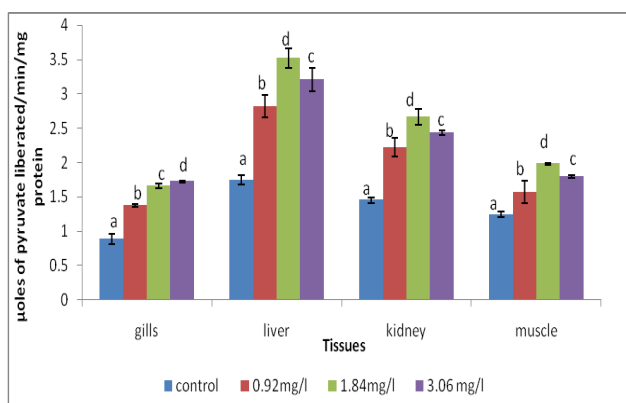


Figure 4: AST activity in the various tissues exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA).
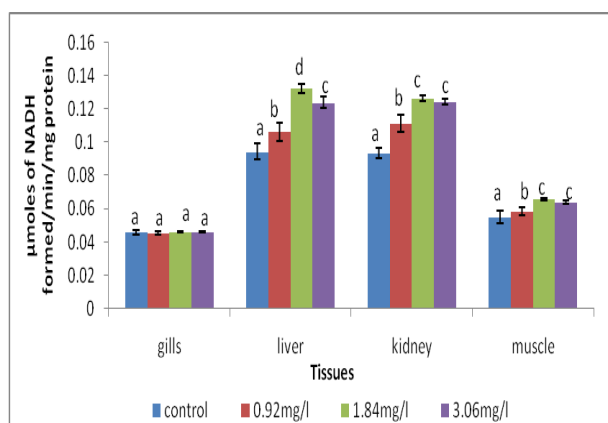


Figure 5: GDH activity in the various tissues exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA)

### Effect of cadmium ions on the levels of plasma ammonia

The results of effect of cadmium ions on the level of plasma ammonia in fish are presented in Fig 6. One-way ANOVA followed by Tukey's test showed that there was significant (P<0.05) increase in the plasma ammonia in all the treated groups compared to control.
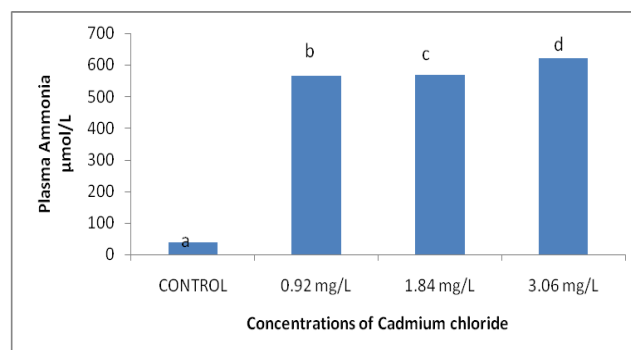


Figure 6: Levels of Ammonia in the plasma of O. *mossambicus* exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each bar, values with different lower case letters vary significantly (P<0.05) (One-way ANOVA).

### Effect of cadmium ions on the rates of ammonia excretion

*O. mossambicus* exposed to varying sub lethal concentration of Cadmium chloride exhibited no significant (P<0.05) variations in the rates of excretion of ammonia compared to control (Fig 7). One-way ANOVA followed by Tukey's test has been carried out to ascertain the statement
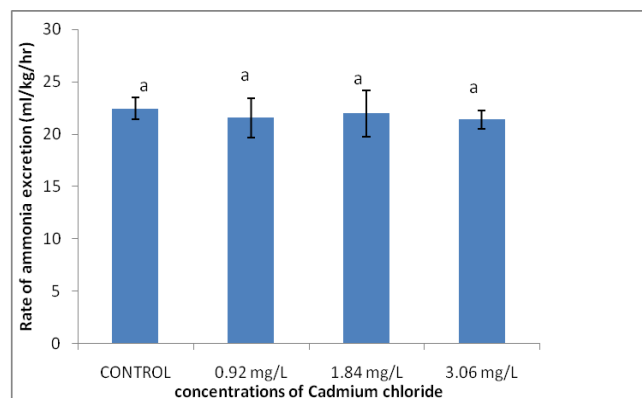


Figure 7: Rates of ammonia excretion by *Oreochromis mossambicus* exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA)

### Effect of cadmium ions on the rates of oxygen consumption

One-way ANOVA followed by Tukey's test showed that there was significant decrease (p<0.05) in the rate of Oxygen consumption of fish treated with cadmium chloride compared to control group (Fig 8)
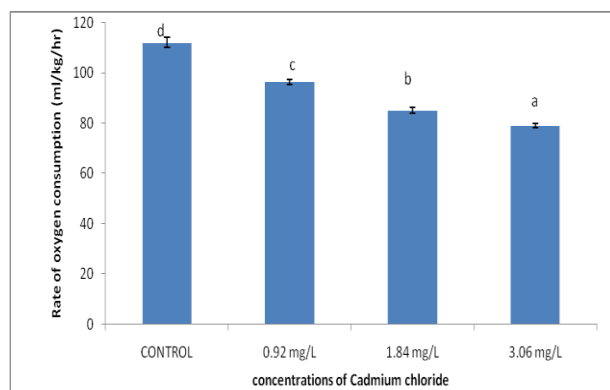
Figure 8: Rates of oxygen consumption by *Oreochromis mossambicus* exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA)

*Effect of cadmium ions on the ammonia quotient*

*O.* mossambicus exposed to varying sub lethal concentration of Cadmium chloride exhibited significant (P<0.05) increase in the Ammonia quotient (Fig 9). One-way ANOVA followed by Tukey's test has been carried out to ascertain the statement
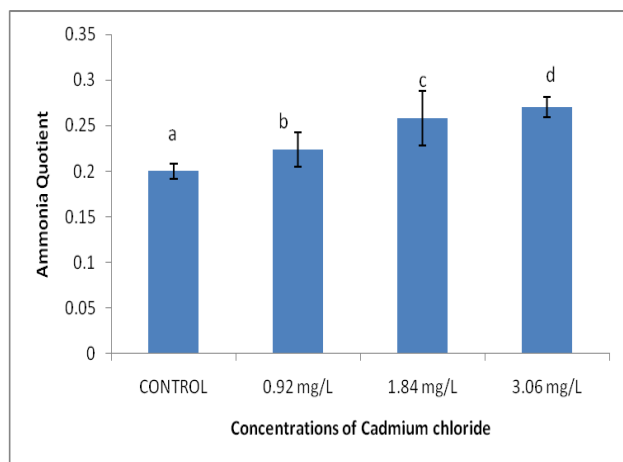


Figure 9: The Ammonia quotient of *Oreochromis mossambicus* exposed to different concentrations of Cadmium chloride. Each bar diagram represents mean ± S.D. On each set of bars values with different lower case letters vary significantly (P<0.05) in each tissue on different treatments (One-way ANOVA).

## IV. DISCUSSION

The present study demonstrated that the fish *Oreochromis mossambicus* exposed to sub-lethal concentrations of cadmium ion (0.92 mg/l, 1.84 mg/l, and 3.06 mg/l) for 7 days displayed a significant decrease (p<0.05) in the level of protein in the gills, liver, kidney and muscle than the control. Proteins in an animal are being constantly degraded and re synthesized from the free

amino acid pool in tissue. A dynamic steady state always prevails between these two opposite processes of protein catabolism and anabolism. During stress conditions, the balance between anabolism and catabolism will be impaired. The metabolism move towards more catabolic state and the tissue protein may undergo proteolysis. Reduction in the protein content in the tissues suggests its increased degradation in to amino acids. The increased free amino acid pool [25] can be used for ATP production by transamination reactions or gluconeogenic pathway. Tissue protein content has been suggested as an indicator of xenobiotic-induced stress in aquatic organisms [26]. Meena Kumari et al. [27] observed a decrease in protein level in *Labeo rohita* treated with copper. A decrease in the protein content was also found in the hepatopancreas of edible crab *Scylla serrata* exposed to cadmium and the gills, liver, kidney, muscle, and intestine of the common carp exposed to mercury [28, 29].

Significant increases in the level of free amino acids were observed when *Oreochromis mossambicus* exposed to cadmium ions. Among the organs studied liver showed highest increase because it is the major site of amino acid catabolism. The decline in total protein content and the simultaneous increase in free amino acid in the tissues studied indicate the activation of protein catabolism to counteract the cadmium chloride induced toxic stress. The free amino acids are mobilized in order to cope with the extra energy demands under stress conditions [30]. The increased protein breakdown is a functional response to deal with the extra energy requirements to cope with Cadmium stress [29]. De Smet and Blust [30] also observed similar increase in free amino acids in common carp *Cyprinus carpio* exposed to cadmium.

The aminotransferases are known to play an important role in the utilization of amino acids for the oxidation and/or for gluconeogenesis [31]. while GDH, a mitochondrial enzyme, catalyzes the oxidative deamination of glutamate generating α-ketoglutarate, an important intermediate of the TCA cycle. Significant increase (p<0.05) in the activities of alanine aminotransferase and aspartate aminotransferase were observed in the tissues of *O. mossambicus* exposed to cadmium ion for 7 days. The alteration in aminotransferase activities indicates changes in energy metabolism in response to an enhanced energy demand to compensate the stress situation. De Smet and Blust [30] indicated that elevated activities of AST and ALT in liver, kidney of *Cyprinus carpio* following Cd exposure. The increased activities of the two major aminotransferases AST and ALT in fish may thereby enhance transamination for the channelling of free amino acids into the TCA cycle and/or to favour gluconeogenesis [32]. In the present study, an increased activity of GDH observed in the liver, kidney and muscle tissues may be because of an increase in glutamate oxidation, resulting in increase in ammonia production and α- ketoglutarate formation at the expense of NAD. The increase in the activity of GDH was found to be most prevalent in liver and kidney indicated significant role of these organs in the deamination. Similarly, an enhancement in the activity of GDH due to carbofuran intoxication was observed in liver and muscle tissues of *C batrachus* [33]. Kumar et al. [34] observed significant increase in the activity of GDH in *Channa punctatus* and *Clarias batrachus* on treatment with cypermethrin. The activity of gill GDH is

lower than the other tissues of fish [35,36,37,38]. The significant increase in the activities of alanine and aspartate aminotransferases and GDH could be due to incorporation of keto acids into the TCA cycle.

Fish have a remarkable capacity to use proteins as an energy source [18], and ammonia is the major end product of nitrogen metabolism. A significant elevation of plasma ammonia was observed in fish exposed to sub lethal concentrations of Cadmium ion for 7 days. The reason for this seems to be a combined effect of elevated, stress induced, ammonia production and an unchanged excretion despite an elevated plasma-to-water gradient [39,40,41,42]. An increase in ammonia production as a result of metal induced stress together with an impaired ability to excrete ammonia across the gill is the typical response to metal exposure in freshwater fish and leads to elevated plasma ammonia levels [42]. Increased ammonia production can arise from a general corticosteroid-mediated stress response that includes increased protein catabolism and gluconeogenesis [43]. No significant change in ammonia excretion was observed compared to control in *O.mossambicus* treated with Cadmium ion. The reason for this seems to be an impaired ability to excrete ammonia across the gill is the typical response to metal exposure [42]. De Boeck et al. [44] observed similar results when treated with copper in the common carp, *Cyprinus carpio.*

Oxygen consumption of aquatic animals is a very sensitive physiological process and therefore, alteration in the respiratory activity is considered as an indicator of stress of animals exposed to heavy metals. A significant decrease in the oxygen consumption was observed when *Oreochromis mossambicus* exposed to sub-lethal concentrations of cadmium ions. The decrease in oxygen consumption may be due to intimate contact with water contaminated with cadmium, which decreases the oxygen diffusing capacity of the gills. Metals may induce various disturbances in fish gills. Excessive secretion and coagulation of mucus impair gas exchange across the secondary lamellae epithelium [45, 46]. Most of the nitrogenous end products of freshwater fish originate from protein catabolism, with ammonia as the principal end product, the contribution of protein catabolism to the total energy production of the fish can be assessed by determination of the ammonia quotient (AQ = mole to mole ratio of ammonia excreted to oxygen consumed.[44,47,48,49,18]. A significant increase in the ammonia quotient was observed in *O.mossambicus* when exposed to cadmium chloride for 7 days. This was supported by De Boeck et al. [44] who also observed similar increase in AQ in common carp when treated with copper. Thus, although oxygen consumption is reduced by cadmium chloride exposure, protein catabolism appears to remain constant, or is at least less affected, and becomes relatively more important. The catabolism of proteins might be more than the measured quantity using AQ because significant accumulation of ammonia occurred in the plasma due to impaired excretion. The rate of protein breakdown is acute as evident in this study.

In conclusion, the present study illustrates the impact of Cadmium chloride on the catabolism of proteins and amino acids, in *Oreochromis mossambicus*. Proteins are known to play dominant role in accomplishing the immediate energy demand in recovering from the stress. The cadmium chloride toxicity in the fish *Oreochromis mossambicus* enhances the catabolism of proteins to handle the extra energy demand. The elevation in free amino acid content, ALT, AST, GDH and plasma ammonia along with a reduction in total protein content of tissues indicate a boost in protein catabolism. The AQ in treated fish increased significantly, which indicate a marked increase in the catabolism of proteins during cadmium ion induced stress.
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# Effect of total solid concentration on anaerobic digestion of the organic fraction of municipal solid waste

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*Abstract-* In this study batch anaerobic digestion of organic fraction of municipal solid waste was carried out for 100 days at room temperature for varying substrate concentration of 115, 99 and 83g/l. The performance of reactors was evaluated by measuring the daily biogas production and calculating the degradation of total solids and the total volatile solids. Effect of organic solids concentration and digestion time on biogas yield was studied. The biogas yields at the end of the digestion from the reactors were 22.7L/KgVS, 54.4L/KgVS and 41.7L/KgVS respectively.  About of 71.69%, 80.06% and 76.55% Volatile solid degradation were obtained during the loading in reactors.

Keywords: Anaerobic digestion; Volatile solid degradation; Municipal  solid waste; biogas yield

## I.   INTRODUCTION

Municipal solid waste (MSW) generation is significantly increasing in Indian urban areas and started creating enormous waste disposal problems in the recent past [1]. In India, MSW management  is the duty of the local municipalities [2].More than 90 percent of the municipal solid waste (MSW) generated in India is dumped in an unsatisfactory way, what creates environmental hazards to water, air and land. At the same time the organic fraction of MSW is about 40-60 percent [3].  In Kerala, around 70% of the waste is compostable organics enabling high level of recycling in the form of manure or fuel [4]and [5]. The anaerobic digestion is an attractive option for energy generation from the putrescible fraction of MSW as well as for reducing the disposal problem [6]. It has reduced environmental impact, especially with respect to the greenhouse effect and global warming.

Anaerobic digestion is a biological process wherein diverse group of microorganism convert the complex organic matter into a simple and stable end products in the absence of oxygen [7]. This process is very attractive because it yields biogas, a mixture of methane and carbon dioxide which can be used as renewable energy resources. AD of organic fraction of municipal solid waste (OFMSW) is used in different regions worldwide to reduce the amount of material being landfilled, stabilize organic material before disposal in order to reduce future environmental impacts from air and water emissions and recover energy. Several research groups have developed anaerobic digestion processes using different organic substrates [8]-[10].In this view, anaerobic digestion of solid waste is a

process that is rapidly gaining momentum to new advances especially in the area of dry anaerobic fermentation and has become a major focus of interest in waste management throughout the world. It appears to be the reliable and promising process for the treatment of organic solid waste. Moreover, when compared to other conversion technologies for treatment of the organic fraction of MSW, the economic, energy, and environmental benefits makes anaerobic digestion an attractive option [11].

The characteristics of the biogas produced depends upon the nature and type of the biomass or feed (wastes) used. The nature of the wastes varies with the locality from which it is collected. Waste generated from a particular region shows the nature of the inhabitants living in that region, their food and other habits, various industries and other commercial units in the region etc. based on these factors the nature and characteristics of waste generated changes from place to place. Thus the quantity and quality of biogas produced depends upon the area from which the biomass is collected. In our study we are using waste collected from Kerala which has its own particular characteristics which makes the study unique.

Anaerobic digestion technology has tremendous application in the future for sustainability of both environment and agriculture because it represents a feasible and effective waste-stabilization method to convert the undiluted solid bio-waste into renewable energy with nutrient rich organic fertilizer. However, the application of this process is limitedly practiced especially in developing countries due to the lack of appropriate treatment system configurations and mainly due to the longer time required for the biostabilization of waste. Any kind of reactors design and operational criteria selection to be operated is depends upon the feedstock characteristics, financial aspects etc. Anyhow, each mode of operation always has its own advantages and limitations. Therefore the purpose of the present study is to develop feasible anaerobic digestion process   for the treatment of OFMSW for potential energy recovery and sustainable waste management and the optimization of environmental conditions within the digester such as temperature, pH, buffering capacity and volatile fatty acid concentrations etc[ 12]for maximizing the biogas production in a shorter retention time.

## II. METHODS

### A. Experimental reactors

The experiments were carried on batch laboratory scale reactor (aspirator bottle) with total capacity of 2 L. The reactor was made of borosilicate glass with bottom sampling outlet. The bottles were closed by rubber stoppers equipped with glass tubes for gas removal and for adjusting the pH. The glass tube was dipped inside the slurry to avoid gas loss during the pH adjustments. The effective volume of the reactor was maintained at 1.6L.Biogas production from the reactors was monitored daily by water displacement method. The volume of water displaced from the bottle was equivalent to the volume of gas generated. The reactor was mixed manually by means of shaking and swirling once in a day. The reactors was operated at room temperature

### B. Inoculum

The inoculum used in this study was fresh cattle dung which contains all the required microbes essential for anerobic digestion process. The pH, total solid and volatile solid of the inoculum were 6.5,24.2% and 85.4% respectively. The percentage of inoculum for acidogenic fermentation of the organic wastes is approximately 30% of the working volume. The inoculum was collected and kept at 4°C until used.

### C. Feed stock preparation

Fresh organic fractions of MSW and inoculum were used as feed to the bio rector. Organic fraction of MSW consists of food waste, fruit waste, vegetable waste from nearby vegetable market and house hold. The wastes were sorted and shredded, then mixed several times in laboratory and kept at 4°C until used. All reactors were loaded with raw feed stock and inoculated with fresh cattle dung. Water was added to obtain the desired total solid concentration. The characteristics of the substrate and feed were shown in the Table 1.

### D. Experimental procedure

The study is programmed to evaluate the mesophilic digestion of OFMSW at three different initial substrate concentrations. The substrate concentration was expressed as weight of solids/total volume of solids plus water, assuming that the density of the solids is approximately equal to the density of water. Three reactors were used of 2L total volume and 1.6L effective volume at discontinuous condition but different total solids concentrations of 115g/l , 99g/L and 83 g/L respectively. All the reactors were fed with municipal garbage, tap water and cattle dung slurry (inoculum), used as the starter in the reactors. Liquid samples were drawn from each reactor periodically and analysed for pH, volatile fatty acids, alkalinity chemical oxygen demand and ammonia nitrogen. The pH was measured every 2 days and it was maintained in the range of 6.5 to 7.5 using 6N sodium hydroxide solution as which is the optimum range for methonogens growth [13]. Volatile fatty acids, alkalinity chemical oxygen demand and ammonia nitrogen were analysed once in a week. Daily biogas production was measured by water displacement method. The substrate was mixed once each day, at the time of the gas measurement, to maintain intimate contact between the microorganisms and the substrate.

### E. Analytical methods

The parameters analyzed for the characterization of substrates were as follows: Total Solids (TS), Volatile Solids (VS), pH, Volatile fatty acid (VFA), Total Kjeldahl Nitrogen (TKN), Total Organic Carbon (TOC).Following quantities were monitored during the digestion process: pH, VFA, alkalinity, Ammonia nitrogen( NH3-N),COD and production of biogas. All analytical determinations were estimated according to the procedures recommended in the Standard methods for examination of water and waste water [14].

pH was measured using digital pH meter. TS samples were dried in an oven at 105-110 ºC, and for VS to the dried ash waste in a muffle furnace at 500 ±50 ºC. TKN and NH3-N content were examined using the spectrophotometer ((HITACHI,U-2900 UV/VIS spectrophotometer). VFA and alkalinity were done using simple titration method (*Anderson and Young, 1992*).TOC analysis was carried out using Shimadzu TOC-LCPH/CPN analyser for non- purgeable Organic Carbon from the standard methods.

Gas production was measured at a fixed time each day by the water displacement method, with water prepared as specified in standard methods. Chemical oxygen demand (COD) was also determined using standard techniques

## III. RESULT AND DISSCUSSION

### A. Substrate characteristics

Table 1 shows a summary of the characterization of substrate and initial mixtures of each reactors. The experiments were concluded when no significant variation of cumulative biogas production was observed. The experiments were done for 100days.The pH and VFA values of the mixtures are in accordance with the composition of OFMSW.

### B. Performance of batch reactors

In an anaerobic system, the acetogenic bacteria convert organic matter to organic acids, possibly decreasing the pH, reducing the methane production rate and the overall anaerobic digestion process unless the acids were quickly consumed by the methanogens. pH in the range of 6.8 to 7.4 should be maintained in the anaerobic digestion process, which is the optimum range for methanogens growth. A decrease in pH was observed during the first few days of digestion due to the high volatile fatty acids formation, hence the pH was adjusted to 7 using 6N NaOH solution. The profile of pH and volatile fatty acids are shown in the figures.1 to 3.

From day 35to 70, the pH was almost found steady. Despite of steady pH the biogas gas production was low during that period due to lack of mixing. The VFA generation in the beginning was high due to higher acidogenesis and lower methanogenic activity. The initial pH drop and high volatile fatty acid concentration show that the substrate contains some easily biodegradable constituents. After day 40 the VFA concentration was found decreased due to methanogenic activity in which the intermediate organic acids was started to convert into biogas.

Table 1: Characteristics of the substrate and feed

| Parameter | OFMSW | R1 | R2 | R3 |
|---|---|---|---|---|
| pH | 6.15 | 6.42 | 6.61 | 6.64 |
| TS(%) | 18.5 | 10.32 | 9.2 | 8.4 |
| VS(%) | 91.6 | 85.37 | 86.78 | 89.6 |
| VFA(millieqivalents/L) | 10.85 | 8.65 | 9.57 | 6.98 |
| COD(mg/L) | 42835 | 43152 | 37318 | 31987 |
| TKN(g/L) | 1.05 | 1.1 | 1.09 | 0.92 |
| TOC(g/L) | 20.32 | 23.87 | 20.5 | 16.76 |
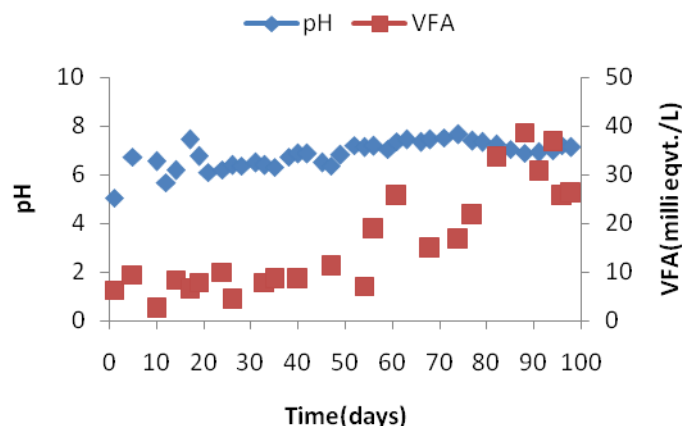


Fig.3: Variation of pH and VFA for TS concentration 83 g/L

The Figure 4 to 6 depicts the variation of COD and NH3-N during the study. The COD of the leachate was found decreasing due to conversion of organic matter into biogas.In this experiment, concentrations of NH4-N were increasing due to release of ammonia during hydrolysis of protein or utilization of nitrogen for biomass synthesis. It is evident that NH4-N concentration (>6000mg/L) indicates the inhibition of methanogens in an acclimated environment [15].In this study, the NH4-N concentration increased from 12mg/L to 1400mg/L. So it can be concluded that there was no any inhibitions of ammonia nitrogen during the AD process of this system.
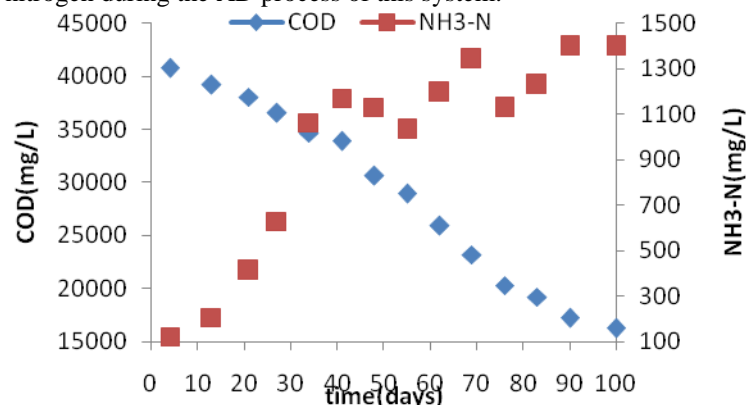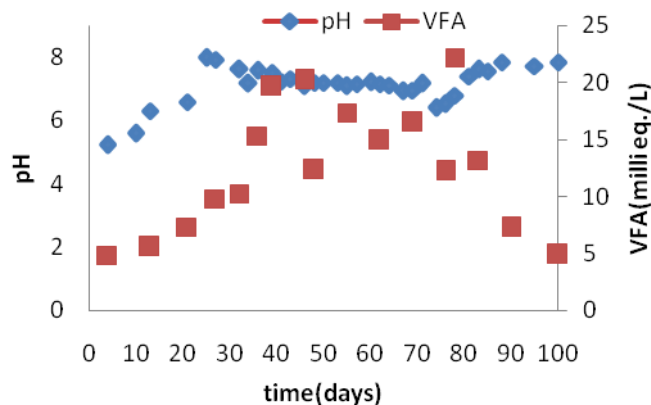


Fig.1: Variation of pH and VFA for TS concentration 115 g/L



Fig 4: evolution of COD and NH3-N (mg/L) in the digester for TS concentration115 g/L
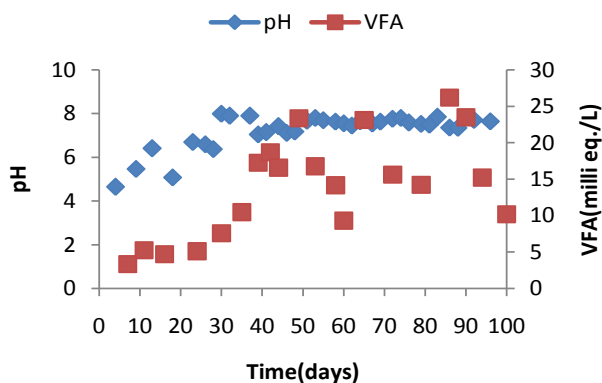


Fig.2:Variation of pH and VFA for TS concentration 99 g/L
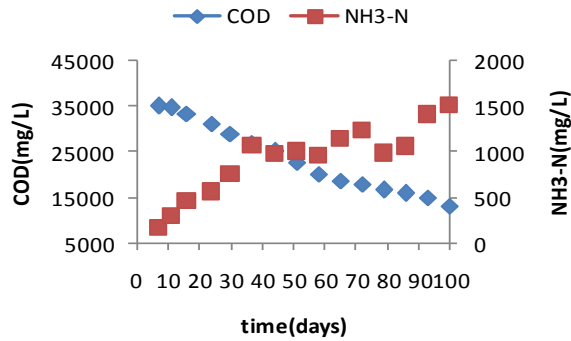
Fig 5: evolution of COD and NH3-N (mg/L) in the digester for TS concentration 99 g/L
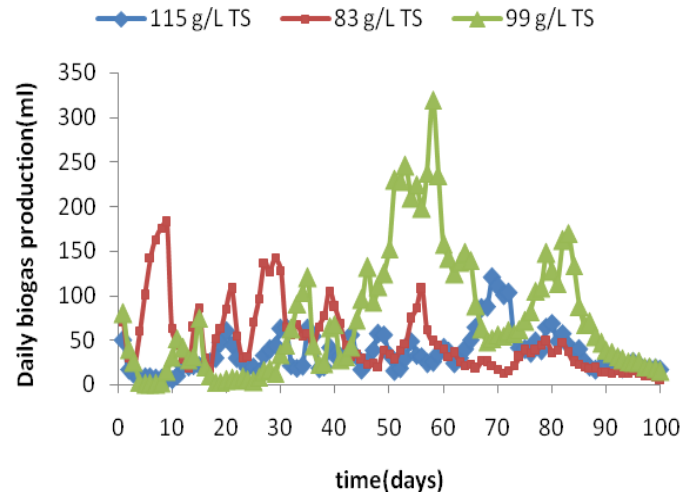


Fig7: variation of daily biogas production versus days for different substrate loading



Fig 6: evolution of COD and NH3-N (mg/L) in the digester for TS concentration 83g/L
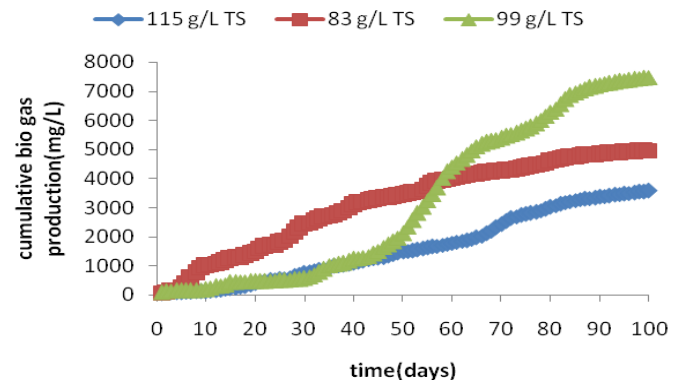


Fig 8: variation of cumulative biogas production versus days for different substrate loading

Figures 7 and 8 indicates the daily and cumulative biogas production for 3 reactors. where the biogas production was high in thebeginning which was due to the entrapped air inside the reactor and the waste itself. The reactors R1, R2 andR3 were operated with total solid concentration of 115g/l ,99g/l and 83 g/l. Initially in the reactors R1 and R2 the production was stopped due to the reduction of pH. So after adjusting the pH value in the optimum range by addition of 6N NaOH to the system, the production was increased. In reactor 3 optimum range of pH was initially made up. Hence the production was not stopped in R3.In R1 initially thick slurry was formed due to high solid contents in the reactor. So the production of biogas was reduced in the initial stages.

The maximum daily biogas production obtained for R1 was 120ml in 69th day and that for R2 and R3 were 340 ml in 58th day and 150ml in 29th day. At the end of the 90 days total cumulative biogas for R1, R2 and R3 was obtained as 3.574L, 7.474 L and 4.957L respectively. The biogas production was decreased from90-100days due to lack of amount of substrate.

### C. Comparative process efficiency

The summary of performance of batch reactors mentioning the characteristics of initial and digested substrate, along with their degradation percentages, under different conditions (TS concentration 100, 90 and 80g/l) are given in Tables 3. It was observed that 71.69% of the total volatile matter converted in reactor 1 and that for R2 and R3 are 80.06 and 76.55 respectively. From the table it was observed that maximum degradation was occurred for reactor 2.The biogas yield, biogas produced per kg organic solids (volatile solids) for different concentrations of organic loading over a 100-day digestion time at room temperatures are shown in Fig 9. The rates of biogas production differed significantly according to the organic loading. It can be observed from 9 that bulk of substrate degradation takes place up to a period of approximate

80 days suggesting that the digesters should preferably be run at a digestion time close to 75 days for optimum energy yield.
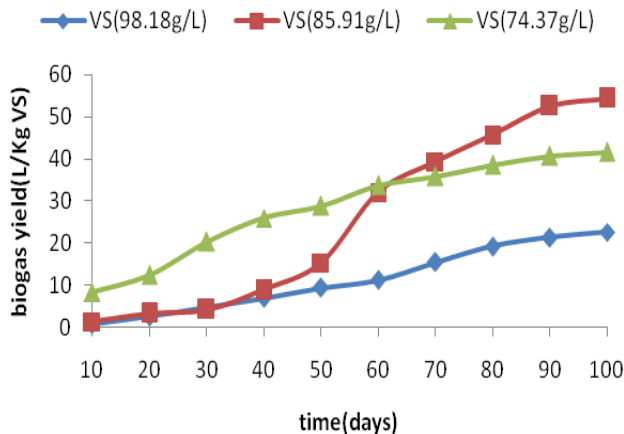


Fig.9: biogas yield at different organic loading

## IV. CONCLUSION

From the results obtained, it can be concluded that digesters should preferably be run at 99 g TS/l ,since maximum biogas production was obtained at this .total solid concentration. It was observed that on decreasing the concentration the production was reduced due to lack of substrate and on increasing the concentration the production was reduced due to increase of loading .At the end of the 100days digestion about 54.4 L/kg VS bio gas was produced. Volatile solid degradation of 71.69, 80.06 and 76.55 were obtained during the loading in reactor R1, R2 & R3 respectively. The low C/N weight ratio in the digested substrate indicates that it can be utilised as bio fertilizer or soil conditioner .However, the effluent chemical oxygen demand concentration indicates that it should be treated before using it for other applications.

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# A Survey on E-Governance Facility Provided by Gujarat Government

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*Abstract-* We are very much aware that nowadays technology has changed our life. These technology changes have pros and cons. Let's discuss pros that Gujarat government has started using latest technology to provide immediate response their citizens and cons about the technology changes are that in some of the village area people are not aware of the technology they have to face many problems. [1] Here by writing this paper we would like to create awareness of e governance facility provided by the Gujarat government. Our paper is divided into two sections, in first section we would like to discuss 1) what is egovernance and what are the basic issues related to egoverence. 2) Highlight the facility provided by the Gujarat government, while in section two we would like to find out the awareness using survey then we will provide information about the facility by preparing blog or documents and will resurvey the details and will compare our survey results.[3]

*Index Terms*- E-Governance, Awareness of E-governance, Government of Gujarat, EGovernance by Gujarat Government

## I. INTRODUCTION

Egoverence is the process of computerization of the working process of government. By providing EGovernenace facility citizen can get information via online portal of government. Government of India and Government of Gujarat have already started working on it. EGovernance provides fast and convenient service to the citizen and government can effectively utilize the resource.

But there are some challenges to implement the service; some of the challenges include low literacy, limited financial resource, lack of human resource in government department. Despite of all these government is trying their best to implement as much service as they can. Let's review some of the very important service which is now provided by the government of Gujarat.

## II. EGOVERNANCE PROJECT STARTED BY THE GUJARAT GOVERNMENT

### II.I ONLINE TICKET BOOKING FOR BUS (GSRTC)

GSRTC Stands for Gujarat State Road Transport Corporation. gsrtc provides to and fro buses from different locations in Gujarat. As per the latest survey that around 24 lakh passengers travels in a day[10], out of them some are using weekly or monthly pass while some are using daily tickets. gsrtc has launched website for online ticket booking of the bus. People of the Gujarat are not much aware of the functionality so awareness should be created for the same. [2]

### II.II FOOD, CIVIL SUPPLIES & CONSUMER AFFAIRS DEPT (FCSCA)

fcsca department of Gujarat government provide list of functionality for their citizens. It includes rules and regulation related to sales and purchasing products related to foods and other. Which rules is going to apply for suppliers and consumers if they are selling inside Gujarat. Website related to FCSCA is providing all this information. By using this website of fcsca you can post complain related to Ration Card, Ration Shop, LPG, PNG, Patrol Pump, Gas Pump, Customer Protection. After a successful registration you will get a complaint number to trace your complaint status. [3]

### II.III E-GOVERNANCE AMDAVAD & E-GOVERNANCE VADODARA

AMC started website to provide online facility to all citizens of Ahmadabad or Vadodara. Facility that are provided online includes: Latest contact details about different department with contact number, birth certificate, death certificate, marriage certificate, vehicle and property tax, file a complaint, RTI etc. Citizen of Ahmadabad can get information related to any of the service provided by the Ahmadabad municipal corporation by using website. Using Egovernance website you can pay your house tax online.[4][5]

### II.IV OFFICIAL GUJARAT STATE PORTAL

This portal provides information related to Gujarat state. It contains more than 100 links to reach to important information. Another important features provided on the Gujarat state portal is that you can take appointment of the PM. You can invite PM for your special occasion or you can write to PM directly. So Gujarat state portal is also very much important website for the citizen of the Gujarat.

### II.V GUJART VIJ COMPANY LIMITED

In Gujarat electricity is provided by the Gujarat vij company limited. For the sake of the easy understanding they have divided into four zone. 1) MGVCL - Madhya Gujarat Vij Company Ltd. 2) Paschim Gujarat Vij Co. Ltd. 3) uttar gujarat vij company ltd. 4) Dakshin Gujarat Vij Co.Ltd. Using their website citizen can pay the electricity bill onilne. [6][7][8][9]

### III.   AWARENESS ABOUT THE EGOVERNANCE PROJECT

Author of the paper has prepared online survey to collect the information about the awareness of the above listed egovernance project by the gujarat governement. To get the the data from the citizen Google form is used to prepare survey and following are the result of the survey. Total response received is 89. 1) In Online Ticket Booking (Gujarat Bus Transport Online Portal) out of 89, 21(24 %) is aware with the website and uses while 65 (76%) is still not aware with the facility. 2) In Food, Civil Supplies & Consumer Affairs Dept of Gujart Government out of 89, 12 (14%) are aware with the facility while 74 (86%) are not aware with the facility. 3) In Egovernance Amdavad & Egovernance Vadodara, out of 89, 14 (16 %) are aware with the facility while 71 (84%) are still not aware with the facility. 4) In Official Gujarat State Portal out of 89, 20 (24%) are aware with the facility while 65 (76%) is still not aware with the facility. 5) In Gujart Vij Company Limited out of 89, 14(16%) are aware with the facility while 71 (84%) are still not aware with the facility.

### IV.   SURVEY RESULT:

#### IV.I ONLINE TICKET BOOKING (GUJARAT BUS TRANSPORT ONLINE PORTAL)



No [65]    Yes [21]
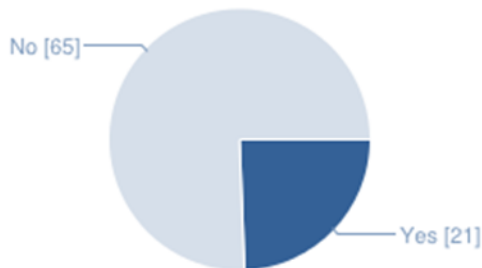
#### IV.II FOOD, CIVIL SUPPLIES & CONSUMER AFFAIRS DEPT OF GUJART GOVERNMENT



No [74]    Yes [12]

#### IV.III EGOVERNANCE AMDAVAD & EGOVERNANCE



No [71]    Yes [14]
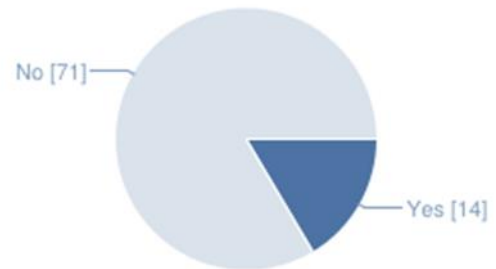
#### IV.IV OFFICIAL GUJARAT STATE PORTAL



No [65]    Yes [20]

#### IV.V GUJART VIJ COMPANY LIMITED



No [71]    Yes [14]
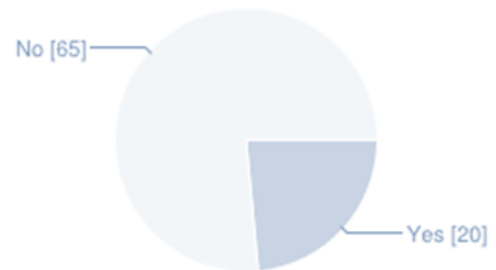
### V.   STEPS TO CREATE AWARENESS

After studying above result we have prepared one blog for creating awareness and inform the entire respondent. After a week we again took survey and we found that now people have started using the E Governance facility.
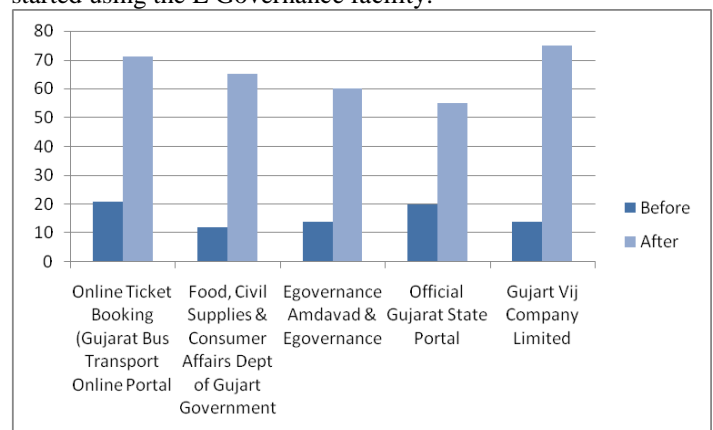
## VI.   CONCLUSION

EGovernance website is very much useful and time saving for the citizen. But awareness about the website is minimal. So we will keep posting on blog related to the EGovernance website features.  If citizen is aware with the online service then they need not required to come to office for the payment or day to day work. Most of the task can be finished on sitting on their computer at home or office. Hope all EGovernance website will continue and citizen can take as much benefit as they can.

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[7]    Online: http://www.pgvcl.com/

[8]    Online: http://www.ugvcl.com/

[9]    Online: http://www.dgvcl.com/

[10]  Website: http://www.gsrtc.in/site/Achievements.html

# Positive Psychology: An Approach to Rehabilitation of Trafficked Victims

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   *Abstract -* The subject of human trafficking has received renewed attention within the last two decades. This study was undertaken among the inmates of a destitute home run by a reputed NGO- 'Assam centre for Rural Development', Guwahati, Assam, India. The study was conducted with the following objectives-
 (A)  The role of positive psychology in helping the trafficked girls to overcome from the mental trauma and disorders like Post Traumatic Stress Disorder (PTSD), mood disorders and depression.
(B)  How their experiences affect their reintegration in the society and re-construction of their social identity
 (C) How they rehabilitate with self-confidence, esteem and improve their economic condition.
   Cases of three trafficked girls were being studied extensively and were followed till they were rehabilitated. In-depth, semi structured interviews were conducted with the victims, two key persons of the NGO and other individuals. Thematic approach has been employed in data analysis. The findings report that positive psychology, indeed, plays a stupendous role in helping the victims to recover.

*Index terms*- Positive Psychology, Human Trafficking, Rehabilitation, Reintegration

## I.   INTRODUCTION

Human trafficking has become a matter of great concern both at the national as well as the global level. According to the Institute of Integrated Development Studies (IIDS) and United Nations Development Fund for Women (UNIFEM, 2004), two million children are trafficked globally every year and almost half of them, under the age of seven, are forced to work in the sex industry. India, in addition to being a source for trafficking, is also a transit and destination country.  Trafficking patterns in India demonstrates that about 90% of trafficking in persons that is TIP is domestic (i.e. interstate and intrastate) and 10%  is international.

*Girl trafficking in the North-east - an overview*

North East region of India consists of seven states Assam, Arunachal Pradesh, Mizoram, Nagaland, Meghalaya, Manipur and Tripura- a home to 200 of the 430 odd tribal groups in the country. The seven month long study carried out by the Nedan Foundation, sponsored by the United Nations Development Programme (UNDP) observed that, trafficking in North East regions occurs at two levels- internal trafficking of children and women from conflict affected rural areas and on an international level- trafficking of women to South East Asian countries like Bangladesh, Bhutan, and Bangkok via Myanmar for various purposes like drug trafficking, labour, bar girl and prostitution. Also, NE region is the main source of domestic servants. The mushrooming domestic servant recruiting agents come to lure these unaware girls who then travel to different destinations with these traffickers. Some of the main reasons of being trafficked victims are due to ethnic group conflict, poverty, few employment opportunities, flood situation, and a look for glamorous world.

The recognition that trafficking is a serious problem has led to a number of initiatives to respond to the issues. In accordance to the legal framework in India, Article 23 of the constitution, "Guarantees right against exploitation; prohibits traffic in human beings and forced labour and makes their practice punishable under law."Although, no special schemes or surveys have been conducted in the NE region to address the issues of human trafficking, the various NGOs are involved in the anti-trafficking activities which consist of three main components- The social components of rehabilitation are intended to mainstream the disadvantaged children and marginalized or stigmatized women. The psychological components are meant to enhance the self-esteem of trafficked survivors or potential victims. Lastly, the economic components are focused on the economic empowerment of the survivors of trafficking (IIDS & UNIFEM, 2004). Among the various NGOs of the NE region let us discuss about the schemes and initiatives of a reputed NGO of Assam- 'Assam Centre for Rural Development.'

Assam Centre for Rural Development (ACRD) is a registered Non Government organization which came into existence in 1995. It includes various programmes of which UJJAWALA PROJECT deals with the Prevention **and Rehabilitation for the girls who are victims of trafficking. (Under Ministry of Women & Child Development, Govt of India.)** ACRD has been trying to generate awareness by organizing meetings on the issue of trafficking in the remote villages and also works with various psychologists in addressing the issues of the victims.  The trafficked girls are brought to the Rehabilitation Home named Nava Jeevan (new life), set

up by ACRD at village Sikarhati in Barihat, Palasbari circle of Kamrup District, Assam, where the women are kept for at least six months to one year until they are rehabilitated.

Positive psychology is the science of positive subjective experience, which studies concepts such as well-being, contentment, hope, optimism, flow and happiness and focuses on what makes life fulfilling (Sheldon & King, 2001). ACRD, in its project Ujjawala applies the tools of positive psychology and uses strategies like instilling of hope, buffering of strengths such as courage, insight, optimism, authenticity, perseverance, realism, pleasure capacity, future mindedness, personal responsibility and purpose. The ways in which ACRD helps these survivors to cope with their trauma are discussed extensively in the later sections.   .

This paper is organised in four parts. The introductory part introduces the study problem and presents the objectives of the study. The second part describes the data source and methodology of the study. While results and discussion are presented in the third part, conclusion is presented in the final part.

## II.   DATA SOURCE & METHODOLOGY

*Participants*- Three participants (trafficked girls) were interviewed and two key persons: Executive Director- Dr. Sunita  Changkakati and Vice President Dr. Krishna Sharma of ACRD acted as the door openers and provided access to the trafficked returnees as well as to their documents, who were also interviewed later.

*Research Design & Procedure*- We have used the descriptive qualitative methodology to describe the cases. Unstructured, open-ended, in-depth interviews were the main source of primary data while the document search has provided the secondary data. Firstly the key persons of the NGO were contacted and the girls were interviewed. Daily visits were made to the NGO for about 2 months (28th may-15th July, 2012) to note how the inmates respond to the therapeutic sessions. Finally after compiling all the information, thematic analysis of the data was carried out along with interpretation and reduction. The data analysis involves understanding the raw data and then breaking them into units of practical meaning that led to emergence of themes. Interview transcriptions, field notes and the documents collected were thoroughly studied and a summary was than drawn from the major themes.

*Ethical Consideration*- Since it is a sensitive topic the girls were informed about the interview beforehand and were asked to come forward voluntarily without any selection process. It was also clarified that the information provided by them will only be used for study purpose and will be completely confidential in order to avoid any negative impact on their life.

*Limitation*- This study does not represent the situation of the entire country which consists of more diverse and complex groups of people. Also the participants could not be pressurized to answer questions on sensitive issues.

## III.   RESULTS AND DISCUSSION

As stated previously, three survivors were being interviewed. To protect the identity, each informant is referred to as a case. Details of each case are as follows-

CASE 1, (20 years) was promised a job in Mumbai, by her cousin, in the tailoring industry but was instead sold to a brothel in Mumbai, at the age of 16. She stayed in Mumbai for about a year and then was moved to another brothel in Kolkata where she stayed for 3 years. Finally after four years the police rescued her in a police raid,   and brought her back to Assam but she refused to go back to her family. So she was handed over to ACRD where she is currently staying. Today she is an active member of the NGO, helping the other survivors to cope up. She is planning to start her own retail shop and also get married to the man of her choice whom she is currently seeing.

CASE 2, (27years) was trafficked at the age of 18 years. She was lured by a man who promised to marry her and eloped with her. But instead he sold her to a brothel in Mumbai. She stayed there for 3 years and then voluntarily moved to Agra to earn more money, where she stayed for the next 4 years. She somehow managed to escape from one of the agents, by jumping on to a moving train when they were taking her to a far off place. She contacted the police and came back to Assam and landed up in ACRD. Today she is an active member and also a peer educator in the NGO. (Peer educator is to support the other returnees).

CASE 3, (20 years), was trafficked at the age of 16 to Delhi. She was lured by a trafficker, who promised her step father to get her a job in the carpet industry. But as the story goes, she was sold to a brothel, where she stayed there for two years. Finally, she managed to escape with the help of some kind Assamese boys who enrolled her in the NGO. She is a new member in ACRD and is still going through the process of recovery. She is also a victim of post traumatic stress disorder (PTSD) and is having daily sessions with the psychologist.

As stated earlier, from the raw data, we have derived the three broad themes: a) understanding the trafficked experiences of the victims b) the rescuing experience c) experience of rehabilitation and the role of positive psychology in it.

*a) Understanding the trafficked experience of the victims-*

The victims face various types of torture, humiliation, and lose their self identity and respect. Hence it is of great importance to understand the experiences of these survivors. In the interview, they were asked to narrate about their emotion, fears, expectations and anything that they wish to reveal.

(Case 1) says,
*Every day I was beaten and was forced to sleep with 10 clients per night. I used to starve as I was given very little food to eat. 'Malkini' (the owner) poured hot and cold water over my body to get rid of the scars. I was forced to drink 'laupani' (alcohol). I had to put on a lot of makeup and wear pretty clothes and then go around with the clients. If I refused, I was threatened that I would be hanged.*

Case 2 also shared her experience of getting pregnant and having an abortion:
*I became pregnant once in the brothel but I could not go for abortion, as it was too late. Even during pregnancy, I had to satisfy clients. I delivered the baby in the brothel but since they did not feed the baby well, it died.*
 She even recalls that:
*Our owner used to give us contraceptive pills so that we do not conceive. Because of the frequent usage of the pills, I used to feel dizzy and weak. But no one cared. We were treated as machines which are made to give pleasure.*

Case 3, silently weeps and recalls:
*Once a little girl of 7 years was forced to satisfy a client but she refused it. The pimp physically tortured her and raped her several times. I was angry and sad and disappointed and felt helpless. I spent nights crying, thinking of the trauma that she had to go through.*

The victims were tortured in many ways. They had to serve many clients in a night. The constant use of contraceptive pills made them extremely weak and fragile. Many of the girls suffered from Sexually Transmitted Diseases (STDs) and also from other diseases like tuberculosis, jaundice etc. Indeed the statements of the informants demonstrate the presence of psycho-socio and mental tortures committed to trafficked women and girls. While Case 3, narrated the tale of the little girl, she was deeply disturbed and got aggressive and had to be calmed. She even mentioned that nights after she encountered the incident, she could not sleep and had disturbing dreams, which are clear signs of PTSD. Moreover the Vice President of the NGO stated that, these girls were trapped in a never ending debt cycle because the relatives who sold them, frequently visits the agents and claim for more money. As a result, the girls are abused even more to clear off the debts. He succinctly stated: "*Once sold it is forever*".

To sum up, we can say that the narratives of the victims clearly states that the trafficked girls go through a lot of physical and mental stress. They are forced to work against their will, locked in rooms, forced to use drugs, and hence they faced all kinds of humiliation, depression, mood disorders which ultimately leads to their loss of identity.

*b) Rescuing Experience*

In this study the informants stated that, they were rescued through various means. They rescued themselves, or with the help of police or with the support of local boys. Here all three of them have different rescuing experiences but the common thing that all three of them accepted was, "we believed and were optimistic about returning back."

However, it was sad enough that, even after being informed about the rescue of the girls, many parents did not respond. Case 3 recalls:
*I was overjoyed with the idea of going back home. But my father and mother refused to recognise me and told that I am no more alive for them. They had no emotions…… I believe, staying in ACRD was my best decision* (sighs).

However, interview with the key persons revealed that there were many cases where the parents accepted their daughters and even helped the police to track the agents. But in most of the cases, the girls refuse to reintegrate in the society due to fear of their family honour being ruined. Also, it was found that, those who were supported by their parents recovered much faster and developed self respect and identity. Hence, both the key persons stated that establishing familial contacts, and counselling the family members, is also a responsibility, taken care by ACRD.

Thus, we can sum up by saying that, these trafficked girls are perceived as objects and treated with no respect at all which demoralises them, leading to low self esteem and loss of personal identity. They get conditioned to the fact that they are not respectable citizens and hence get comfortable with the idea of people calling them out with names and abusing them. Indeed this has given rise to the questioning of their own self identity as to who they are, can they lead a normal life, should they be treated as equals and so on.

*c) Experience of rehabilitation in ACRD and the role of Positive Psychology*

All three victims stated that, although they wanted to escape but were reluctant to think of any such plans due to the threatening of the brothel owners and the agents. During the rescuing process they have developed a certain understanding of their

self. Moreover they were also scared of the social stigma, shame and the fear of rejection that they and their family might have to face and hence they found themselves in the dilemma. Case 1 comments:

*I did not want to go back to my family after staying 7 years in a brothel. I did not want my siblings to face problems because of me. I have a younger sister, and my return would have been a huge problem in her marriage.*

They happily agreed that life for them in ACRD has been a wonderful experience. It has given a new meaning to their life and has helped them gain confidence and most importantly, self esteem.

As described above, UJJAWALA PROJECT works for the prevention and rehabilitation of the girls who are victims of trafficking. And positive Psychology is the science of positive subjective experience. Frederickson (1998) have also stated that positive emotions also build physical, intellectual and social resources which increase survival. Promoting positive feelings enable the individual to develop psychologically and emotionally, and physically. (Seligman & Pawelski, 2003). So thus we see, building positive emotions with sexual abuse survivors is a goal that should be pursued in therapy, as desensitization work with the survivors is not enough to build back their strengths. Individuals who have experienced sexual abuse may also have a poor self-image, lower self-esteem, relationship difficulties and other characteristics that can affect their sense of self and their interaction with others. Helping clients who have experienced sexual abuse to construct positive emotions could support them in communicating differently with themselves and with others. (Hansen *et.al,* 1998).

Ujjawala Project, in its various schemes, has made wide use of positive psychology and its tools to address the issue of human trafficking. Some of the ways are:

The survivors are encouraged to narrate their life stories and also retelling them from a new perspective. They are kept busy and are taught to sing, perform drama, recitation, dances, to play indoor and outdoor games etc. The girls are imparted training on different income generating activities like hand loom, tailoring, doll making, flower making and beautician course etc. so that they can earn income through these trades and lead a better and dignified life. Prayer, meditation, physical exercises, indoor and outdoor games, etc are also day to day activities of the girls to keep them engaged and forget their past. Some of the other facilities provided to the inmates in Nava jeevan are non formal schooling for both the illiterate and literate girls so that they can read and write in Assamese and English. A library has been set up for the girls to study books on various subjects. The inmates are provided legal support service in case of requirement at Nava jeevan. Some of the girls have been engaged in different jobs after they have completed their stay in Nava Jeevan. It has been found after follow up study that a few girls have got married and lead a normal life with their spouses. Many girls have started small enterprises by opening tailoring, beautician work, hand loom etc. after going back to their villages.

**Table 1- Girls rescued and trained by ACRD**

| 1. | Total no. Of girls rescued and trained in Nava jeevan | 201 |
|----|--------------------------------------------------------|-----|
| 2. | Presently no. Of girls residing at Nava jeevan | 25 |
| 3. | No. Of girls so far trained in different trades | |
| A. | Beautician | 22 |
| B. | Weaving | 20 |
| C. | Tailoring | 75 |
| D. | Soft toy making | 8 |
| 4. | No. Of girls who started small enterprises after returning to their villages | |
| A. | Beauty parlour | 9 |
| B. | Tailoring shop | 10 |
| C. | Weaving unit | 3 |
| D. | Sales girls/ guards | 6 |
| E. | Got married | 25 |
| F. | Re admitted to school and continued education | 23 |



Fig.1. Handloom training



Fig. 2. Tailoring

*Measuring Subjective well-being and strengths of character*

A person's cognitive and affective evaluations of his or her life are subjective well being." (Diener et al. 2002) According to Lubin & Van Whitlock (2004 ), considering the components of well-being—the presence of positive emotion, the absence of negative emotion, and a cognitive judgement of satisfaction and fulfilment- is important to all individuals and even to the most troubled ones. A happy and engaged life consists of using one's strengths and talents to achieve flow. Also one must measure one's own positive character traits like, interests, talents, and strengths. The ACRD psychologist, encourages the girls to write about their positive experiences, their strengths, things that they love, what makes them proud of themselves etc, for 20 minutes, on three consecutive days, for several weeks. This helps the girls to identify their own strength and power. Also the girls were asked to write about five things for which they were thankful. The girls reported feeling better about the lives in general, more optimistic about the coming week and being more connected to others.

Such exercises make the girls happier and less depressed. They were higher in life satisfaction and positive effect. The survivors are taught to use their own strengths and look forward to their lives with hope and optimism. They are also given the task of writing stories about themselves, portraying themselves to be the best.

Moreover, these positive interventions build pleasure, engagement and meaning. Feelings of positive emotions like gratitude, love, kindness, buffer individuals from stress. Thus we see positive strategies are active and specific ingredients for a normal, healthy life. It helps an individual to use one's strengths and face challenges.

## IV.  CONCLUSION

This study identifies that the girls go through tremendous pressure, humiliation and trauma, both physically and mentally. Even after getting rescued, due to fear of stigma and rejection by the society, they refuse to reintegrate back to their earlier lives. But I/NGOs play a great role in rehabilitating the girls.  We have especially discussed upon the schemes and projects of ACRD. Here we have examined the stupendous role played by positive psychology in helping the victims come back to lives. Also it is important to raise awareness on the issues of trafficking and the various rights that a victim has in the society. We must view the victims positively and help them build up confidence and self respect.

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# Effective Utilization of Crusher Dust in Concrete Using Portland Pozzolana Cement

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***Abstract-*** The purpose for taking up this investigation owing to the fact that now a days natural sand confirming to Indian Standards is becoming scarcer and costlier due to its non availability in time because of Law of Land, illegal dredging by sand mafia, accessibility to the river source during rainy season, non confirming with IS 383-1970. Hence the present investigation was taken up with a view to verify the suitability, feasibility and potential use of crusher dust, a waste product from aggregate crushing plant in concrete mixes, in context of its compressive strength and workability and in terms of slump, compacting factor, flow table and modified flow respectively.

In view of above discussion, an attempt is made to replace the natural sand in concrete control mixes of M25 and M30 grades designed for 100 to 120mm slump at replacement levels of 30%, 40%, 50% and 60% using Portland Pozzolana Cement. There were in all 5 mixes in each grade of concrete including control mix and four mixes with crusher dust as a partial replacement of natural sand.

It was observed that with use of crusher dust at all replacement levels, the workability of concrete was reduced from 1-6%. From the test results, it was observed that the replacement of natural sand by crusher dust increased the compressive strength of concrete by 5-22%. It was also found that amongst all the mixes, the highest compressive strength was obtained for 40% replacement of sand by crusher dust. Hence it could be concluded and recommended that crusher dust could be effectively used in concrete of above grades for replacement levels of sand by 30-60% economically leading to sustainable development.

***Index Terms-*** Crusher dust, sand, workability, strength.

## I. INTRODUCTION

Concrete is a composite material composed of coarse granular material (the aggregate or filler) embedded in a hard matrix of material (the cement or binder) that fills the space among the aggregate particles and glues them together. The usage of concrete, worldwide, is twice as much as steel, wood, plastics, and aluminium combined. Concrete's use in the modern world is only exceeded by the usage of naturally occurring water. The economy, efficiency, durability, moldability and rigidity of reinforced concrete make it an attractive material for a wide range of structural applications.
Concrete is widely used for making architectural structures, foundations, brick/block walls, pavements, bridges/overpasses, motorways/roads, runways, parking structures, dams,

pools/reservoirs, pipes, footings for gates, fences and poles and even boats. Combining water with a cementitious material forms a cement paste by the process of hydration. The cement paste glues the aggregate together, fills voids within it, and makes it flow more freely.

Aggregate is one of the important constituents which has effect in strength development in the theory that the gaps of coarse aggregate is filled by the fine aggregate and the gaps of fine aggregate is filled by the binding materials. In addition the strength of concrete mainly depends on water/cement ratio, aggregate gradation, and aggregate size and shape, cement quality, mixing time, mixing ratios, curing etc. Concrete must be both strong and workable, a careful balance of the cement to water ratio is required when making concrete. Fine aggregate are basically sands won from the land or the marine environment. Fine aggregates generally consist of natural sand or crushed stone with most particles passing through a 9.5mm sieve. For concrete sand fineness modulus range is 2.3-3.1.

Among these ingredients river sand is commonly used as fine aggregate in concrete which is becoming scarce and hence expensive due to excessive cost of transportation from natural sources. The large scale depletion of these sources creates serious environmental problems. So Governments are restricting the collection of river sand from river bed. In such a situation the crusher dust can be an economical alternative to river sand. Crusher dust is a byproduct generated from quarrying activities involved in the production of crushed coarse aggregate. The residue from stone crusher is further washed with water to remove the excess fines so that the fraction confirming to the IS 383 – 1970 specifications can be extracted. It is possible to use such manufactured sand as fine aggregate in concrete which will reduce not only the demand for natural river sand but also the environmental burden.

All along India, we have been using natural sand. The volume of concrete manufactured in India has not been much, when compared to some advanced countries. The infrastructure development such as express highway projects, power projects and industrial developments have started now. Availability of natural sand is getting depleted and also it is becoming costly. Concrete industry now will have to go for crushed sand or what is called manufactured sand.

So far, crushed sand has not been used much in India for the reason that ordinarily crushed sand is flaky. Badly graded rough textured and hence result in production of harsh concrete for the given design parameters. We have been not using superplasticizer widely in our concreting operations to improve the workability of harsh mix. For the last about 4 to 5 years the old methods of manufacturing ordinary crushed sand have been

replaced by modern crushers specially designed for producing, cubical, comparatively smooth textured, well graded sand, good enough to replace natural sand.

## II. MATERIALS USED

PPC confirming to IS 1489-1991 part 1 was used in the experiment. Coarse aggregates of 10 mm and 20 mm size and Identify the constructs of a Journal – Essenti

natural sand confirming to zone III was used. Crusher dust confirming to zone I was also used as a partial replacement of natural sand at the replacement levels of 30%, 40%, 50% and 60%. The physical and chemical properties of all these materials were tested as per IS 383-1970.

### Table 1. Test Results on Cement

|    | Particulars | Test Results | Requirements of IS:1489-1991 (Part 1) |
|----|-------------|--------------|----------------------------------------|
| 1. | Standard Consistency (%) | 32 | |
| 2. | Setting Time (minutes)<br>   a. Initial<br>   b. Final | <br>240<br>335 | <br>30 Min<br>600 Max |
| 3. | Soundness<br>   a. Le-Chat Expansion (mm) | <br>1.0 | <br>10.0 Max |
| 4. | Compressive Strength (MPa)<br>   a. 72 +/- 1hr. (3 days)<br>   b. 168 +/- 2hr. (7 days)<br>   c. 672 +/- 4hr. (28 days) | <br>30.5<br>40.3<br>55.2 | <br>16 Min<br>22 Min<br>33 Min |
| 5. | Drying Shrinkage (%) | UT | 0.15 Max |
| 6. | % of Fly Ash addition | 20.00 | 15.0 Min<br>35.0 Max |

### Table 2. Physical Properties of Aggregates

| Particulars | Specific Gravity | Water Absorption |
|-------------|------------------|------------------|
| Coarse Aggregate (10 mm) | 2.89 | 0.66 % |
| Coarse Aggregate (20 mm) | 2.93 | 0.90 % |
| Sand | 2.58 | 1.20% |
| Crusher Dust | 2.65 | 0.84% |

### Graph 1. Grading Curve of Natural Sand.

**Graph 2. Grading Curve for Crusher Dust.**
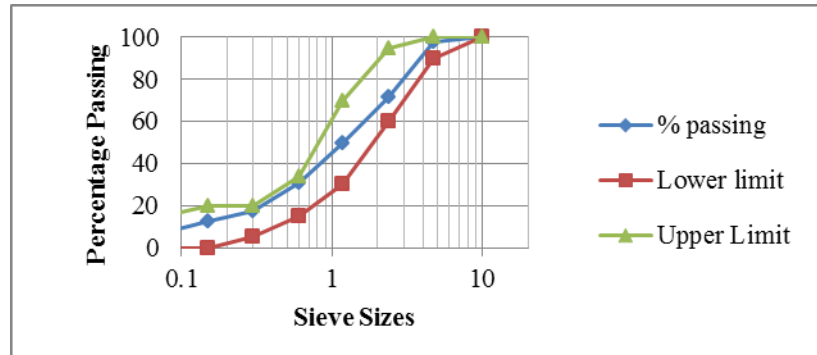


**Graph 3. Combined Grading Curve**
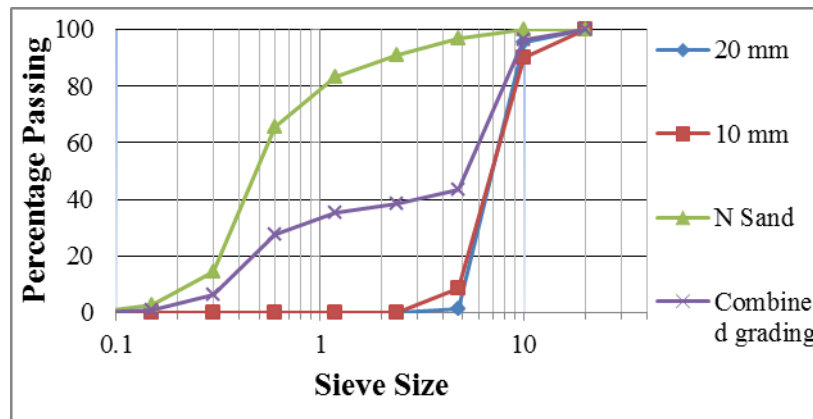


**Experimental Methodology:**

Prior to starting the experimentation, mix design of M25 and M30 were carried out as per IS 10262-2009. The engineering properties of concrete mixes such as slump, flow table test, compacting factor test, modified flow test were carried out as per IS 1199-1959 and compressive strength test were carried out as per 516-1959.

A total of 120 specimens were cast and tested after 7 and 28 days of curing. The modified flow test apparatus is a patented apparatus developed by VNIT.

**Table 3. Design Mixes (M25 Grade Concrete)**

| Mixes | Control Mix | 70:30 | 60:40 | 50:50 | 40:60 |
|---|---|---|---|---|---|
| w/c ratio | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Cement (kg/m$^3$) | 440 | 440 | 440 | 440 | 440 |
| Water (kg/m$^3$) | 220 | 220 | 220 | 220 | 220 |
| Coarse Agg (kg/m$^3$) | 1206 | 1206 | 1206 | 1206 | 1206 |
| Sand (kg/m$^3$) | 776 | 544 | 486 | 393 | 314 |
| Crusher Dust (kg/m$^3$) | 00 | 240 | 340 | 420 | 494 |

**Table 4. Design Mixes (M30 Grade Concrete)**

| Mixes | Control Mix | 70:30 | 60:40 | 50:50 | 40:60 |
|---|---|---|---|---|---|
| w/c ratio | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 |
| Cement (kg/m$^3$) | 500 | 500 | 500 | 500 | 500 |
| Water (kg/m$^3$) | 225 | 225 | 225 | 225 | 225 |
| Coarse Agg (kg/m$^3$) | 1156 | 1156 | 1156 | 1156 | 1156 |
| Sand (kg/m$^3$) | 731 | 519 | 464 | 336 | 303 |
| Crusher Dust (kg/m$^3$) | 00 | 236 | 330 | 416 | 461 |

III.   RESULTS AND OBSERVATIONS

**Table 5. Compressive strength test results**

| SI. NO | CONCRETE MIX | CUBE COMPRESSIVE STRENGTH (150X150X150MM) MPa | | CUBE COMPRESSIVE STRENGTH (100X100X100MM) MPa | |
|--------|--------------|------------|------------|------------|------------|
| | | 7 DAYS | 28 DAYS | 7 DAYS | 28 DAYS |
| 1 | M25 CONTROL MIX | 21.13 | 31.84 | 25.5 | 35.2 |
| 2 | M25 70 : 30 (C1) | 21.65 | 34.47 | 25.7 | 41.2 |
| 3 | M25 60 : 40 (C2) | 22.47 | 38.96 | 28.3 | 43.7 |
| 4 | M25 50 : 50 (C3) | 21.32 | 37.74 | 28.1 | 42.9 |
| 5 | M25 40 : 60 (C4) | 21.64 | 33.4 | 26.3 | 41.4 |
| 6 | M30 CONTROL MIX | 27.86 | 39.84 | 29.8 | 41.5 |
| 7 | M30 70 : 30 (C5) | 27.92 | 41.93 | 29.1 | 45.1 |
| 8 | M30 60 : 40 (C6) | 28.19 | 46.19 | 30.4 | 48.7 |
| 9 | M30 50 : 50 (C7) | 27.6 | 44.81 | 29.8 | 46.2 |
| 10 | M30 40 : 60 (C8) | 27.89 | 43.26 | 29.5 | 43.3 |

**Graph 4. Comparison of compressive strength of concrete**
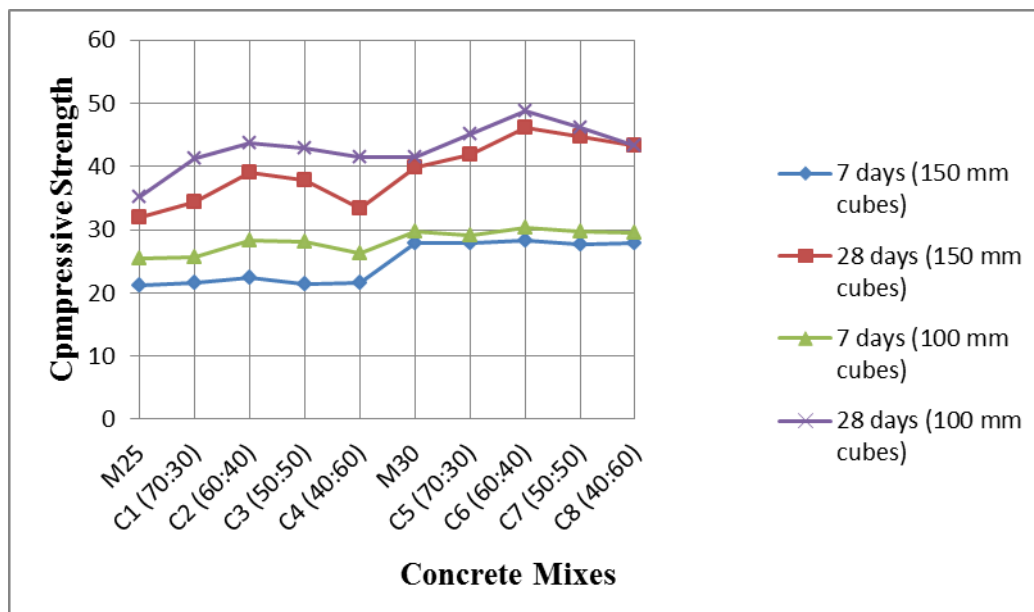
**Table 6. Test results on the properties of fresh concrete**

| SI. NO | CONCRETE MIX | SLUMP FLOW (MM) | COMPACTING FACTOR TEST | FLOW TABLE TEST (%AGE) |
|---|---|---|---|---|
| 1 | M25 CONTROL MIX | 100 | 0.98 | 18 |
| 2 | M25 70 : 30 (C1) | 100 | 0.97 | 16 |
| 3 | M25 60 : 40 (C2) | 100 | 0.96 | 20 |
| 4 | M25 50 : 50 (C3) | 110 | 0.95 | 18 |
| 5 | M25 40 : 60 (C4) | 110 | 0.93 | 18 |
| 6 | M30 CONTROL MIX | 100 | 0.98 | 18 |
| 7 | M30 70 : 30 (C5) | 100 | 0.96 | 18 |
| 8 | M30 60 : 40 (C6) | 100 | 0.95 | 20 |
| 9 | M30 50 : 50 (C7) | 100 | 0.94 | 18 |
| 10 | M30 40 : 60 (C8) | 110 | 0.92 | 18 |

**Graph 5. Slump test**
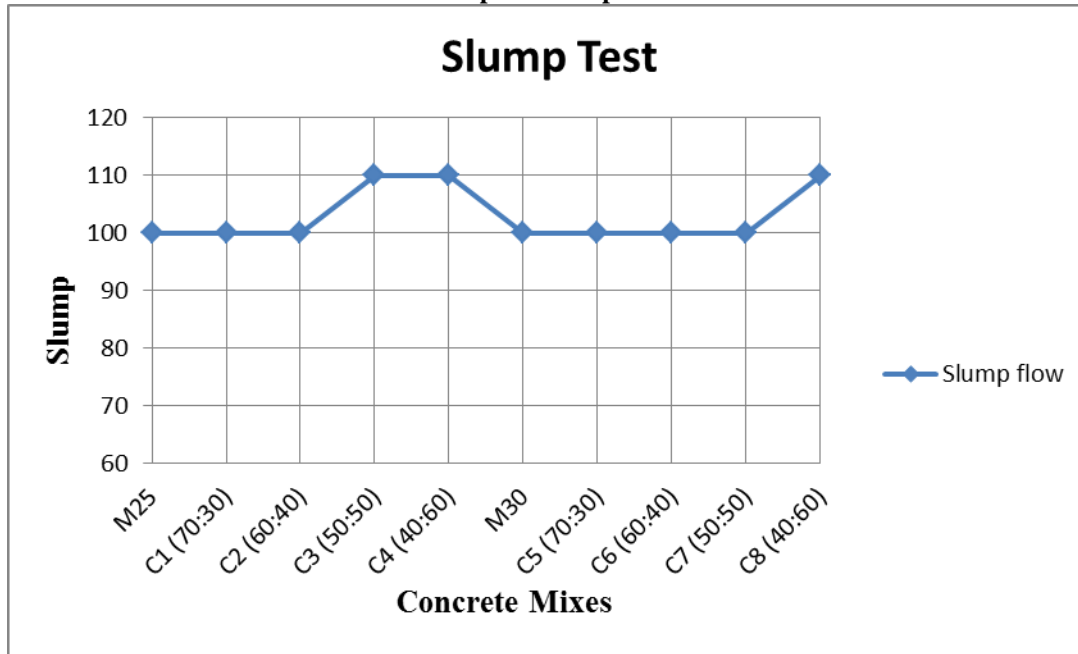
**Graph 6 Comparison of compacting factor test on M25 grade concrete mixes**
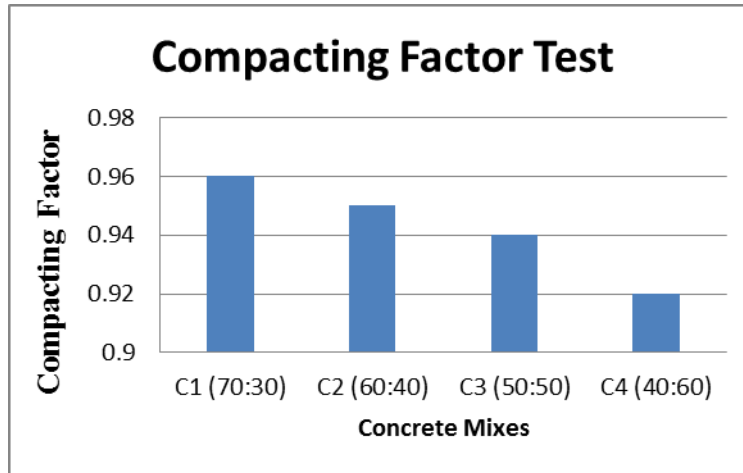


**Graph 7 Comparison of compacting factor test on M30 grade concrete mixes**
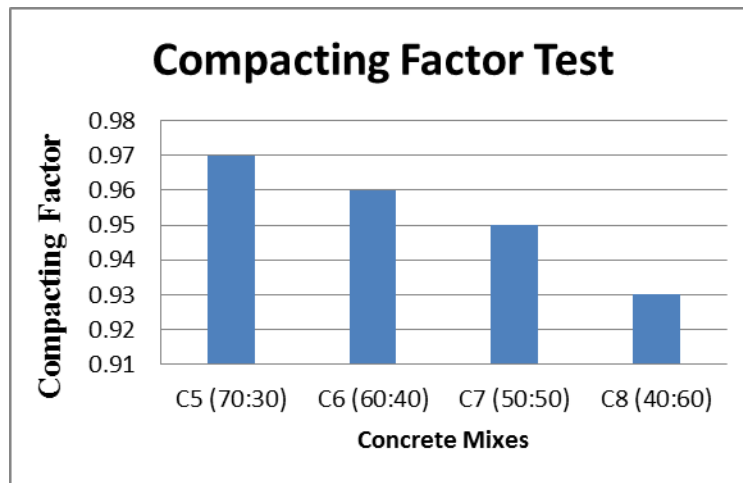


**Graph 8 Comparison of flow table test on M25 grade concrete mixes**
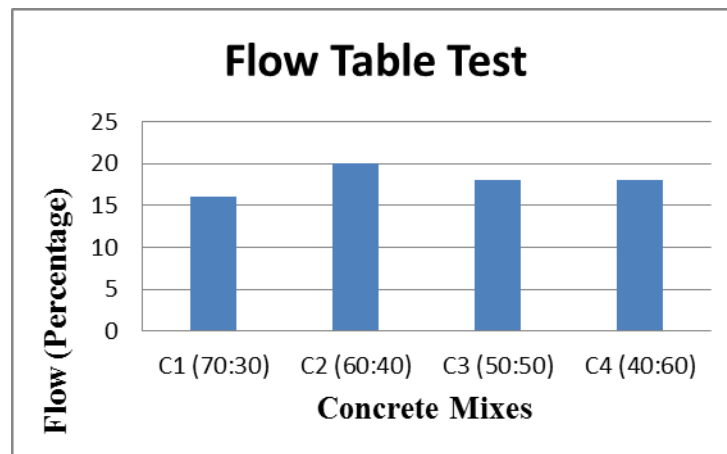
**Graph 9. Comparison of flow table test on M30 grade concrete mixes**
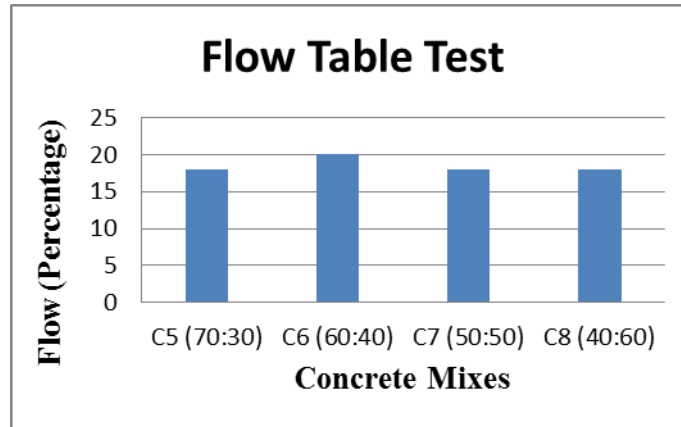


**Table 7. Flow properties of concrete at different chute inclinations**

| SI. NO | CONCRETE MIX | FLOW AT DIFFERENT ANGLES (m/s) | | |
|--------|--------------|-------------------------|---------|---------|
| | | $15^0$ Angle | $30^0$ Angle | $45^0$ Angle |
| 1 | M25 | | | |
| 2 | M25 70 : 30 (C1) | 0.035 | 0.074 | 0.122 |
| 3 | M25 60 : 40 (C2) | 0.033 | 0.071 | 0.121 |
| 4 | M25 50 : 50 (C3) | 0.033 | 0.069 | 0.117 |
| 5 | M25 40 : 60 (C4) | 0.032 | 0.064 | 0.113 |
| 6 | M30 | | | |
| 7 | M30 70 : 30 (C5) | 0.034 | 0.072 | 0.121 |
| 8 | M30 60 : 40 (C6) | 0.032 | 0.069 | 0.118 |
| 9 | M30 50 : 50 (C7) | 0.031 | 0.066 | 0.115 |
| 10 | M30 40 : 60 (C8) | 0.029 | 0.063 | 0.11 |

**Graph 10. Comparison of flow properties of M25 grade concrete mixes**
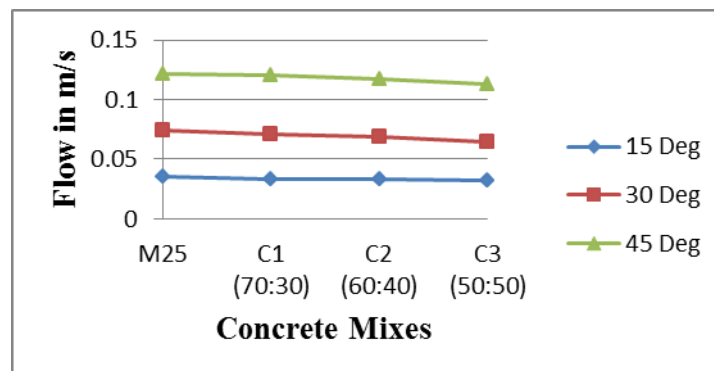
**Graph 11. Comparison of flow properties of M30 grade concrete mixes**
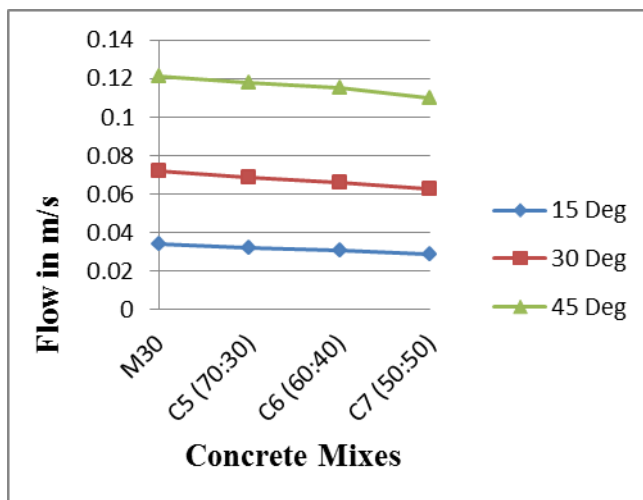


**Table 8. Density of fresh and hardened concrete**

| SI. NO | CONCRETE MIX | PLASTIC DENSITY | DEMOULDED DENSITY | 7 DAY DENSITY | 28 DAY DENSITY |
|---|---|---|---|---|---|
| 1 | M25 CONTROL MIX | 2585 | 2492 | 2549 | 2552 |
| 2 | M25 70 : 30 (C1) | 2638.5 | 2567.4 | 2593.9 | 2598.2 |
| 3 | M25 60 : 40 (C2) | 2656.8 | 2589.9 | 2613.1 | 2614.3 |
| 4 | M25 50 : 50 (C3) | 2652.3 | 2562.8 | 2591.5 | 2594.4 |
| 5 | M25 40 : 60 (C4) | 2632.1 | 2539.3 | 2582.1 | 2588.3 |
| 6 | M30 CONTROL MIX | 2616.3 | 2543.3 | 2568.2 | 2575.8 |
| 7 | M30 70 : 30 (C5) | 2651.4 | 2583.5 | 2623.2 | 2629.5 |
| 8 | M30 60 : 40 (C6) | 2678.6 | 2596.4 | 2637.2 | 2641.3 |
| 9 | M30 50 : 50 (C7) | 2663.1 | 2571.4 | 2622.4 | 2629.4 |
| 10 | M30 40 : 60 (C8) | 2645.2 | 2568.3 | 2615.8 | 2620.2 |

**Graph 12. Comparison of density of M25 grade concrete mixes**
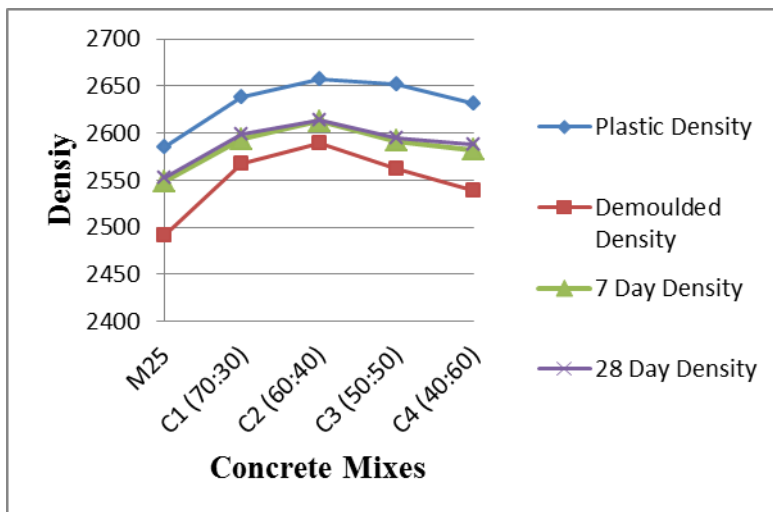
**Graph 13. Comparison of density of M30 grade concrete mixes**
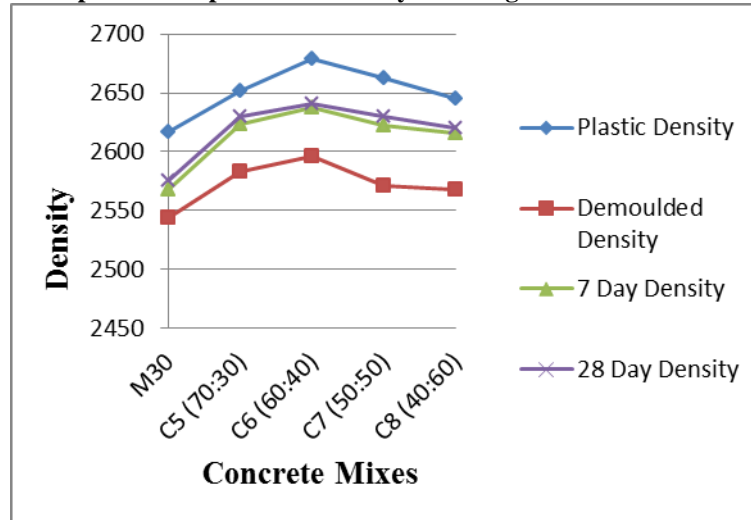


## IV.    CONCLUSION

Based on the results of the experimental investigation, following conclusions could be drawn as follows

The compressive strength of M25 concrete mix had increased by 22% with the use of crusher dust at 40% replacement of natural sand. The compressive strength of all mixes i.e., a partial replacement of natural sand with crusher dust at the levels of 30%, 40%, 50% and 60% showed an increase in compressive strength by 8.26%, 22.34%, 18.53% and 4.9% respectively.

The compressive strength of M30 concrete mix had increased by 16% with the use of 40% replacement of natural sand by crusher dust. The compressive strength of all mixes i.e., a partial replacement of natural sand with crusher dust at the levels of 30%, 40%, 50% and 60% showed an increase in compressive strength  by 5.25%, 16%, 12.5% and 8.9% respectively.

Compacting factor test results show that there is a decrease in workability with the increase in quantity of crusher dust as a partial replacement of natural sand. The compacting factor test results for a partial replacement of natural sand by crusher dust at the levels of 30%, 40%, 50% and 60% was 0.97, 0.96, 0.95 and 0.93 respectively for M25 grade concrete mixes. Similarly, for M30 grade of concrete mixes, the compacting factor test results for a partial replacement of natural sand by crusher dust at the levels of 30%, 40%, 50% and 60% was 0.96, 0.95, 0.94 and 0.92 respectively. The workability can be increased by using plasticizers.

The round shape and smooth surface texture of natural sand reduces the inter particle friction in the fine aggregate component so that the workability is higher in natural sand. Manufactured sand particles are angular in shape and their rough surface texture improves the internal friction in the mix. Because of that the workability is reduced.

The maximum fresh and dry densities are maximum for concrete mixes containing 40% crusher dust as partial replacement of natural sand. The increase in density might also be increasing the compressive strength due to better particle packing.

The amount of fine particle present ensures effective packing and large dispersion of cement particles thus fomenting better hydration conditions moreover the dust particles completed the matrix interstices and reduce space for free water the combination of among the concrete components. This may achieved by adding plasticizers for workability by reducing the water cement ratio. With this we can achieve more workability, compaction and more strength. We can produce high performance concrete.

The modified flow test results indicate that as the crusher dust quantity increases, the velocity of the flow is also increased.

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424

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# Design and Analysis of Stepped Impedance Microstrip Low Pass Filter Using ADS Simulation Tool for Wireless Applications

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*Abstract-* There is an increasing demand for microwave systems to meet the emerging telecommunication challenges with respect to size, performance and cost. This project describes a general design technique for micro strip low pass filters that are used to convey microwave frequency signals. The parasitic problems of X- band can be adjusted through impedance ratio K, which can enhance the performance of harmonic suppression. The ADS simulation tool is used to design an X-band stepped impedance low pass filter of range 8-12 GHz. This simulation results show that the filter works on 10GHz at the center frequency and achieves attenuation of 60dB, which effectively suppresses the parasitic bands. To attain the filter with these characteristics, Insertion Loss Method is performed. Compared to other filter types, this design works very well with excellent harmonic suppression performance.

*Index Terms*- ADS, Attenuation, Harmonic suppression Insertion loss, Micro strip, Stepped impedance.

## I. INTRODUCTION

Micro strip is a type of electrical transmission line, which can be fabricated using printed circuit board [PCB] technology, and is used to convey microwave-frequency signal. It consists of a conducting strip separated from a ground plane dielectric layer known as the substrate.   Micro strip is much less expensive than traditional waveguide technology, as well as being far lighter and more compact.  The disadvantages of micro strip compared with waveguide are the generally lower power handling capacity, and higher losses.

Also, unlike waveguide, microstrip is not enclosed, and is therefore susceptible to cross talk and unintentional radiation. For lowest cost, microstrip devices may be built on an ordinary FR-4 (standard PCB) substrate.   However it is often found that the dielectric losses in FR-4 are too high at microwave frequencies, and that the dielectric constant is not sufficiently tightly controlled.   For these reasons, an alumina substrate is commonly used.   On a smaller scale, micro strip transmission lines are also built into monolithic microwave integrated circuits [MMIC] s.

Micro strip lines are also used in high-speed digital PCB designs, where signals need to be routed from one part of the assembly to another with minimal distortion, and avoiding high cross talk and radiation.  A stripline circuit uses a flat strip of metal, which is sandwiched between two parallel ground planes. The insulating material of the substrate forms a dielectric.

The width of the strip, the thickness of the substrate and the relative permittivity of the substrate determine the characteristic impedance of the strip, which is a transmission line.   In the general case, the dielectric material may be different above and below the central conductor to prevent the propagation of unwanted modes; the two ground planes must be shorted together. Most communication systems require an RF front end, where RF filters and low noise amplifiers perform analog signal processing.   Micro strip RF filters are commonly used in receivers and transmitters operating in 800 MHz    to   30 GHz frequency range. In this project, a design of prototype lowpass filter and its implementation to microstrip line is done and responses are analyzed.   Joining together two micro strip transmission lines with different characteristic impedances forms fundamental micro strip low pass filter.   The design is performed in Advanced Design System software.

## II. DESIGN AND MATHEMATICAL CALCULATION

In microwave filters, lumped elements of the of filter circuit sections are simulated by means of waveguides, coaxial lines, strip (or) micro strip lines, cavity resonators, etc. [2].The equivalent lumped elements values of the microwave components are themselves functions of the frequency [2].

There are two design techniques properly used.
1) Image parameter method.
2) Insertion loss method.   .

### A. *Advantage of Insertion Loss Method*

Insertion Loss method complete specification of a physically realizable frequency characteristic over the entire pass and the stop bands from which the microwave filters are synthesized.

### B. *Low-Pass Design*

Basic design of microwave filters of type's low-pass, band-pass and band-stop, operating at arbitrary frequency bands and

between arbitrary resistive loads, are made from a prototype low-pass design through:

1) Some frequency transformer,
2) Element normalization and Simulation of these elements by means of sections of microwave transmission line,
3) Design of a prototype low-pass filter with the desired pass band characteristics,
4) Transformation of this prototype network to the required type (low-pass, high-pass, band-pass) filter with the specified center and band-edge frequencies.
5) Realization of the network in microwave form by using sections of microwave transmission lines.

C. *Flow Diagram to Design a Filter*
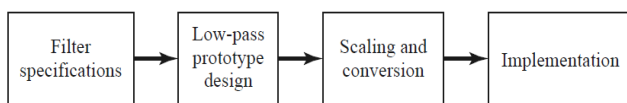


Fig 1 Design flow diagram

D. *Filter Specifications*

| Response type | Butterworth (or) maximally flat |
|---|---|
| Centre frequency | 10GHz |
| Stop band attenuation | -60db |
| Source and load impedance | 50 ohm |
| Substrate height | 0.63mm |
| Dielectric constant | 9.6 |

## III. DESIGNING STEPS FOR LOW PASS FILTER IN ADS

STEP.1
We choose order of the filter to be 7, N = 7.
There are two responses to assign prototype values for designing.
1) Butter worth (maximally flat) filter,
2) Chebyshev filter.
For Butterworth response we use the specific formula to determine prototype values. The formula is
Butterworth Prototype Element Values

$g_o = 1$
$g_k = 2\sin[(2k-1)\pi/2n]$,      k=1,2,…..,n
$g_{n+1} = 1$,      for all n

STEP.2: **Filter** Transformations from Prototype

In order to design actual low pass filters, the transformations of the low pass prototype filters with normalized cut-off frequency, $W_c = 1$ and having the source and load resistances of 1ohm are made into the desired type with Required source and load impedances using frequency and impedance transformations.

Formula to calculate $L_K$ and $C_K$

| PROTOTYPE ELEMENT | LOW-PASS FILTER |
|---|---|
| SERIES ARM  gk | $Lk = gk\, z_l/wc$ |
| SHUNT ARM  gk | $Ck = gk/zl\, wc$ |

The values are shown in table below

| Prototype element values | Corresponding L and C Values |
|---|---|
| g1= g7=0.445 | L1=L7=2.225nH |
| g2=g6=1.247 | C2=C6=2.494pF |
| g3=g5=1.802 | L3=L5=9.01nH |
| g4=2 | C4=4pF |

STEP 3: By Substituting all these L and C values in the network design, we have;
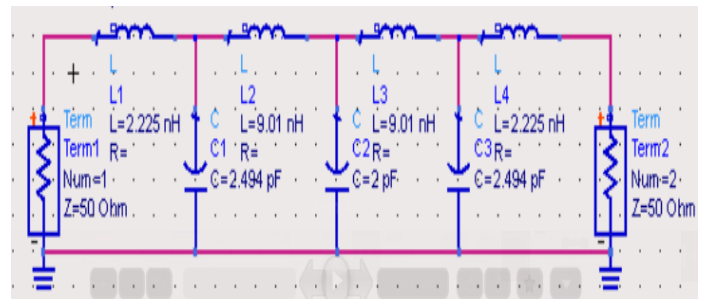


Fig 2 Schematic diagram of LPF using L&C values in network
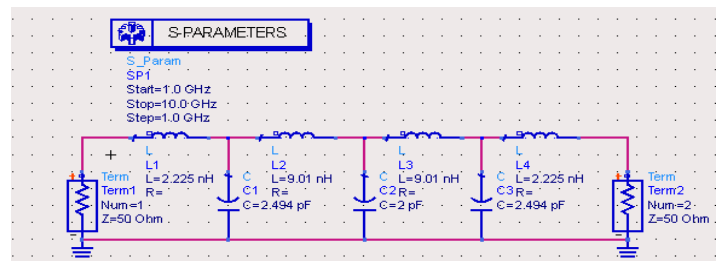


**Fig 3 Schematic diagram of LPF with S parameters**

Schematic diagram of LPF using L&C in network with S-parameter. The design is being synthesized and "display window" is being created.
Output waveform of LPF using lumped elements
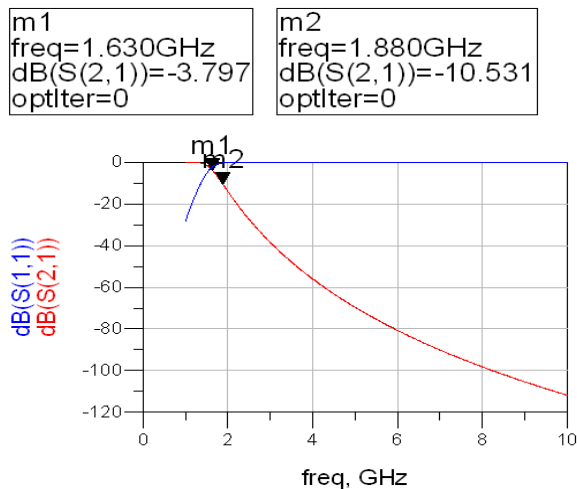
**Fig 4 Output Wave form S parameters vs Frequency**

This is the prototype low pass filter response where the attenuation property is not satisfied here. Hence we go for micro strip implementation.

STEP 4:

Filter designs beyond 500MHz are difficult to realize with discrete components because the wavelength becomes comparable with the physical filter element dimensions, resulting in various losses severely degrading the circuit performance. Thus to arrive at practical filters, the lumped component filters must be converted into distribution element realizations.

In order to convert lumped components to micro strip lines of various impedances should be found out hence we go for

1)   Richards Transformation
2)   Kuroda Identities

**RICHARDS TRANSFORMATION:**

To accomplish the conversion from lumped and distributed circuit designs, Richards proposed a special transformation that allows open and short circuit transmission line segments to emulate the inductive and capacitive behavior of the discrete components [1].

Richards transformation allows us to replace lumped inductors with short circuit stubs and capacitors with open circuit stubs of characteristic impedance $Z_o = 1/C$.[1] Thus from prototype series inductance are the same and shunt capacitance is replaced by $1/C$ values.

**Formula for Electrical Lengths**

$$B\,l_l = g_x * R_0 / Z_h$$

$$B\,l_c = g_x * Z_L / R_0$$

After substitution the Results after Richards Transformation and Kuroda Identity     as shown table below

| Impedance with 50 ohm not considered | Impedance with 50 ohm considered | Electrical lengths (Degree) |
|---|---|---|
| | | |

| | | |
|---|---|---|
| Z1=Z7=1.445 | 72.25 | 17.64 |
| Z2=Z6=0.8019 | 40.095 | 57.29 |
| Z3=Z5=3.247 | 162.35 | 31.79 |
| Z4=0.5 | 25 | 57.29 |

**Step 5: LINE CALC**

With having the impedance and electrical length of the stub lines, the width and length of the line can be calculated using linecalc tool in schematic window as shown in Fig 5.
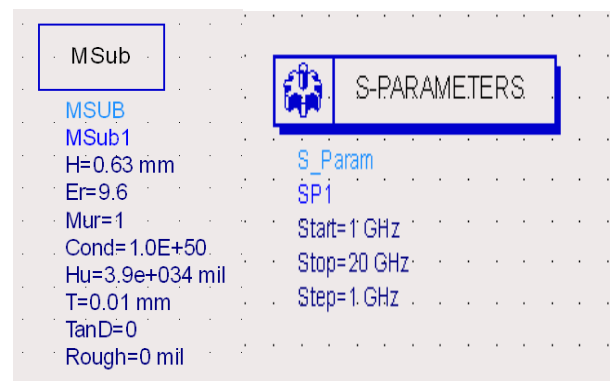


Fig 5 Line Calculation Tool

Thus for each inductance and capacitance line width and length is calculated using linecalc as shown in table.

| IMPEDANCE (OHM) | ELECTRICAL LENGTH (DEGREE) | WIDTH (MIL) | LENGTH (MIL) |
|---|---|---|---|
| Z1=Z7=72.25 | 17.64 | 10.359 | 22.996 |
| Z2=Z6=30.09 | 57.29 | 37.975 | 70.4118 |
| Z3=Z5=162.35 | 31.797 | 0.3255 | 43.4755 |
| Z4=45 | 57.29 | 80.104 | 61.1688 |

Finally the transformation from prototype to micro strip look likes;
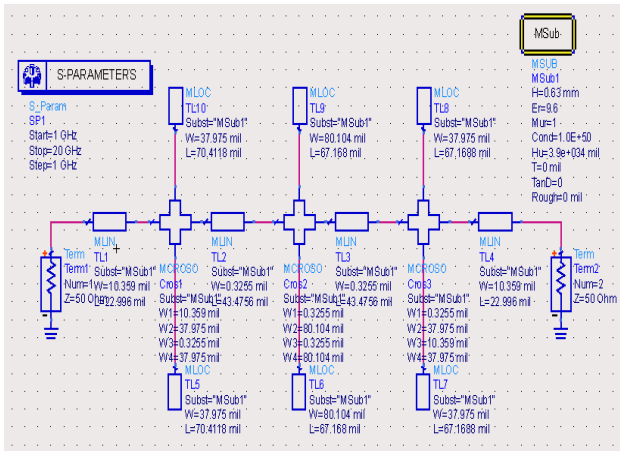
**Fig 6 Schematic diagram of LPF using Micro strip**

For the above schematic, the layout can be given as follows.
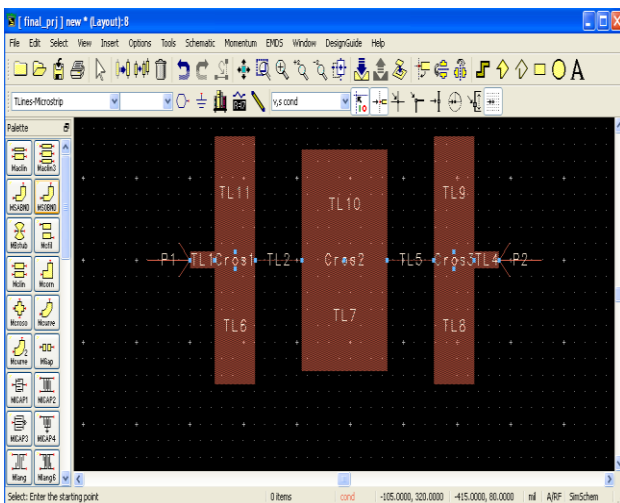


**Fig 7 Layout of LPF using Micro strip**

## III. INFERENCE

Thus we get sharpest attenuation of -60 db. using insertion loss method and cut off frequency of 9 GHz app. to 10 GHz. Hence, the filter allows to pass the frequencies less than 10GHz and rejects those frequencies more than that.

**S (1,1),S (2,2) =** scattering matrix for return loss.

**S (2,1)** = scattering matrix for insertion loss.
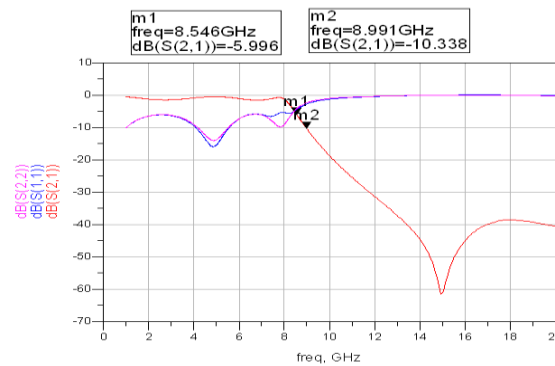


## IV APPLICATION OF MICROSTRIP LOW PASS FILTER

Wi-Fi is a wireless LAN technology that enables laptop PC's, PDA's, and other devices to connect easily to the Internet. Technically known as IEEE 802.11 a/b/g/n. Wi-Fi is less expensive and nearing the speeds of standard Ethernet and other common wire-based LAN technologies. Several Wi-Fi hot spots have been popular over the past few years. Some business charge customers a monthly fee for service, while others have begun offering it or free in an effort to increase the sales of their goods.

## V. CONCLUSION

In this paper, stepped impedance micro strip low pass filter is designed. This filter provides us to achieve better harmonic suppression. This filter not only shows a superior harmonic suppression in stop-band, but also saves as much compact circuit size compared with the conventional one. This design is applied in X-band electromagnetic environments. Various steps to design a stepped impedance micro strip filter are described. The special calculator, linecalc of ADS is used for designing. The calculated filter parameters are applied to design a filter. The software platform used in this designing purpose is ADS (Advanced Design System). This software is used especially in leading industries working on MMIC's. A filter of mentioned specifications is designed. The corresponding waveforms are obtained. The range of attenuation achieved can be known from the waveform. Then the layout of the designed stepped impedance micro strip filter is obtained using the software itself. Thus, finally a stepped impedance micro strip filter whose harmonic suppression is -60db is obtained.

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# An Introduction to Computational Frontal Static Stress Analysis of a Baja Car

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   *Abstract-* The Society of Automotive Engineers organizes student design competitions to inculcate in students the general practices of good Engineering. One such student design activity is the SAEINDIA BAJA event held each year in Pithampur, India the aim of which is to build an All Terrain Vehicle as per the constraints given by the organizers. The growing popularity of the competition coupled with the need to design safe, sturdy and sustainable ATV has led to the origin of the idea of the paper. The process of dynamic stress analysis is expensive and time consuming, and simulating the problem statement is unnecessarily tedious at an initial design stage. So it is advantageous to carry out the static stress analysis first, which offers a simplistic simulation criterion of the problem statement and requires a lower computational time. This analysis will validate the safety of the preliminary design and help the designer understand the changes that need to be incorporated in the design. The paper aims to give an introduction to this static stress analysis method using ANSYS APDL 12.0, covering topics such as impact force determination, loading points, convergence of nodes, and the mesh size dependence of generated stress.

   *Index Terms*- SAE, ATV, Static Stress Analysis, ANSYS APDL 12.0

## I.   INTRODUCTION

Considering the functional objectives and the rules laid by the SAE Baja, a preliminary design of the frame structure was developed wherein the structural members and their end connections were simply represented by their centre lines and points respectively, in a 3D environment using CATIA V5. The geometries of cross-section and end connections were ignored for simplicity. Parametric modeling was implemented to ensure that future changes could be incorporated easily. A finite element (FE) model was created using the 'Pipe 16' element in ANSYS, on which static analysis was performed. The next step was simulating the problem statement by choosing appropriately the material properties, cross-sectional properties, positional constraints, loading conditions and mesh element size. The analysis showcases the distribution of Von Misses stresses and the deformation of the frame members, when subjected to the applied loads. If the stress generated in the chassis members was found to be above the yield limit of the material, the existing frame was modified for a safe design. The new design was again subjected to the same analysis, and the iterations continued till the stress and deformation was within the desired limit.

## II.   MATERIAL PROPERTIES

   In this analysis, circular tubing of AISI 1018 having uniform cross sections was selected, confirming to the rule book. The material properties have been listed in the Table 1.

| Parameter | Value | Unit |
|---|---|---|
| AISI 1018 | - | |
| Outer Diameter | 25.4 | Mm |
| Thickness | 3 | Mm |
| Young's Modulus of Elasticity | 250 | GPa |
| Permissible Yield stress | 365 | N/mm^2 |
| Poisson's ratio | 0.3 | - |
| Carbon Content | 0.18 | % |

**Table 1: Material Properties**

### III.   ANALYSIS

*A. Element Type*

   The analysis of the chassis was performed in ANSYS APDL. Node to node connectivity between members was ensured to obtain correct readings of the analysis. The line type element 'PIPE 16' was used. It is a uni-axial element with tension-compression, torsion and bending capabilities; and has six degrees of freedom at the two nodes: translation in the nodal X, Y, and Z directions and rotation about the nodal X, Y, and Z axes.

*B. Assumptions*

   1)   The chassis material is considered to be isotropic and homogenous.
   2)   Chassis tube joints are considered to be perfect joints.
   3)   The 'Crumple zone' phenomenon is not considered.

*C. Calculations*

   1. Impact Force Determination by Speed Limit

   According to the constraints in the rulebook, the maximum speed of the car is assumed to be 60km/hr or roughly around 16.66 m/s.

For a perfectly inelastic collision, the impact force is as calculated from Eqn.(1).

$$W_{net} = 1/2(m)(v^2)_{final} - 1/2(m)(v^2)_{initial} \cdots (1)$$

Where, $W_{net}$ is net work done on account of an inelastic collision.

$$W_{net} = -1/2(m)(v^2)_{initial} \cdots (2)$$
$$but, \ W_{net} = Impact \ Force * d \cdots (3)$$

Where $d$ is the distance travelled during impact.

   It is considered that for static analysis, the vehicle comes to rest 0.1 seconds after impact. Therefore, for a vehicle which moves at 16.66 m/s (or 60 km/hr), the travel of the vehicle after impact is 1.66 m. From Eqn. (1), (2) and (3), we get:

$$Impact \ Force = 1/2(m)(v^2)_{initial} \times 1/d \ \ldots (4)$$
$$Impact \ Force = 1/2(275)(16.66^2) \times 1/1.66$$
Impact Force (F1) = 22990.298 N

   Therefore, Impact Force by Speed Limit(F1) ≈ 23,000 N

   2. Impact Force Determination by Acceleration Limit

   The 'Motor Insurance Repair Centre' has analyzed that the baja car will see a maximum of 7.9 G's of force during impact.

$$Force = m \times a \ \ldots (5)$$
Where, $m = 275kg$ and $a = 7.9 \times 9.81m/s^2$
Force = 21312.225 N

   Therefore, Impact Force by Acceleration Limit (F2) ≈ 21,400 N

   These two values of F1 (from Eqn.4) and F2 (from Eq. No.5) are practically comparable.

   3. Impact Force Determination for Worst case Scenario

   According to research, a human body will pass out at forces much higher than 7.9 G's. Therefore, a value of 10 G's was considered for an extreme worst case collision. Therefore for static frontal impact analysis, the load on the vehicle is calculated from Eqn. (6).

$$F3 = m \times a \ldots (6)$$

Where, $m = 275kg$ and $a = 10 \times 9.81 m/s^2$

$$F3 = 275 \times 10 \times 9.81$$

$F3$ = 26,700 N

Assuming a factor of safety of 1.25 for the body frame, a force of **33,000 N** is applied in the analysis.

## IV.   LOADING POINTS

The structure is loaded at the points where the Centre of gravity is located (as indicated by the yellow figures on the chassis in Fig. (1). The forces are applied on the frontal part of the chassis (as indicated by red arrows in the figure) as it is the first point of contact in case of a frontal collision**.**
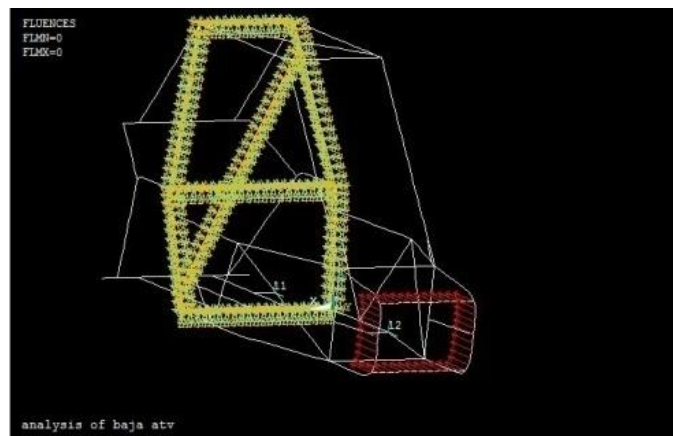


**Fig. 1**

## V.   VON-MISSES STRESSES

Failure of mechanical components subjected to bi-axial or tri-axial stresses occurs when the strain energy of distortion per unit volume at any point in the component, becomes equal to the strain energy of distortion per unit volume in a standard tension test specimen during yielding. According to this theory, the yield strength in shear is 0.577 times the yield strength in tension. Experiments have shown that the distortion energy theory is better in agreement for predicting the failure of ductile components than any other theory of failure.

## VI.   CONVERGENCE NODE

The analysis was carried out using progressively reducing elemental sizes. The elemental size having consecutive stress error less than 5% is generally considered as the optimum size of mesh. It means that any further decrease in size will only negligibly increase the accuracy of the results.

## VII.   OBSERVATION TABLE

The stress values for different mesh sizes are as tabulated in Table 2.

| PARAMETER | CASE I | CASE II | CASE III | CASE IV |
|---|---|---|---|---|
| Size of Mesh (units) | 50 | 10 | 8 | 7 |
| No. of nodes | 741 | 3586 | 4484 | 5130 |
| No. of Elements | 772 | 3815 | 4515 | 5712 |
| No. of nodes selected for Fixed Constraint | 147 | 588 | 884 | 1009 |
| No. of nodes subjected to the Force | 44 | 180 | 262 | 288 |
| Force on each node | 750 | 183 | 126 | 115 |

| Max value of Von Misses Stresses | 42.775 | 417.187 | 443 | 444.09 |
| Percentage Error | - | 87.5 | 6.19 | 0.24 |

## VIII. OBSERVATIONS

1. Maximum stressed regions of **Table 2: Mesh Size Dependence of Von Misses Stress** the chassis are under safe stress.

2. Two high stress regions were detected as shown in Fig. (4) and Fig. (5)

3. The maximum Von Misses stress was found to be 444.09N/mm2, which exceeds the   yield strength.
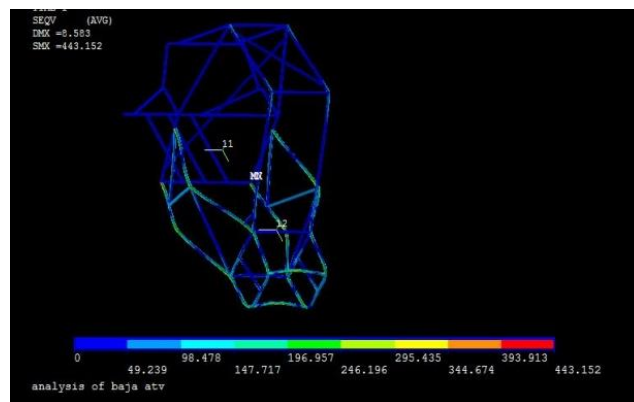


**Fig. 2: Results for Mesh Size 10**
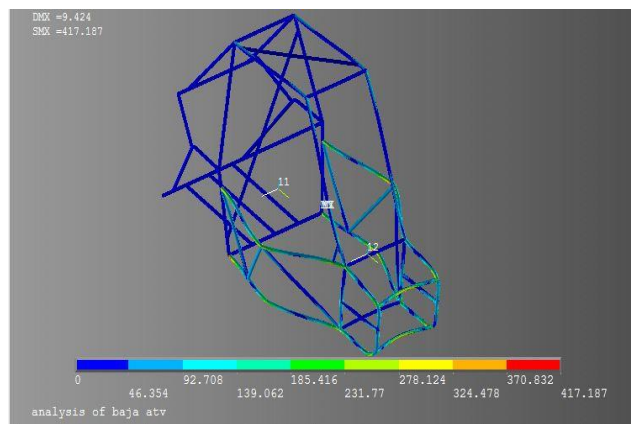


**Fig. 3: Results for Mesh Size 8**
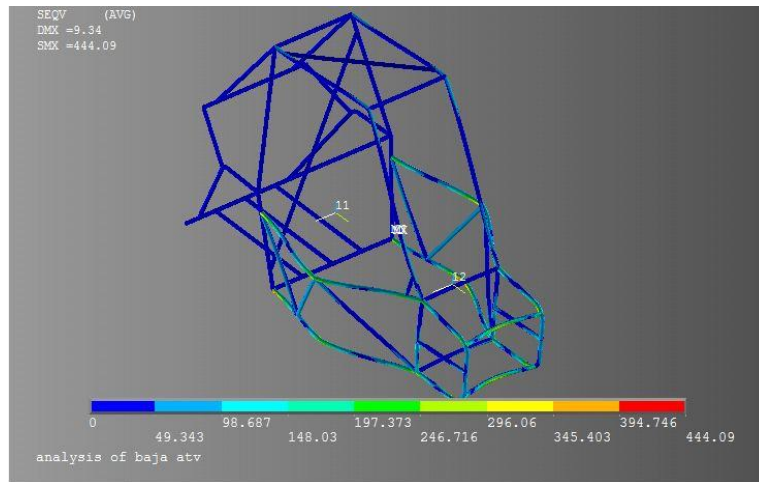
**Fig. 4: Results for Mesh Size 10**
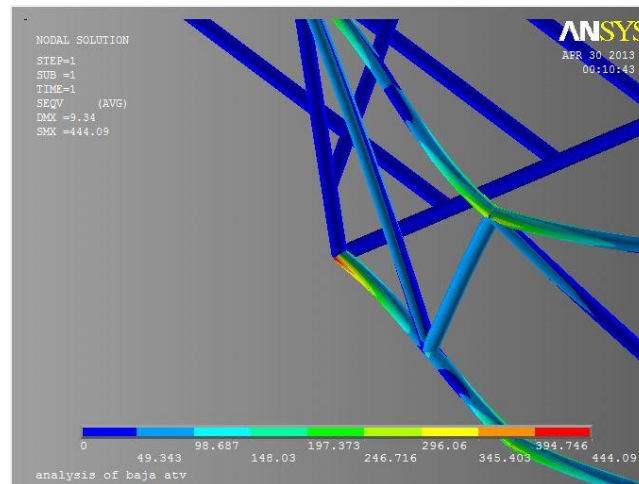


**Fig.5: Regions of high stress concentration in Fig. 4**
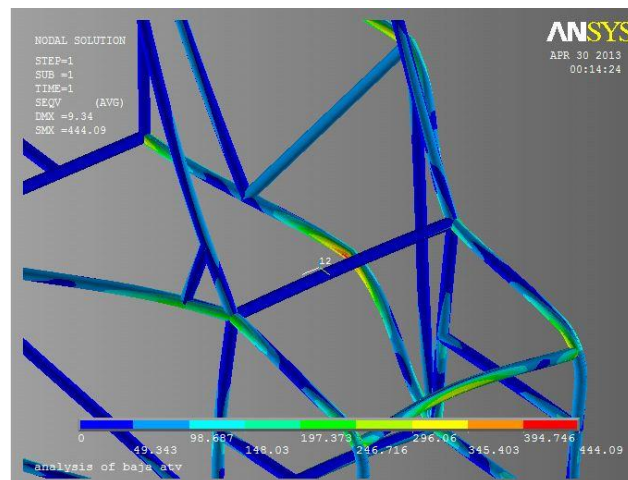


**Fig.6: Regions of high stress concentration in Fig.4**

435

## IX.  CONCLUSION

1) The analysis highlights the areas of high stress concentration, which need a change in design.

2) This preliminary analysis consumes little time and approves of a reasonable design, which can form the basis for a detailed modeled.

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# Multiple Power Supplied Fertilizer Sprayer

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*Abstract*- In this paper, the design and implementation of multiple power supplied fertilizer sprayer has been presented. The proposed system is the modified model of the two stroke petrol engine powered sprayer which minimizes the difficulties of the existing power sprayer such as operating cost, changing of fuel etc. The two stroke petrol engine has been replaced by a direct current motor and operated by the electrical energy stored in the battery attached to the unit. The battery can be charged by solar panel during the presence of sun. It could also be operated on direct current during rainy and cloudy weather conditions. This system can be used for spraying pesticides, fungicides, fertilizers and paints.

The proposed system has been tested and compared with theoretical values of current and charging time. From the results it is found that the time taken to charge the full battery of capacity 12V, 7Ah has required 16.67 hours. The fully charged battery could be used to spray 575 liters pesticides. Which is approximately covers 5-6 acres of land. It is also found that, if we charge the battery for a day, then it covers approximately 200 liters of pesticides which in turn covers 2 to 2.5 acres of land. The developed systems initial cost is little more as compared to conventional sprayer but the running cost of the system is all most zero in other words minimum.

*Index Terms*- Solar Panel, DC Pump, Microcontroller, Sprayer, Fertilizer

## I. INTRODUCTION

RENEWABLE Energy resources are the most preferable resources for generation of electrical energy because of environmentally friendly. Of all the renewable energy resources, solar power is the most resource mainly because it is free, unlimited and free from pollution [1]. The solar energy is usually harvested through solar panels that are made up of photovoltaic cells. Approximately 80% of all photovoltaic systems are mended into a standalone system [2].

The advent of photovoltaic modules and arrays or simply solar panel corroborates this progress. The photovoltaic (PV) or solar cells crafted from silicon semiconductor are configured to trap and convert the sun's energy into the useful energy which is then used to perform work such as Dehydration of Agriculture products [3], irrigation pump[4][5][6][7][9], pesticide Duster[8] etc.

M.Y.Hussain and et al[3] have been developed a mixed mode solar dehydrator for dehydration of agriculture products. The agriculture products were included such as fruits and vegetables of common uses are dried under hygienic environment. They also claimed that the cost of dehydration is nominal and qualities of the dried products are up to the marketable standards. Lot of research work has been carried out the applications of solar energy for the irrigation pumps Sonali Goel and et al[4] have proposed a solar application for water pumping system and its comparison with the other non-conventional energy sources such as wind, micro hydro and biomass energy. From the comparison, they concluded that solar energy efficient. Mahir et al[5] [6] have proposed automatic drip irrigation of drawf cherty tree system with solar powered brushless D.C. motor. It is also shown that the efficiency of system increases by tracking. Hemant Ingale et al[7] have propsed an automatic solar based agriculture pumping using micro controller. This can be used for gardens, allotments, and greenhouses and polytonal. S.Mathana Krishnan [11] have proposed residential solar cooker system by introducing of phase charge materials used for harvesting of sun's energy to cook. By doing this, they have shown that efficiency of cooking increases. Abhishek Jivarg et al[8] have presented a paper on solar operated multiple granulated pesticide duster .In which solar energy used for pesticide duster.

The conventional sprayer having the difficulties such as it needs lot of effort to push the liver up and down in order to create the pressure to spray. Another difficulty of petrol sprayer is to need to purchase the fuel which increases the running cost of the sprayer. In order to overcome these difficulties, we have proposed a Multiple Power supplied Fertilizer Sprayer. This can be operated using solar energy during the presence of sun, otherwise it can be operated using the electricity supply. The main advantages of the presented system are the running cost reduces to minimum and also time saving.

## II. EXISTING SPRAYERS

### A. Hand Driven Sprayer

Hand driven pumps consist of a flexible diaphragm made of synthetic rubber connected to the pump handle by a crankshaft mechanism, a rigid diaphragm chamber and either flat or ball-type inlet and outlet valves. The outlet valve is connected to a pressure chamber, which in many hand driven pump sprayers has a variable pressure setting valve. These pumps typically operate between pressures of 1 and 3 bar (15-44 psi) and it is suitable for herbicide application where large droplets are required to minimize spray-drift.

### B. Fuel Operated Sprayer

The power sprayer consists of an integrated or external spray tank; a high pressure piston pump usually powered by a petrol engine a pressure regulating valve and a hose of up to 50 m of length. Spray tanks are too big to be carried as a knapsack. The power sprayer is produced in a number of versions. Most simple and common is an engine driven pump mounted on a frame without wheels, a 200 l drum and hose and lance. Flow

regulation is to be done via a pressure regulating valve and/or by restrictors (basic power sprayer) and the size of the nozzle. At the other end of sprayers mounted on wheels, equipped with pressure regulators. Technically, the power sprayer has a lot in common with the motorized knapsack-sprayer. The unit is generally set for high volume spraying, transporting the droplets with high pressure. Hallow cone nozzles are the preferred type of nozzles.

## III. BLOCK DIAGRAM

The block diagram of proposed system is as shown in figure 1. It consists of five units namely: energy conversion, storage, protection & control, DC drive and sprayer. The details of each unit are discussed as follows
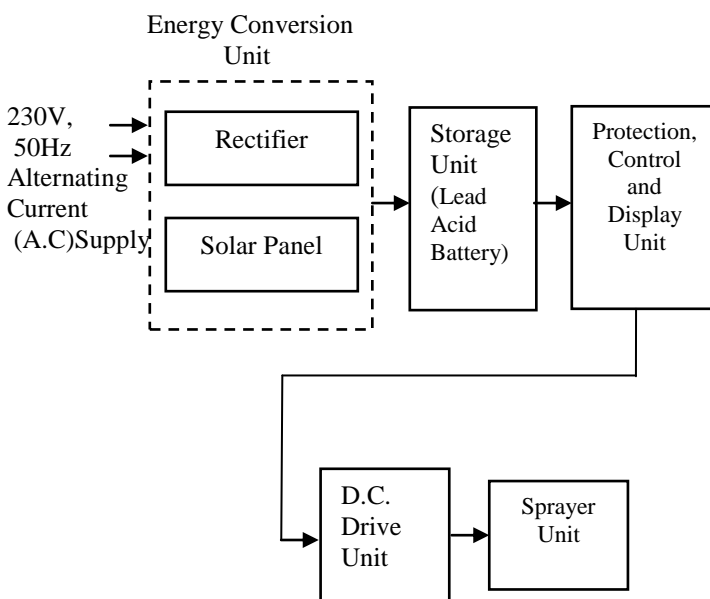


Figure 1: The block diagram of proposed system

The first unit of proposed system is energy conversion unit. The energy conversion can be done by two modes such as direct supply mode and solar energy mode. In case of direct supply mode, the single phase Alternating Current (A.C) supply was converted into Direct Current (D.C) supply with the help of full wave bridge rectifier chip (i.e. DB 107). This can be used, wherever the solar energy is not available i.e. during rain and cloudy weather conditions. In case of solar energy mode, solar energy obtained by the sun is converted into electrical energy using solar panel by photovoltaic effect.

The output of energy conversion was used to charge a deep cycle battery. The number of times a battery can be discharged is known as its life cycle. For solar applications, a battery should be capable of being discharged in several times. In such cases a deep cycle battery is used. In this work a lead-acid accumulator serves the purpose. The lead-acid battery has the properties such as high current availability, contact voltage, longer life and more ability to charge as compare to conventional batteries.

The output of battery was connected to DC pump through protection circuit. In this work, DC pump is used because of the advantages such as less in noise, longer in life, maintenance free, motor speed can be varied in the larger extent by varying the supply voltage and self-lubricated. Pump is used to suck the spraying liquid from the sprayer tank and spray it through nozzle. The sprayer consists of sprayer tank and sprayer pipe. The sprayer tank is made up of plastic or fiber material in order to reduce the weight of the tank. The capacity of the tank is 16 liters and connected to the sprayer pipe with adjustable nozzle. By adjusting the nozzle the output of flow can be controlled. The whole unit can be carried conveniently at the back of human body with the help of shoulder straps. The supporting base of entire unit needs to be strong and light weight.

## IV. SOFTWARE
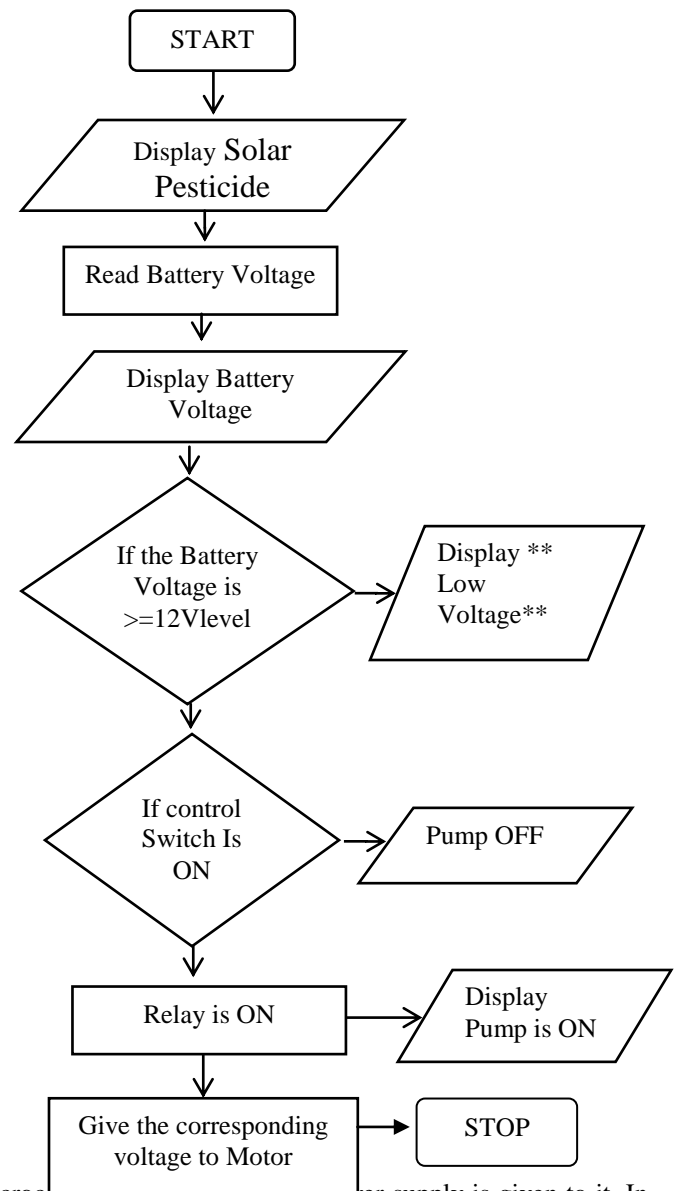


Microcontroller starts when the power supply is given to it. In the first line of coding the microcontroller displays the title as

"Solar Pesticide Sprayer". If the output pin is high the microcontroller sends the signal to LED, LED starts blinking this shows health of the microcontroller, the LED blinks with the delay of 50ms. The voltage level in the battery is sampled with the use of inbuilt ADC the microcontroller displays the amount of voltage present in the battery on LCD display. In the next line of coding microcontroller checks whether the voltage level is equal to more than or 12V. If the condition is not satisfied i.e. if the battery voltage is less than 12V microcontroller display as **LOW VOLTAGE** on the LCD display. If the condition is satisfied the microcontroller checks the status of the control switch, if the control switch is pressed the relay goes to ON state, once the relay is ON the voltage from the battery is fed to DC pump and pump is ON. On the pump is ON the display unit displays as "Pump Status: ON".. If the control switch is not pressed the display unit displays as "Pump Status: OFF". In any stage of the execution if the RESET button is pressed the microcontroller starts the execution from the beginning.

## V. WORKING

The working of the proposed system is as follows: when the control button is made ON and OFF while the sprayer motor is switched ON and OFF using the push button. The sprayer takes the energy from the energy conversion unit and this energy is stored in form of chemical energy in the battery which is then converted to electrical energy required to run the DC pump through protection and control unit. The protection and control unit as shown in figure 2
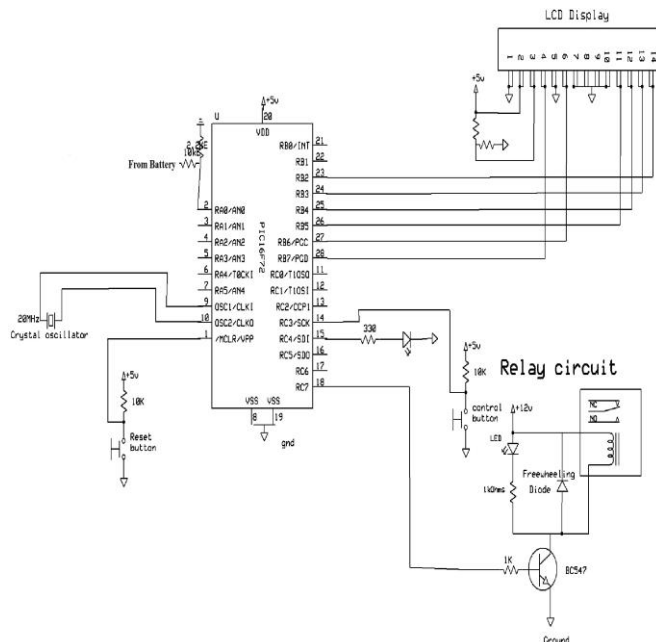


Figure 2: Protection and control unit

The protection and control unit consists of sampler, regulator and relay circuit. The sampler circuit samples the output voltage of the battery into voltage levels. The sampled voltage was converted into digital signal with the help of built in analog to digital converter of microcontroller PIC16F72. This digital value is compared with the set value of voltage level i.e. 12V. If the voltage level reaches less than set value then the relay operates in turn the pump made OFF. This circuit also protects from the over loading, internal fault condition. One of the ports of the microcontroller is connected to the LCD display, which continuously monitors and displays the voltage level of the battery and status of pump. The output of the control unit is connected to the pump. This is used for the sucking of liquid from the tank and sprays the fertilizer.

The technical specifications for particulars, required to the sprayer are tabulated in table 1. The specifications considered are temporary and subjected to change depending upon the usability and complications of area and work undertaken.

Table 1: Technical specifications of different components required for multiple power supplied fertilizer sprayer system

| S.NO | Particulars | Specifications |
|------|-------------|----------------|
| 1 | Solar Panel (Polycrystalline) | Max power, $P_{max}$: 5W Voltage at Max power, $V_{mp}$: 17.40V Current at Max power, $I_{mp}$: 0.29A Open circuit voltage, $V_{oc}$: 21.00V Short Circuit Current $I_{sc}$: 0.33A Tolerance: ±5% Max system voltage: 800V |
| 2 | Battery | Capacity: 12V, 7Ah Constant voltage charge with voltage regulation Standby use: |

| | | 13.6V -13.8V Cycle use: 14.1V-14.4V Max initial current: 1.4A |
|---|---|---|
| 3 | Microcontroller | PIC16F72 |
| 4 | DC pump | Voltage: 12V Current: 0.5 Amps to 1.5 Amp (max) Flow rate: >560ml / 10 seconds Fluid pressure: 1.6kgf/cm2 |

Table 2: Comparison of theoretical and practical values

| Charging time of the battery | | Current | | Voltage | | Discharge Time |
|---|---|---|---|---|---|---|
| Theoretical | Practical | Theoretical | Practical | Theoretical | Practical | Practical |
| 16.67 hours | 17.2 hours | 0.42amp | 0.25amp | 21volts | 19.5 volts | 3.45 hours |

The model of the designed fertilizer sprayer is shown in figure 3.



Figure 3: Working model of multiple power supplied fertilizer sprayer

## VI. DESIGN

### 1. Analytical calculation of current and charging time of the battery.

(i).The current produced by the solar panel (I) was calculated by knowing the maximum power (P) of the solar panel and the voltage rating (V) of the battery that is given by

$$I=P/V$$

Therefore, $I=5/12 = 0.42$ Ampere

(ii). Charging time (T) was computed by taking the ratio rating of battery in ampere hour (Ah) to the total current consumed by the solar panel.

T= (battery rating in ampere hour)/(total current consumed by the solar panel)

Therefore, $T=7/0.42=16.67$ hours

### 2. Practical measurement of current and charging time of the battery.

Experimentally the current produced by the solar panel can be measured by connecting an ammeter in series with supply. The charging time of the battery using solar panel has been measured by continuously charging battery and it is found that 17.5 hours for three day of every day 8 hours.

The results obtained from the practical values and theoretical values were compared and they are tabulated in Table 2.

## VII. CONCLUSION

The proposed system was tested with AC charging as well as solar charging. From the results it was found that the current and time required for charging the full battery capacity of 12V, 7Ah by analytically and practically is 16.67hours and 17.2 hours respectively. The fully charged battery can be used to spray 580 liters of fertilizer, which approximately spray 5-6 acres of land. It was also found that, if we charge the battery in a day it can be used to spray 200 liters of fertilizer. The initial cost of the proposed system is little more as compared to conventional sprayer but the running cost of the system is very less. The developed system used for spraying the fertilizer, pesticides, fungicides and painting.

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# A Novel Framework for Face Recognition in Real-Time Environments

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**Abstract--** In this paper we propose a novel frame work for face recognition in real-time environments using the Principal component Analysis (PCA)-based face recognition methodology. The proposed frame work is developed by three schemes namely, nonlinearity clustering, eigen vector mapping and relationship learning. In the beginning, a clustering algorithm is proposed as a preprocessing step. After clustering, the very low resolution (VLR), High resolution (HR), illuminated image (IL) pairs in every cluster is approximate nonlinear, i.e., the relationship will be approximately represented by a matrix. Then second resultant matrix spaces are converted into eigen vectors mapping for supporting nonlinear problem in real face images. Finally a kernel PCA model is used to learn relationship mapping, with completely different constraints. We develop a new information constraint is designed for human-based recognition and machine-based recognition to adopt real-time environment. The system proceeding the relationship learning between VLR images to the HR image space as well as IL image space for nonlinear problem. Based on learning map SR algorithm can reconstruct the image space and so measures the reconstruction error, rather than the existing algorithms that perform error the VLR space.

*Index Terms*-- Face recognition, Kernel PCA, Very Low Resolution (VLR), Illuminate Images (IL), and Relationship Learning

## I. INTRODUCTION

Biometrics is used within the method of authentication of a person by verifying or distinguishing that a user requesting a network resource is who he, she, or it claims to be, and vice versa. It uses the property that a person's attribute related to a person itself like structure of finger, face details etc. By comparing the existing information with the incoming information we are able to verify the identity of a specific person [1]. There are many types of biometric system like finngerprint recognition, face detection and recognition, iris recognition etc., these traits are used for human identification in surveillance system, criminal identification. Advantages of using these traits for identification are that they can't be forgotten or lost. These are distinctive options of a person's being that is being used wide [2].

Face recognition is an integral part of biometrics. In biometrics basic traits of human is matched to the prevailing knowledge and looking on results of matching identification of a person's being is traced. Facial features are extracted and enforced through algorithms that are efficient and a few modifications are done to improve the prevailing algorithm models. Computers that detect and recognize faces can be applied to a large type of practical applications together with criminal identification, security systems, identification etc. Face detection and recognition is used in several places today, in websites hosting images and social networking sites. Face recognition and detection will be achieved using technologies related to computer science.

Features extracted from a face are processed and compared with equally processed faces present within the database. If a face is recognized it's better-known or the system might show the same face existing in database else it's unknown. In surveillance system if an unknown face appears more than one time then it's kept in database for more recognition. These steps are very helpful in criminal identification. In general, face recognition techniques may be divided into two groups based on the face representation they use appearance-based, that uses holistic texture options and is applied to either whole-face or specific regions in an exceedingly face image and feature-based, that uses geometric facial features (mouth, eyes, brows, cheeks etc), and geometric relationships between them.

Face recognition has become a vital issue in several applications like security systems, credit card verification, criminal identification etc. Even the flexibility to just detect faces, as opposed to recognizing them, can be important.

Based on Sirovich and Kirby's findings, that projections on eigenpictures can be used as classification features to acknowledge faces. They used this reasoning to develop a face recognition system that builds eigenfaces, which correspond to the eigenvectors related to the dominant eigenvalues of the known face (patterns) covariance matrix, and so acknowledges particular faces by comparing their projections on the eigenfaces to those of the face images of the known individuals. The eigenfaces define a feature space that drastically reduces the dimensionality of the initial space, and face identification is carried out during this reduced space.

Problems arise once we wish to perform recognition in a very high-dimensional space. Goal of PCA is to reduce the dimensionality of the data by retaining as much as variation attainable in our original data set. On the opposite hand dimensionality reduction implies data loss. The most effective low-dimensional space will be determined by best principal elements. The foremost advantage of PCA is using it in eigenface approach that helps in reducing the size of the information for recognition of a take a look at images. The images are keep as their feature vectors within the information that are found out projecting every and each trained image to the set of eigen faces obtained. PCA is applied on eigen face approach to reduce the dimensionality of a large information set.

Many approaches are developed and proposed for in face recognition systems. Generally, the proposed face recognition approaches can do good performance under controlled conditions. However, there still remain several issues that must be overcome for a strong face recognition system under varied conditions like pose, expression, very low resolution (VLR) and illumination variations. Once the person is not close to the camera, the face region are going to be smaller than 16 pixels. Working on such a very low resolution (VLR) face image is named a VLR face problem. Especially, illumination variation that happens on face images degrades the performance of face recognition systems under practical environments. Plenty of learning-based face SR algorithms have been proposed within the last decade. The existing approaches use constant criterion to perform error evaluation for the reconstructed HR images that is named a data constraint [15]. The data constraint is used to match the images by calculating the distance within the low-resolution (LR) image space for SR processing. As an example, Baker and Kanade's technique [1] copies the high-resolution (HR) details from HR training images that are the best match within the corresponding LR training images, because the missing details within the input query LR image. This technique works well if the distance metric within the VLR image area reflects the particular face similarity within the HR image space.

A Robust Face Recognition scheme should have the following desirable features:

- ✓ The system will perform the different lighting condition of face image.

- ✓ It's supports low resolution image for detecting face and recognize it.

- ✓ It will provide enhanced training and testing results for face recognition.

Here we are proposing a kernel PCA based Relation-learning PRLSR algorithm for face recognition. The proposed frame work is developed by three schemes. The relationships between HR, VLR image and illuminated image spaces are learned within the training phase and are used to reconstruct the hr images in testing phase. The training phase consists of three steps, namely, non linearity clustering, eigen vector formation and relationship learning. in the beginning, a clustering algorithm is proposed as a preprocessing step. After clustering, the VLR, HR, illuminated image pairs in every cluster are nearly linear, i.e., the relationship can be approximately represented by a nonlinear matrix. Then second resultant matrix spaces are converted into eigen vectors.

Finally A nonlinear kernel model is used to learn relationship mapping, with completely different constraints. We develop a new data constraint is designed for human-based recognition and machine-based recognition to adopt real-time environment. The system proceeding the relationship learning between VLR images to the HR image space similarly as IL image house for nonlinear drawback. Based on learning map SR algorithm can reconstruct the image space and then measures the reconstruction error, instead of the existing algorithms that perform error the VLR image space. It uses relationship mapping to map the VLR images into the illuminated image space. Details of every step are described in the following sections.

Section 2 describes the Linearity Clustering and section 3 describes the eigenvector formation of a matrix .More details about relationship learning by kernel PCA are given in Section 4. Implementation and some results are shown in Section 5.

## II. RELATED WORK

Kyungnam Kim discussed a number of limitations and questions on his approach that eigenface system to perform face recognition on the fundamental idea of PCA and more in depth study of the course material. Though the face recognition results were acceptable, the system only using eigenfaces might not be applicable as a real system. That has to be additional robust and to have different discriminant options [1]. Sang-Heon Lee, Dong-Ju Kim and Jin-Ho Cho proposed the illumination-robust face recognition system comprising new D2D-PCA feature and a fusion approach integrating two half-face images for varied consumer applications. Within the proposed system, whole-face images are divided into two sub-images to minimize illumination effects and therefore the D2D-PCA is applied to each of those sub-images. The individual matching scores obtained from two sub-images are combined using a weighted-summation operation, and therefore the fused-score is used to classify the unknown user [2].

Andrew Wagner and Arvind ganesh have proposed a system for recognizing human faces from images taken underneath practical conditions that is conceptually easy, well actuated, and competitive with state-of-the-art recognition systems for access control scenarios and that they demonstrate a way to capture a collection of training images with enough illumination variation that they span test images taken underneath uncontrolled illumination [3]. Wilman W. W. Zou, and Pong C. Yuen proposed a completely unique approach to find out the relationship between the high-resolution image space and therefore the VLR image space for face SR. based on this approach, two constraints, namely, new information and discriminative constraints, are designed for good visuality and

face recognition applications under the VLR problem, respectively [4].

Leonardo franco, Alessandro obtained a generalization rate of 84:5% on unseen faces, similar to the 83:2% rate obtained once employing a similar system but implementing PCA processing at the initial stage that they train and check with images from the Yale Faces database [5]. Jisnu Bhattacharyya found that a additional significant segmentation could be achieved by compensating images for illumination using the strategy proposed in that thesis. Furthermore, the accuracy of skin detection, a set of color image segmentation, was found to improve once this illumination compensation method was first applied. Finally, compensating images for illumination increased the accuracy of face recognition [6]

Rabia Jafri and Hamid R. Arabnia summary of a number of the well-known methods in each of those categories is provided and some of the advantages and drawbacks of the schemes mentioned therein are examined. Furthermore, a discussion outlining the incentive for using face recognition, the applications of this technology, and a few of the difficulties plaguing current systems with respect to this task has also been provided [7]. V. Radha and N. Nallammal present neural network classifier (Radial Basis function Network) to detect frontal views of faces. The curvelet transform, Linear Discriminant Analysis (LDA) ar used to extract features from facial images first, and Radial Basis function Network (RBFN) is used to classify the facial images based on features [8].

Mayank Agarwal, Nikunj jain, Mr. Manish Kumar and Himanshu Agrawal present a technique for face recognition based on information theory approach of coding and decoding the face image and proposed methodology is connection of two stages – Feature extraction using principle component analysis and recognition using the feed forward back propagation Neural Network [9].

Debabrata Chowdhuri, Sendhil Kumar K.S, M Rajasekhara babu and Ch. Pradeep Reddy has defined and discussed the VLR face recognitionin in that paper. to resolve the problem, feature extraction technique is used and to enhance the performance parallel environment is used. For machine-based face recognition applications, a discriminative constraint was designed and parallel environment is integrated with the new data constraint [11]. SenthilSingh .C and Dr. Manikandan. M proposed an approach to find out relationship between the high resolution space and therefore the VLR image space for face. Based up on the approach the face recognition applications under the VLR problem is designed for good visuality [12].

Xudong Xie and Kin-Man Lam aim to reduce or remove their effect. In their technique, a local normalization technique is applied to an image, which might effectively and with efficiency eliminate the effect of uneven illuminations while keeping the local statistical properties of the processed image the same as within the corresponding image under normal lighting condition [13].

Emil Bilgazyev, Boris Efraty, Shishir K. shah and Ioannis A. Kakadiaris proposed a new method for super resolution by first learning the high-frequency parts within the facial data that can be added to a low-resolution input image to form a super-resolved image. Their method is totally different from typical methods as we estimate the high-frequency components, which are not used in other methods, to reconstruct a higher-resolution image, instead of studying the direct relationship between the high- and low resolution images [14]. P.S.Hiremath and Prabhakar C introduced a novel symbolic kernel PCA method for face recognition that symbolic data representation of face images as symbolic faces, using interval variable s, yield fascinating facial features to cope up with the variations attributable to illumination, orientation and facial expression changes[17].

## III. SYSTEM MODEL

The proposed frame work consists of three phases, namely, linearity clustering, eigen vectors with relationship learning and PCA based recognition. In the initiative, linearity clustering is executed and also it's a preprocessing step. During this step it considers training section and here three completely different kind of images pairs are used to clustering as linear. The images pairs are VLR images, HLR images and illuminated images. Fig 1(a) shows the proposed system model.
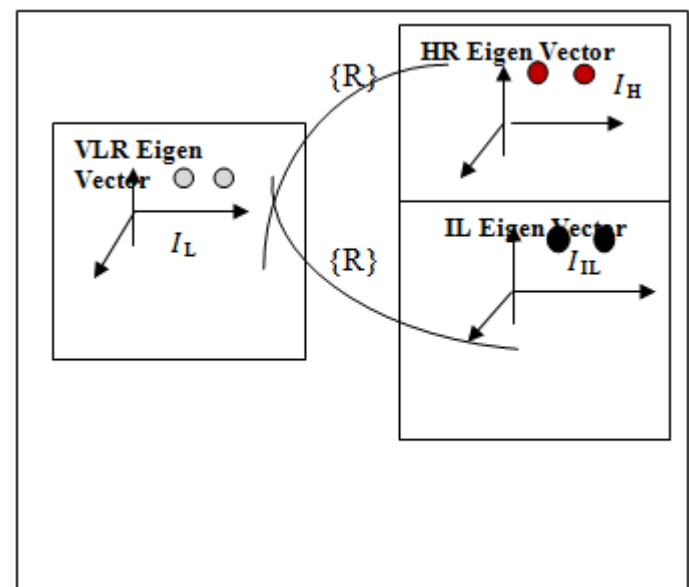


Fig. 1 Proposed New Constraints to Learn Relationship Mapping.

After clustering, the VLR, HR, IL image pairs in every cluster are nearly linear, by eigen vector formation i.e., the relationship may be approximately represented by a eigen matrix and eigen values. A linear regression model is used to learn relationship mapping, with completely different constraints further. We develop two constraints for various applications. As shown in Fig. 1(a), a new data constraint is designed for human-based recognition. It uses relationship mapping to map the VLR images into the HR image space and then measures the reconstruction error, instead of the existing algorithms that perform error measure within the VLR space. On the other hand, relationship mapping to map the VLR images into the IL image space and then measures the illuminated image reconstruction is developed for machine-based recognition purposes. Details of every step are given here.

## IV. PREPROCESSING

### A. Non-Linearity Clustering

Non-Linearity clustering is utilized to ensure that clustered training image pairs have a linear relationship. This clustering method reduces the complexness of the relationship learning such the nonlinear model can learn the relationship in every cluster. Alone this line, we design sparse based clustering algorithm that employs nonlinearity as a clustering criterion. In this paper, we outline the non linearity of a group of information pairs (i.e., the LR–HR-IL image pairs) as follows:

Given a group of data pairs   $P = \{( x^i, y^i, z^i)\}$ I = 1, 2,…,N  the linearity of data pairs $P$ is defined as

$$L(P) = \exp ( - \min_{A,b,c} \max_x {}^i\| z^i - y^i (Ax^i + b - c) \|^2) \quad (1)$$

We would prefer to maximize the linearity of every cluster as follows:

$$\hat{C} = \arg\max_C \frac{1}{\neq |C|} \sum_{P \in C} L(P)$$

$$\text{s.t} \neq |C| \leq K \qquad (2)$$

Where $C$ is the set of clusters of data pairs, $\neq |C|$ is the number of clusters in   , and $K$ is the maximum number of clusters. From a machine learning perspective, $K$ is used to prevent overlearning.

Since (2) involves a complex nonlinear non differentiable function $L$ and parameters $A$ and $b$ are not known before

clustering, (2) is an ill-posed and NP-hard problem. Instead of solving (2) directly, we use another method to maximize linearity. Kim and Kwon [11] showed that the relationship mapping from the LR to HR spaces will be represented as a fusion of many multivariable real-valued functions. Without loss of generality, we denote the relationship between data pairs in $P$ as a multivariable real-valued function $(x)$ , which satisfies

$$f ( x^i = y^i = z^i ) \qquad (3)$$

Where ( $x^i, y^i, z^i$) is a data pair. To clearly present the concept of the proposed method to be converting the Covariance matrix of the data pair (x, y, z), and $\Omega f(x)$ is named the "eigen vector" of the data pair.

the $e_i$'s and $\lambda_i$'s are given by the eigenvectors and eigenvalues of the covariance matrix

$$C = f(x)f(x)^T \qquad (4)$$

For the case of learning relationship mapping, let (xi, yi, zi) be the $i$the LR–HR-IL training image pair $(I_l^i, I_h^i)$ and $f$ be relationship mapping. The clustering algorithm based on linearity is given in Algorithm 1.

**Algorithm 1** Clustering based on nonlinearity

**Require**: training image pairs $= \{I_l^i, I_h^i\}$ , terminating Condition $\mathcal{E}$, parameters $\lambda_1$ and $\lambda_2$ , number of clusters $K$

1: **for** each image pair $(I_l^i, I_h^i)$ **do**

2: Calculate the image sparse of $I_l^i$, denote by $G_i$

3: **end for**

4: Let $E$

$$Z = \{z_i | z_i = (\lambda_1 I_l^i, \lambda_2 G_i), i = 1, \dots, N\}$$

5: Initialize with random cluster centers chosen from $Z$, denote by $\{\bar{z}_P^{(0)} | P = P_1, \dots, P_K\}$

6: $n \leftarrow 0$

7: **repeat**

8: $n \leftarrow n + 1$

9: Classify $z_i$ to its nearest cluster according to the sparse distance between $z_i$ and $\bar{z}_P^{(n-1)}$

10: Update the cluster centers

11: **until** $max_P \left\| z_P^{(n)} - z_P^{(n-1)} \right\| < \epsilon$

12: Merge the clusters that have the similar linear $\neq |C| < K$

13: **return** Merged result $\left\{ \bar{z}_P^{(n)} \middle| P = P_1, ..., P_K \right\}$

## V. EIGEN FACES FOR NONLINEAR

The eigenvectors of a square matrix are the non-zero vectors that, after being multiplied by the matrix, remain proportional to the original vector, i.e. any vector x that satisfies the equation:

$$\mathbf{A}\mathbf{x} = \lambda\mathbf{x},$$

Where A is the matrix in question, x is the eigenvector and $\lambda$ is the associated eigenvalue.

As will become clear later on, eigenvectors are not unique within the sense that any eigenvector can be multiplied by a constant to form another eigenvector. For every eigenvector there is only one associated eigenvalue, however.

If you consider a $2 \times 2$ matrix as a stretching, shearing or reflection transformation of the plane, you can see that the eigenvalues are the lines passing through the origin that are left unchanged by the transformation .

Note that square matrices of any size, not just $2 \times 2$ matrices, can have eigenvectors and eigenvalues.

In order to find the eigenvectors of a matrix we should begin by finding the eigenvalues. To do this we take everything over to the LHS of the equation:

$$\mathbf{A}\mathbf{x} - \lambda\mathbf{x} = \mathbf{0},$$

then we pull the vector x outside of a set of brackets:

$$(\mathbf{A} - \lambda\mathbf{I})\mathbf{x} = \mathbf{0}.$$

The only way this will be solved is if $A - \lambda I$ does not have an inverse, thus we find values of $\lambda$ such that the determinant of $A - \lambda I$ is zero:

$$|\mathbf{A} - \lambda\mathbf{I}| = 0.$$

Once we have a set of eigenvalues we are able to substitute them back into the original equation to find the eigenvectors.

### A. Eigen Vector Mapping

The eigenvectors corresponding to nonzero eigenvalues of the covariance matrix produce an orthonormal basis for the subspace within that most image data can be represented with a little amount of error. The eigenvectors are sorted from high to low per their corresponding eigenvalues. The eigenvector associated with the largest eigenvalue is one that reflects the greatest variance within the image. That is, the smallest eigenvalue is related to the eigenvector that finds the least variance.

$$\Omega = [v1, v2, vM]^T$$

where $v_i = e^T_i w_i$ . $v_i$ is the $i^{th}$ coordinate of the facial eigen image within the new space, that came to be the principal component. The vectors $e_i$ are images, so called, eigenimages, or eigenfaces. They can be viewed as images and indeed look like faces.

## VI. KERNAL PCA

The kernel PCA [17] is capable of deriving low dimensional options that incorporate higher order statistics. Higher order dependencies in an image include nonlinear relations among the pixel intensity values, like the relationships among three or additional pixels in an edge or a curve, which can capture necessary information for recognition.

In this paper, we present a kernel PCA method based relationship learning for real-time face recognition. The proposed PRLSR, that is extension of kernel PCA method [13] to relationship mapping, is employed to extract nonlinear eigen face features from nonlinear faces in a very high dimensional space, which is nonlinearly associated with the input space. Normally, the face recognition techniques use just one test image for every trial [17]. However, the proposed method uses test face class instead of test check face image for classification. Such situations arise in some real time applications where more than one test image of a similar subject are captured. The test face class, consisting of the images of same subject with totally different orientation, lighting condition and expression, is used for construction of test symbolic face.

### A. Kernal PCA Based Face Recognition System

The kernel matrix and also the kernel PCA features are both defined on dot products within the high dimensional feature space, whose computation might be prohibitively expensive. Kernel PCA, however, manages to compute the dot products by means of a kernel function [17]:

$$K(x, y) = (\Phi(x) . \Phi(y))$$

Two classes of kernel functions widely used in kernel classifiers are polynomial kernels defined, as:

$$k(x, y) = (x . y)d$$

### B. Relationship Learning by Kernel PCA

For each cluster, we denote the training image pairs by D = $\{(\Omega_l^i, \Omega_h^i, \Omega_{il}^i)\}$, and also the training image pairs are centered by shifting the mean of the VLR–HR-IL training images. Let $\Phi$: $R^p \rightarrow F$ be a nonlinear mapping between the input space and also the feature space. For kernel PCA, the nonlinear mapping, F, $\Phi$ usually defines a kernel function.

Let $K \in R^p$ define a kernel matrix by means of dot roduct in the feature space:

$$K_{ij} = (\Phi(\Omega_h{}^i). \ \Phi(\Omega_{il}{}^i))$$

Assume the mapped data is centered. , the eigenvalues, A = $[a_1, a_2, ..a_m \ ]$ , and also the eigenvectors V = $V_1, V_2, ..Vm]$, of kernel matrix K can be derived.

The simplest technique for determining which face class provides the most effective relationship description of an input facial image is to find the face class k that minimizes the Euclidean distance

$$K \ \epsilon_k = \Phi[V_i - V_k]$$

where k is a vector describing the $k^{th}$ reconstructed class. If $V_k$ is less than some predefined threshold $\theta$, a reconstructed image is classified as belonging to the class k. Let R be the relationship mapping from the VLR to HR, IL Eigen image spaces within the cluster, then we have

$$\ddot{I}_l{}^i \approx R(K_h{}^i, K_{il}{}^i)$$

After determining R, the HR image can be recovered by applying on the VLR image. Therefore, the SR problem is converted to the learning of relationship mapping R. So, $\Omega$ describes the contribution of every eigenface in representing the facial image by treating the eigenfaces as a basis set for facial images.

## VII. IMPLEMENTATION AND RESULTS

Public face databases CAS-PEAL [5] and YaleB [6] are chosen for the experiments. For CASPEAL, a subset that consists of 1040 frontal view face images is used. For YaleB, a subset of frontal view images from 38 persons with 64 different illuminations is used. All images are manually aligned by the position of the eyes and normalized to the resolutions of 64 x 48 (HR) and 16 x 12 (VLR). The images are well aligned. Since there is no general method for aligning images with different poses, only frontal view images are used in our experiments. For every database, images are divided into two non overlapped sets per their class label. In the CAS-PEAL database, images from 500 persons (one per person) are randomly selected as the training data, and for the YaleB database, images of 19 persons (64 per person) are randomly selected as the training set. The rest of images are used as the testing (probe) set.

As shown in Fig. 3, the training data pairs will be clustered using linearity clustering, so that the relationship between the data pairs in every cluster can be linearly approximated by Eigen faces vectors. One relationship is PRLSR learned for



(a)
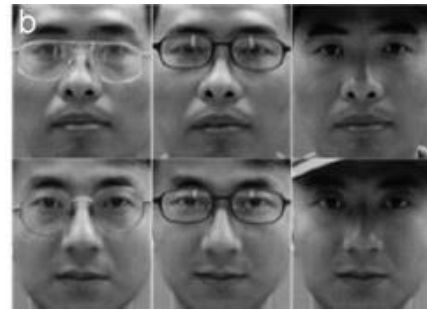


(b)



(c)

Fig. 2 Training Image pairs a) VLR Image Pairs b) HR Image Pairs c) IL Image Pairs

each cluster by PCA. In the testing phase the VLR testing image will be classified into one among the clusters, and then, the reconstructed image is obtained by applying on the input testing image
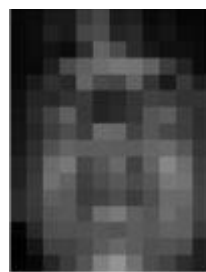
(a)



(b)



(c)



(d)

Fig. 3 Reconstructed images a) Input VLR image b) RLSR image c) PRLSR
Image d) Original Image
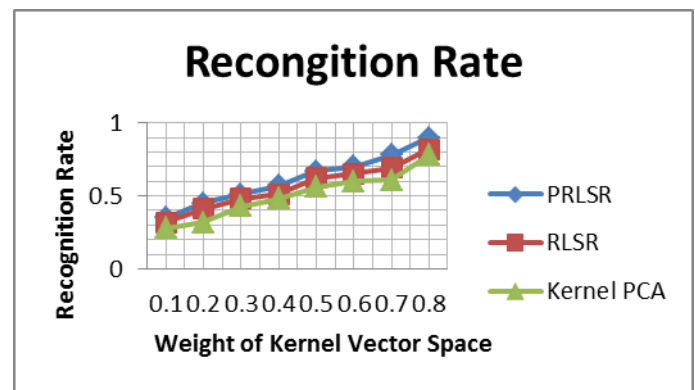


Fig. 4 Recognition Accuracy

We also performed the relationship learning experiment against different weights, and the proposed kernel PCA approach using PRLSR showed the best recognition accuracy of 96%. Consequently, we confirmed the effectiveness of the proposed face recognition system under real-time-variant environments from the experimental results.

## VIII. CONCLUSION

The VLR nonlinear face recognition problem has been defined and discussed in this paper. To solve the problem, a piecewise nonlinear kernel PCA model was used, and a novel relationship-based SR was proposed. Based on this idea, for good visual quality applications, a new data constraint that measures the error in the HR and IL image space was developed, and PCA-RLSR was proposed. To evaluate the performance of the proposed system, experiments were performed with the extended Yale face database B, and CAS-PEAL the results confirmed that the proposed approach achieves the best recognition rate of 96%. Our algorithms can be easily utilized in a real-time face recognition system under illumination-variant, VLR, and nonlinear future space environments. Further analysis of the proposed system to be concentrate the non-faces real-time recognitions.

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# Kinanthropometric Variance of Different Intensity Running Events of University Level Female Athletes of West Bengal

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*Abstract*- Kinanthropometry is an emerging scientific specialization concerned with the application of measurement to appraise human size, shape, proportion, composition, maturation and gross function. It is the application of anthropometry in sports and Physical Education field to find out performance of human being having the body of different shapes and sizes. At the same time, it is a scientific fact that different games and sports need different types of body-build. These research findings have changed the overall human performance capacity in the modern sports field. The purpose of the present study is to find out the difference between the body-build of different levels of female Track & Field runners in respect of their respective kinanthropometric variables.

*Index Terms*- Body types,  Female runners, Kinanthropometric measurement, Track & Field.

## I.   INTRODUCTION

Kinanthropometric components, including common measures like age, stature, body mass, skinfolds etc. and aspects like proportionality, somatotype and body composition are important role players in sporting performance. Although various researchers have already investigated the relationship between morphological characteristics (kinanthropometry) and performance in different sports, but investigation of kinanthropometric characteristics of different athletes always become a new topic of research, because there characteristics or profile are changing with time. The purpose of this study was therefore to describe the body composition of University level female athletes and identify the variance of these kinanthropometric variables according to different intensity running events. Anthropometry consists of making external measurements of human body. The results can be used to apprise body build, nutritional status and posture.

Kinanthropometry is an emerging scientific specialization concerned with the application of measurement to appraise human size, shape, proportion, composition, maturation and gross function. It is a basic discipline for problem-solving in matters related to growth, exercise, performance and nutrition. Various anthropometric measurements and persons with different body types and motor skill performance have been extensively studied. Thus, sports anthropometry has developed as a special branch, not only as a parameter of selective diagnostic procedure but also as a performance prediction tool.

**William et al. (1981)** reported differences within male of female junior Olympic samples. Additional structural

differences, generally of a lesser magnitude, also existed between other groups of junior Olympians. Differences in body composition characteristics were also noted when Junior Olympians were compared with other adolescent athletes or non-athletes.

**DeGarry, Levine and Carter (1974)** after intensive study of anthropometric measurements of athletes, concluded that the top level performance in a particular type of body size and shape, other aspects are being similar. They established a strong relationship between the structure of an athlete and specific task (event) of an athlete for high level of performance.

Biomechanical and physiological demands in sprinting, middle and long distance track events are different. There is a great importance of Kinanthropometry in sports performance. It is found worthwhile to compare female athletes of West Bengal, who participate different University level track events such as 100 mts, 200 mts, 400 mts, 800 mts, 1500 mts, 300mts, 500mts, 4x100 and 4x400 mts relay to provide information about their some Kinanthropometric speciality for participating in their respective events.

Track and field events are marked by an exceptional variety of duration of a single event, energetic demands and the tempo of energy release. The fact that runners need to carry their body weight, which means they need to overcome the force of gravity on different distances, stipulates a specific (lean) body composition as a prerequisite for more efficient and economic performance in a single event. Athletes who have (or) acquired the optimal physique for a particular event are more likely to succeed than those who lack the general characteristics **(Carter, 1984)**. Studies on somatotype of athletes, elite athletes and Olympic athletes have generally shown that strength and speed dependent athletes tended to be basically mesomorphic while distance dependant athletes were found to be more ectomorphic with limited amount of mesomorphic muscularity **(Battinelli, 2000)**.

## II.   METHODS

**Subjects:**

31 female runners who were participating in Kalyani University, West Bengal Inter College Athletic Meet, 2012 were chosen as subjects. The subjects were categorised into three groups namely,

1. Short Distance Group (SDG): Who participated 100 mts, 200 mts. and 400 mts. Run and     n=15,

2.  Middle Distance Group (MDG): Who participated 800 mts, and 1500 mts. Run and n=8,

3. Long Distance Group (LDG): Who participated 3000 mts, and 5000 mts. Run and n=8.

Standardized kinanthropometric measurement procedure was used with the help of requisite equipment available i.e. Stadiometer, Steel tape, Skinfold calliper and Weighing machine. The following kinanthropometric measurements were taken: Weight[Kg.], Height[cm.], Arm length[cm.], Leg length[cm.], Biceps skin fold[mm.], Triceps skin fold[mm.], Sub-scapular skin fold[mm.] and Height/leg ratio.

One way ANOVA was computed to compare among three groups on the selected kinanthropometric variables and for significance of 'F' then Tukey HSD method was applied for post HOC difference between two separate means.

### III. RESULTS AND DISCUSSION

Mean, S.D. and S.E. of Height, Weight, Arm length, Leg length, Biceps skin fold, Triceps skin fold, Sub-scapular skin fold and Height/leg ratio is presented in Table No.1,2,3,4,5,6,7 and 8 respectively.

**Table :- 1 Mean, S.D. and S.E. of Height of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 156.972 | 156.0513 | 157.1625 | 156.7835 |
| S.D. | 3.2838 | 3.2156 | 2.1197 | 2.9483 |
| S.E. | 0.8479 | 1.1369 | 0.7494 | 0.5295 |

**Table :- 2 Mean, S.D. and S.E. of Weight of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 47.2233 | 46.1523 | 43.3625 | 45.9506 |
| S.D. | 2.0716 | 3.3964 | 2.0896 | 2.8845 |
| S.E. | 0.5349 | 1.2008 | 0.7388 | 0.5181 |

**Table :- 3 Mean, S.D. and S.E. of Arm length of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 72.3867 | 71.85 | 72.5438 | 72.2887 |
| S.D. | 0.9674 | 0.8852 | 1.33 | 1.0516 |
| S.E. | 0.2498 | 0.313 | 0.4702 | 0.1889 |

**Table :- 4 Mean, S.D. and S.E. of Leg length of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 93.3873 | 93.345 | 95.4088 | 93.8981 |
| S.D. | 3.7756 | 2.6291 | 2.5794 | 3.2616 |
| S.E. | 0.9748 | 0.9295 | 0.9119 | 0.5858 |

**Table :- 5 Mean, S.D. and S.E. of Biceps skinfold of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 3.562 | 3.9825 | 3.8688 | 3.7497 |
| S.D. | 0.2499 | 0.1391 | 0.2155 | 0.02834 |
| S.E. | 0.0645 | 0.0492 | 0.0762 | 0.0509 |

**Table :- 6 Mean, S.D. and S.E. of Triceps skinfold of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 7.0947 | 7.25 | 6.8863 | 7.081 |
| S.D. | 0.1981 | 0.355 | 0.1025 | 0.02608 |
| S.E. | 0.0511 | 0.1255 | 0.0362 | 0.0468 |

**Table :- 7 Mean, S.D. and S.E. of Subscapular skinfold of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 7.388 | 8.3188 | 8.3238 | 7.8697 |
| S.D. | 0.2006 | 0.1638 | 0.2402 | 0.5131 |
| S.E. | 0.0518 | 0.0579 | 0.0849 | 0.0922 |

**Table :- 8 Mean, S.D. and S.E. of Height/leg ratio of three groups.**

|  | SDG | MDG | LDG | Total |
|---|---|---|---|---|
| N | 15 | 8 | 8 | 31 |
| Mean | 1.677 | 1.666 | 1.643 | 1.665 |
| S.D. | 0.0384 | 0.0206 | 0.0250 | 0.0336 |
| S.E. | 0.009927 | 0.0579 | 0.0849 | 0.0922 |

The ANOVA table for different Kinanthropometric variables are presented in Table No.9. Here between group (BG) variance is calculated with degrees of freedom =2 and error variance is calculated with degrees of freedom =28.

**Table:-9 Analysis of variance of Kinanthropometric Variables of three groups.**

| Variables | $(SS)_b$ | $(SS)_e$ | $(MS)_b$ | $(MS)_e$ | F | p |
|---|---|---|---|---|---|---|
| Height | 5.9716 | 254.7979 | 2.9858 | 9.0999 | 0.33* | 0.721682 |
| Weight | 78.21 | 171.3934 | 39.105 | 6.1212 | 6.39** | 0.005175 |
| Arm-length | 2.204 | 30.9695 | 1.102 | 1.1061 | 1* | 0.380640 |
| Leg-length | 24.6171 | 294.529 | 12.3086 | 10.5189 | 1.17* | 0.325083 |
| Biceps SF | 1.0754 | 1.3345 | 0.5377 | 0.0477 | 11.28** | 0.000255 |

| | | | | | |
|---|---|---|---|---|---|
| Triceps SF | 0.5347 | 1.5054 | 0.2674 | 0.0538 | 4.97** | 0.014218 |
| Sub-scapular SF | 6.743 | 1.1551 | 3.3715 | 0.0413 | 81.72** | 0.0001 |
| H/L ratio | 0.005887 | 0.028068 | 0.002943 | 0.001002 | 2.94* | 0.069343 |

*Not-Significant,**Significant.

### Table:-10 Post HOC Test For Weight

| $M_{sdg}$ Vs $M_{mdg}$ | NS | HSD[0.05] = 2.81, HSD[0.01]= 3.6 |
|---|---|---|
| $M_{sdg}$ Vs $M_{ldg}$ | P<0.01 | |
| $M_{mdg}$ Vs $M_{ldg}$ | NS | |

### Table:-11 Post HOC Test For Biceps SF

| $M_{sdg}$ Vs $M_{mdg}$ | P<0.01 | HSD[0.05] = 0.25, HSD[0.01]= 0.32 |
|---|---|---|
| $M_{sdg}$ Vs $M_{ldg}$ | P<0.05 | |
| $M_{mdg}$ Vs $M_{ldg}$ | NS | |

### Table:-12 Post HOC Test For Triceps SF

| $M_{sdg}$ Vs $M_{mdg}$ | NS | HSD[0.05] = 0.26, HSD[0.01]= 0.34 |
|---|---|---|
| $M_{sdg}$ Vs $M_{ldg}$ | NS | |
| $M_{mdg}$ Vs $M_{ldg}$ | P<0.01 | |

### Table:-13 Post HOC Test For Subscapular SF

| $M_{sdg}$ Vs $M_{mdg}$ | P<0.01 | HSD[0.05] = 0.23, HSD[0.01]= 0.30 |
|---|---|---|
| $M_{sdg}$ Vs $M_{ldg}$ | P<0.01 | |
| $M_{mdg}$ Vs $M_{ldg}$ | NS | |

Table:-9 shows that there was no significant difference between height, arm-length, leg-length and height/leg ratio of three groups, but it was found that there was at least two groups were significantly different in respect of their weight, biceps skinfold, triceps skin fold as well as sub-scapular skin fold. Therefore, Tukey post HOC test was conducted for those means i.e. for weight, biceps skinfold, triceps skinfold and sub-scapular skinfold. Post HOC test showed that, in case of weight, there was no significant difference between mean of SDG($M_{sdg}$) and mean of MDG ( $M_{mdg}$) and mean of MDG($M_{mdg}$ ) and mean of LDG ( $M_{ldg}$), but significant difference  was found between mean of SDG($M_{sdg}$ ) and mean of LDG ( $M_{ldg}$) in 0.01 level of significant. This means that the body weight of SDG was found greater than long distance runners. There was no different between MDG and LDG as well as SDG and MDG in respect of weight. At the same time, significant difference was found between short distance runners and middle distance runners in respect of biceps skinfold (in 0.05 level of sig.). Same result was found between short and long distance runners in respect of biceps SF (in 0.01 level of sig.). This means that SDG were found lower biceps SF in comparison with MDG and LDG. In that case also MDG and LDG were not different. In case of triceps SF opposite result was found i.e. significant difference was found between MDG and LDG, but no significant difference was found between SDG and MDG as well as SDG and LDG. Sub-scapular SF shows similar

result like biceps SF i.e. significant difference was found between short distance runners and middle distance runners (in 0.01 level) as well as short distance runners and long distance runners (in 0.01 level). No difference was found between MDG and LDG. In this case also SDG showed lower sub-scapular SF than other groups. Researchers in the past have pointed out that sprinters are highly mesomorphic in nature (**Tanner, 1964; Sodhi, 1984; Vucetic et al., 2005**) i.e. lower fat percentage than middle distance and long distance runners. The present study is very much consistent with those studies.

The results of the a study conducted by **Abraham, G. (2010)** indicates that in comparison to other sports disciplines track and field athletes have lower body fat percentage. The analysis of that study showed that athletes of various track and field events statistically differ in morphological measures, especially in dimensions of body volume and body fat. **Abraham, G. (2010)** also concluded that the lowest value of % body fat was present among sprinters which are reflected in their lower values of skinfold measurement. The present study showed more or less similar results. **Cureton (1941)** stated that in general people with long legs and long arms and relatively short trunks were physically work types in long sustained heavy work but might show great speed and endurance at high levels of athletic activity. **Westlake (1967)** divided 61 female track and field athletes of San Diego County into four groups on the basis of their best event and somatotyped them using **Heath- Carter (1967)** anthropometric method. The mean somatotypes for each group were sprinters 3-3.5-4, jumpers 3-3-4.5, distance runners 3-4-3.5, and throwers 5-4.5-2. Thrower differed from the other groups in being heavier, more endomorphic, more mesomorphic and less ectomorphic. Distance runners were shortest and they were less linear than sprinters and jumpers. **Eiben (1972)** studied 125 women athletes during the Europian athletic championship. He found that in each anthropological character the sprinters had small dimension than all other women athletes.

**Muthiah and Venketswarlu (1973)** studied the Indian track and field athletes and noticed among the  runners, the age increased and height and weight decreased with the increase in distance they run. **De-Garay et al (1974)** examined 1265 Olympic athletes at Mexico Olympics in 1968, from the total number of 6084 competitors and studied the apparent relationship between  sports specially and physical structure of the individual. This study clearly supports the hypothesis: (a) there is a strong relationship between structure of athlete and the specific task in which he excels and (b) Clear physical prototypes exists for optional performance at the Olympic level games. **De-Garay et al (1974)** were perhaps the first to report comprehensive anthropometrical data to Olympic women players. Anthropometric study was done by **Sidhu (1990)** on 105 runners specializing in long, middle and short distances, by applying standard techniques. The results indicated that long, middle and short distance runners have somatotype ratings of 1.5-3.5-3.91. 1.52-3.68-3.56 and 1.61-3.62-3.65  respectively. Percentage of body fat calculated by applying **Brozek et al., (1963)** formula is 7.51, 7.55 and 8.72 in long, middle and short

distance runner. Long distance runners are less endomorphic than middle distance runners. Long distance runners are significantly leaner than short distance runners as indicated by 85 percentage of body fat, but do not differ significantly in somatotype components. Similarly middle distance runners have significantly less body fat than the short distance runners, but these two groups do not show significant differences in somatotype components. **Hebbelinck et al., (1973**), studied the somatotypes in a Spanish school-aged population The study showed an evolution in the components of the somatotype with age, and a distribution of somatoplots in the somatochart which presented peculiar characteristics in both sexes.

## IV.  CONCLUSION

1. Body weight of University level Short distance runners of West Bengal are found greater than long distance runners of same University. There is no different between Short distance runners and Middle distance runners as well as Middle distance runners and Long distance runners in respect of weight.

2. Short distance runners of Kalyani University of West Bengal have lower biceps skinfold in comparison with Middle distance and Long distance runners. In case of triceps skinfold Middle distance runners are having greater triceps skinfold in comparison to Long distance runners as well as Short distance runners. Short distance runners shows less triceps skinfold in comparison to other two groups.  Sub-scapular SF shows similar result like biceps skinfold.

3. Short, middle and long distance runners are not differing significantly in Height, Leg-length, Arm-length and Height-leg ratio.

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# Anti-Angiogenic Effects of Diltiazem, Imatinib, and Bevacizumab in the CAM Assay

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*Abstract-* Angiogenesis that plays important roles in a variety of physiological processes is strictly delimited and finely tuned by a balance of pro-angiogenic and anti-angiogenic factors. Angiogenesis is essential for viability, growth, invasion and metastasis of tumors. The chorioallantoic membrane model is considered to be a valuable method for investigation of anti-angiogenic effects of drugs and other substances. The aim of the present study is to investigate the anti-angiogenic effects of a calcium channel blocker (diltiazem), a tyrosine kinase inhibitor (imatinib), and a vascular endothelial growth factor inhibitor (bevacizumab) with the means of the chicken chorioallantoic membrane (CAM) model. Each drug was administered onto the chorioallantoic membrane at the concentrations of $10^{-4}$M, $10^{-5}$M, and $10^{-6}$M on 8th day of incubation. After 24 h, development of the blood vessels under a stereo-microscope was investigated. The evaluations were performed using a scoring system. We evaluated anti-angiogenic effects of the drugs in two ways according to their average anti-angiogenic effect and comparison of median anti-angiogenic score. These two angiogenesis evaluation techniques provided similar results to measure anti-angiogenic effects of the study drugs. Bevacizumab has the strongest anti-angiogenic effect compared to the diltiazem and imatinib, and although not reaching statistical significance imatinib has a strong anti-angiogenic effect than that of the diltiazem.

*Index Terms-* Angiogenesis, diltiazem, imatinib, bevacizumab, chorioallantoic membrane, chicken egg

## I. INTRODUCTION

Angiogenesis as a physiological process involves the growth of new blood vessels from pre-existing vessels and plays a central role in embryonic and normal developments and wound healing. It has also important roles in the etiology of many diseases such as chronic inflammatory disorders, cancer, and some pregnancy related diseases such as intrauterine growth restriction and preeclampsia (1-3). The remarkable diversity in angiogenic signaling pathways provides many options for therapeutic intervention, and since angiogenesis plays an essential role in tumor growth and invasion, anti-angiogenesis is currently a major area of oncologic research. A tumor is unable to grow more than 2 mm in diameter unless there is the development of new vessels by angiogenesis (4). Some approved anti-angiogenic agents such as bevacizumab, sorafenib, sunitinib, and thalidomide are used clinically as effective drugs for several

types of cancer, and many new agents are in phase II trials. The anti-angiogenic agents can act synergistically with conventional chemotherapy drugs and tend to have non-overlapping toxicities (5).

Molecular processes related to angiogenesis include stimulation of endothelial growth to develop new vessels by cytokine production (i.e. vascular endothelial growth factor (VEGF), fibroblast growth factor (FGF)-2), degradation of extracellular matrix proteins by matrix metalloproteinases, and migration of endothelial cells mediated by cell membrane adhesion molecules like integrins. Drugs targeting pathologic angiogenesis have been designed to interfere with any of these steps and some of them are currently undergoing evaluation in clinical studies (6).

Diltiazem is a potent vasodilator and belongs to a non-dihydropyridine group of drugs that are a class of calcium channel blockers, used in the treatment of hypertension, angina pectoris, and some types of arrhythmia. Sartippour et al. (7) investigated the effect of some drugs, such as diltiazem, enalapril, and omeprazole as generally administered agents in cancer patients, on in vitro angiogenesis. They concluded that these drugs in massive doses had a potential to inhibit endothelial proliferation but they had no effect at human therapeutic ranges. Higgins et al. (8) examined the effect of diltiazem on oxygen-induced retinopathy in a mouse model with evaluation techniques for neovascularization. They concluded that diltiazem decreases retinal neovascularization and improved retinopathy. Except that investigation, there is no study included diltiazem to evaluate its angiogenic effect in the chorioallantoic membrane (CAM) and similar assays.

Imatinib mesylate is a member of a new class of anticancer agents, the so-called small molecules. It is a phenylaminopyrimidine analogue that competes with ATP for its specific binding site in the kinase domain of specific tyrosine kinase receptors (9). It is a signal transduction inhibitor that specifically targets several protein tyrosine kinases, c-abl, c-kit, and the platelet derived growth factor (PDPG) receptor (10-12). PDGF is a crucial angiogenic factor involved in maturation of the microvasculature (13). Balke et al. (14) investigated eight osteosarcoma cell lines for their ability to form vascularized tumors on the CAM with or without imatinib. They concluded that treatment with imatinib potently inhibited tumor angiogenesis and growth in their model. Rocha et al. (12) examine the effects of imatinib on Human Aortic Smooth Muscle Cells and Human Umbilical Vein Endothelial Cells after incubation with progesterone. They suggested that imatinib had anti-angiogenic effects related to smooth muscle cells but not

endothelial cells, and it was probably preventing vessel stabilization.

Overexpression of VEGF, the key mediator of angiogenesis in physiologic and pathophysiologic conditions, is accepted as related to poor prognosis in malign tumors. Bevacizumab, a recombinant humanized anti-VEGF monoclonal antibody, is the most clinically advanced anti-angiogenic agent. Although bevacizumab has been gained a place in the first-line treatment of advanced colorectal and non-small-cell lung cancer, there is a rapidly growing body of evidence for its efficacy in treatment of a number of other solid tumors (15).

To date, a variety of in vivo angiogenic assays have been developed to investigate angiogenesis in physiological and pathological circumstances and pro- and anti-angiogenic effects of compounds. The chick embryo CAM developed as a successful, feasible, and sensitive model for in vivo research on angiogenesis and anti-angiogenesis (16, 17). There was no study conducted to examine and compare the anti-angiogenic effects of diltiazem, imatinib and bevacizumab in the same setting of CAM assay. In the management of cancer patients with cardiovascular diseases, many drugs belonging to these drug groups may need to be used together in clinical practice.

In this study, we sought to determine the effects of diltiazem, imatinib and bevacizumab on angiogenesis in the CAM assay.

## II.  MATERIALS AND METHODS

**Drugs and preparation of the pellets**

In this study, the effects of diltiazem (Diltizem® 25 mg flakon, Mustafa Nevzat İlac Sanayi Anonim Sirketi®, Istanbul), imatinib (Novartis Institutes for BioMedical Research, Basel, Switzerland), and bevacizumab (Altuzan 400 mg/16 mL vial, Roche Mustahzarlari Sanayi Anonim Sirketi, Istanbul) were investigated. While diltiazem and imatinib were prepared by solving in sterile distilled water, bevacizumab was in the form of soluble infusion. Suramin, a prototype of a pharmacological antagonist of growth factors, has a potential to inhibit multiple control points of angiogenesis (18). Thalidomide inhibits the activity of basic fibroblast growth factor-2 (5). Suramin and thalidomide (Sigma-Aldrich, St. Louis, MO, USA) was dissolved or emulsified immediately prior to use in positive controls (19, 20).

Three concentrations ($10^{-4}$M, $10^{-5}$M and $10^{-6}$M) of the study drugs and a $10^{-4}$M concentration of suramin and thalidomide were used. The choice of these concentrations were based on the results of the previous studies which have shown that the concentration of $10^{-4}$ M provides submaximal efficacy of the drugs, and the observations regarding the efficacy of $10^{-6}$ M concentration of the drugs in human body. First of all, the concentrations of $10^{-4}$ M of the drugs were prepared; the more diluted concentrations were prepared by diluting these solutions. The classical molarity formula (M=m/V) was used to find out the required drug amount to provide $10^{-4}$ M concentration. The study drugs and positive controls were administered in a 2.5% (w/v) solution of agarose (Merck, Darmstadt, Germany). For easy administration, the pellets were prepared as 10 µl drops on circular stainless steel surface which is 5 mm in diameter. The pellets were then solidified at room temperature, and applied onto the CAM within 1 h. In first negative controls, no pellet was administered. The pellets with no drugs including only 10 µl agarose solution were used in second negative controls.

## III.  CHORIALLANTOIC MEMBRANE ASSAY

Ross 308 impregnated chick eggs were obtained from Yemsel Tavukculuk Hayvancilik Yem Hammaddeleri Sanayi ve Ticaret Anonim Sirketi (Kayseri). The impregnated chick eggs were incubated in horizontal position in 37.5°C and 80% relative humidified environment. On the day 5 of incubation period, 5 ml of albumin was taken from the solid side of the eggs by a syringe allowing detachment of the embryo from the eggshell and a shell piece of 2-3 cm in diameter was removed to open a window on the other side of the eggs. Normal development was verified and embryos with malformations or dead embryos were excluded. The window was sealed with gelatin and thereafter, the eggs were returned to the incubator for 72 hours to have CAM reached approximately 2 cm in diameter, and then on day 8 the pellets were placed on chorioallantoic membranes of each egg. The eggs were then incubated for 24 hours and after this period angiogenesis was evaluated.

Table 1 presents the ratio of angiogenesis evaluation/test compound administration. For each concentration of the study and positive control drugs, fifteen eggs were used in each egg set. All of the tests were duplicated. For no pellet and agar only negative controls, one and two egg sets, respectively, were used. We excluded the eggs with inflammation and embryo toxicity caused by the pellets. When used in $10^{-4}$M and $10^{-5}$M concentrations, test drugs caused embryo toxicity in 28 eggs; therefore, data obtained from the 343 eggs that were suitable for evaluation were used. There was no exclusion related to inflammation.

**Table 1. The number of angiogenesis evaluation/study compound administration in the study and control groups.**

|  | 10-4 M | 10-5 M | 10-6 M |
|---|---|---|---|
| Diltiazem | 14/30 | 28/30 | 30/30 |
| Imatinib | 28/30 | 29/30 | 30/30 |
| Bevacizumab | 24/30 | 29/30 | 30/30 |
| Suramin | 15/15 |  |  |
| Thalidomide | 15/15 |  |  |
| No pellet | 15/15 |  |  |
| Agar | 30/30 |  |  |

**Angiogenesis scoring**

The vascular composition of the chorioallantoic membranes where the pellets were administered was evaluated under stereoscopic microscope by using the scoring system of Burgermeister et al. on day 9 (21) (Table 2).

**Table 2. The scoring system of angiogenic effect of the compounds on chorioallantoic membrane.**

| Score | Effect | Definition |
|-------|--------|------------|
| 0 | Absent | Normal embryo, no difference with respect to surrounding capillaries |
| 0.5 | Weak | There is no area lacking capillary vessels. The density of the capillaries is decreased but not larger than the pellet |
| 1 | Moderate | The area lacking capillaries is small or capillary density is decreased in a certain area. The effects are not more than twice of the pellet area |
| 2 | Strong | The area lacking capillaries is at least as twice as pellet area |

After the scoring, the equation developed by Krenn & Paper (20) was used for the determination of the average mean score for each drug concentration:

Average score = [Egg number (Score 2) X 2 + Egg number (Score 1) X 1] / [Total egg numbers (Score 0, 1, 2)]

Average score $<0.5$ = no anti-angiogenic effect. Average score 0.5 to 0.75 = weak anti-angiogenic effect, score $>0.75$ to 1 = good anti-angiogenic effect, and score $>1$ = very good anti-angiogenic effect.

### 3.3. Statistical Analysis

The data were expressed as median (min-max) in dot-plot graphs. Anti-angiogenic scores of study drugs and positive controls were analyzed by Kruskal-Wallis with post hoc Dunn's multiple comparison test tests and expressed as median (min-max). A p value of less than 0.05 was considered as statistically significant.

### IV. RESULTS

In the first negative controls, angiogenesis of chorioallantoic membranes was normal. The pellets with no drugs including only 10 µl agarose solution as the second negative controls did not cause any significant anti-angiogenic effect (average anti-angiogenic score = 0.2).

The average anti-angiogenic scores of suramin and thalidomide were 0.5 (weak anti-angiogenic effect) and 1 (good anti-angiogenic effect), respectively. The average anti-angiogenic scores of diltiazem $10^{-4}$M, $10^{-5}$M and $10^{-6}$M were 0.9 (good anti-angiogenic effect), 0.6 (weak anti-angiogenic effect), and 0.4 (no anti-angiogenic effect), respectively. The average anti-angiogenic scores of imatinib were 1.0 (very good anti-angiogenic effect), 0.7 (very good anti-angiogenic effect), and 0.5 (good anti-angiogenic effect) for $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations, respectively. The average anti-angiogenic score of bevacizumab was 1.58 (very good anti-angiogenic effect), 1.55 (very good anti-angiogenic effect), and 1.16 (very good anti-angiogenic effect) for $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations, respectively.

The median anti-angiogenic score of thalidomide $10^{-4}$M was significantly higher than that of the suramin $10^{-4}$M [1 (0-2) versus 0 (0-1); $p<0.05$]. Figure 1 shows the median anti-angiogenic scores of diltiazem in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations. As shown in the scatter-dot graph, the following significant differences were found. The median anti-angiogenic score of diltiazem $10^{-4}$M was significantly higher than those of the diltiazem $10^{-6}$M and suramin $10^{-4}$M [1 (0.5-1) versus 0.5 (0.5-1) and 0 (0-1), respectively; $p<0.05$]. The median anti-angiogenic score of diltiazem $10^{-5}$M was significantly higher than that of the suramin $10^{-4}$M [1 (0.5-1) versus 0 (0-1); $p<0.05$].
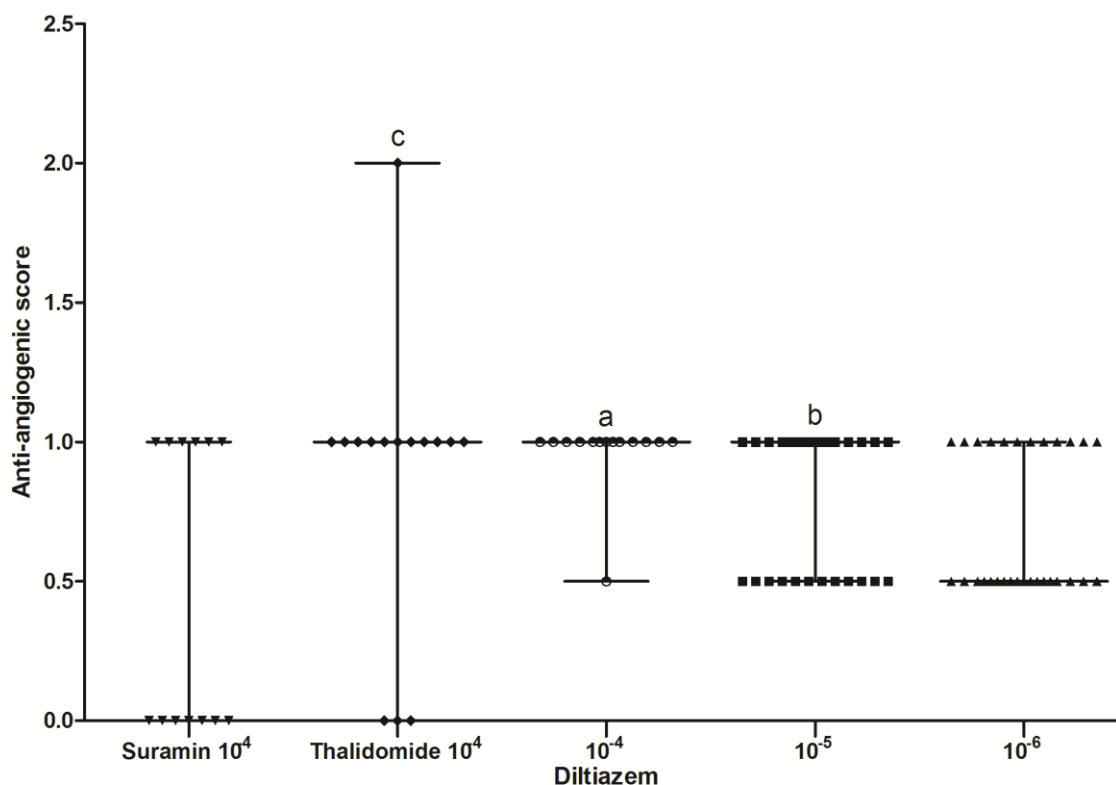
**Figure 1.** Anti-angiogenic scores of diltiazem in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations. The data were expressed as median (min-max) on scatter-dot plots. [a]$P<0.05$ versus diltiazem $10^{-6}$M and suramin $10^{-4}$M. [b]$P<0.05$ versus suramin $10^{-4}$M. [c]$P<0.05$ versus thalidomide $10^{-4}$M.

Figure 2 shows the median anti-angiogenic scores of imatinib in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations. As shown in the scatter-dot graph, the following significant differences were found. The median anti-angiogenic score of imatinib $10^{-4}$M was significantly higher than those of the imatinib $10^{-6}$M and suramin $10^{-4}$M [1 (0.5-2) versus 1 (0-1) and 0 (0-1.0), respectively;

$p<0.05$]. The median anti-angiogenic score of imatinib $10^{-5}$M was significantly higher than that of the suramin $10^{-4}$M [1 (0.5-2) versus 0 (0-1); $p<0.05$]. Overall, these results suggest that, being more significant in higher concentrations, imatinib has anti-angiogenic effect on chick CAM model.
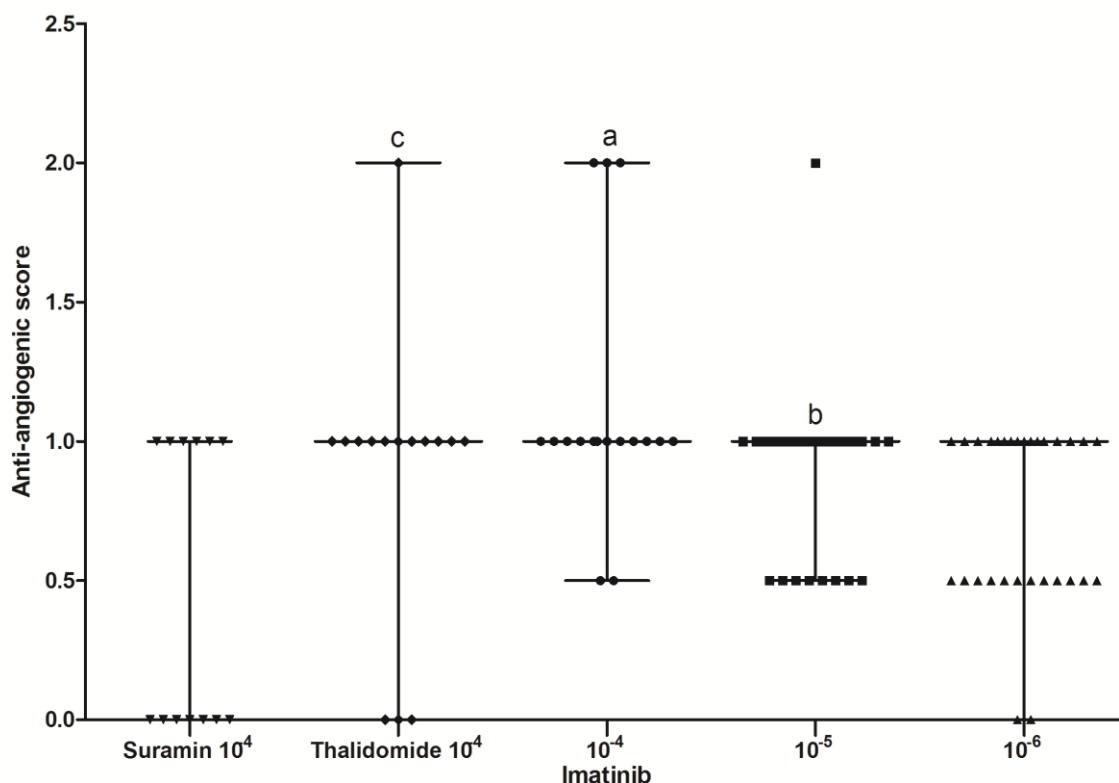


**Figure 2.** Anti-angiogenic scores of imatinib in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations. The data were expressed as median (min-max) on scatter-dot plots. [a]$P<0.05$ versus imatinib $10^{-6}$M and suramin $10^{-4}$M. [b]$P<0.05$ versus suramin $10^{-4}$M. [c]$P<0.05$ versus thalidomide $10^{-4}$M.

Figure 3 shows the median anti-angiogenic scores of bevacizumab in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations. As shown in the scatter-dot graph, the following significant differences were found. The median anti-angiogenic score of bevacizumab $10^{-4}$M was significantly higher than those of the bevacizumab $10^{-6}$M, suramin $10^{-4}$M, and thalidomide $10^{-4}$M [2 (1-2) versus 1 (0.5-2), 0 (0.5-1) and 1 (0-2), respectively; $p<0.05$]. The median anti-angiogenic score of bevacizumab $10^{-5}$M was significantly higher than those of the bevacizumab $10^{-6}$M, suramin $10^{-4}$M, and thalidomide $10^{-4}$M [2 (1-2) versus 1 (0.5-2), 0 (0-1), and 1 (0-2), respectively; $p<0.05$]. The median anti-angiogenic score of bevacizumab $10^{-6}$M was significantly higher than that of the suramin $10^{-4}$M [1 (0.5-2) versus 0.5 (0-1.0); $p<0.05$]. Overall, these results suggest that, being more significant in higher concentrations, diltiazem has anti-angiogenic effect on chick CAM model.
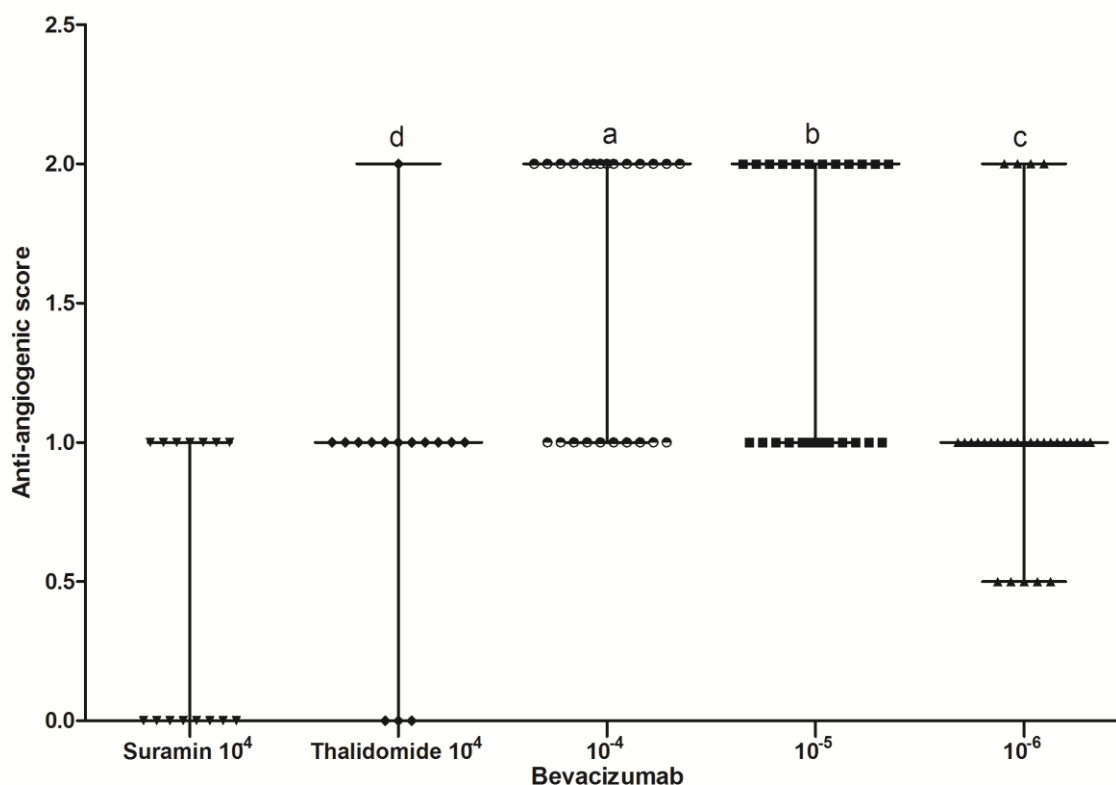
**Figure 3.** Anti-angiogenic scores of bevacizumab in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations. The data were expressed as median (min-max) on scatter-dot plots. [a,b]$P<0.05$ versus imatinib $10^{-6}$M, suramin $10^{-4}$M, and thalidomide $10^{-4}$M. [c]$P<0.05$ versus suramin $10^{-4}$M. [d]$P<0.05$ versus thalidomide $10^{-4}$M.

After comparison of the median anti-angiogenic scores of diltiazem, imatinib, and bevacizumab, overall, bevacizumab was the strongest anti-angiogenic agent compared to the other drugs ($p<0.05$). The median anti-angiogenic scores of diltiazem, imatinib, and bevacizumab were significantly higher than that of the suramin ($p<0.05$). The median anti-angiogenic score of bevacizumab was significantly higher than that of the thalidomide ($p<0.05$). Diltiazem, imatinib, and thalidomide were comparable with regard to their median anti-angiogenic scores ($p<0.05$).

## V. DISCUSSION

We used chick CAM assay for the evaluation of the diltiazem, imatinib, and bevacizumab on angiogenesis. There was no CAM assay investigated their anti-angiogenic effects. This was the first study investigated the anti-angiogenic effects of these drugs in the same setting of CAM assay. Our findings demonstrated that diltiazem, imatinib, and bevacizumab have anti-angiogenic effects. Overall, according to their average anti-angiogenic scores, study drugs and positive controls ranked from very good to weak anti-angiogenic effect as the following: bevacizumab, imatinib and thalidomide, diltiazem, and suramin. Overall, these results suggest that, being more significant in higher concentrations, all the study drugs have anti-angiogenic effect on chick CAM model. After comparison of the median anti-angiogenic scores of study drugs and positive controls, they

ranked as the following: bevacizumab, diltiazem, imatinib, and thalidomide, and suramin. In this study, we evaluated anti-angiogenic effects of the drugs in two ways according to their average anti-angiogenic effect and comparison of median anti-angiogenic score. These two evaluation methods provided similar results to measure anti-angiogenic effects of the study drugs.

CAM is an extra-embryonic membrane formed on day 4 of incubation by fusion of the chorion and the allantois. Immature blood vessels grow very rapidly until day 8 and rive rise to a capillary plexus. Rapid capillary proliferation continues until day 11, and the vascular system attains it final form on day 18. CAM is a very angiogenic tissue until day 11 or 12 of chick embryo development. Between day 8 and day 10, CAM is highly responsive to pro- and anti-angiogenic effects of the drugs. In addition, 3 to 5 days are usually enough for the assays. There is no clear difference between in ovo or shell-less cultures. In this study, in ovo technique was used. Focal application of test substances is still the most used method (17).

Angiogenesis is essential for tumor progression and dissemination (22, 23). New blood vessel formation during tumor growth is regulated by pro- and anti-angiogenic factors (22, 24). Angiogenic switch occurs when the effects of anti-angiogenic factors become preponderant. This leads to formation of new blood vessels supplying tumor tissue (24). Anti-angiogenic approaches fell in two categories as agents that blocked the activity of pro-angiogenic molecules. Nowadays, over 300 anti-angiogenic molecules targeting different signaling pathways are being tested for their anticancer properties at preclinical and

clinical stages. Owing to its central role in promoting tumor growth, VEGF has become the most important target for blocking its action a different level of signaling pathways (17). The rabbit ear chamber, the mouse dorsal skin and air sac, the CAM, the iris and avascular cornea of the rodent eye, and the zebrafish are the classical assays for investigation of angiogenesis in in vivo methods. In vivo angiogenesis assays may be very sensitive to environmental factor, and the activation of inflammatory or other non-endothelial cell types can modify the development of new vessel formation. Because the CAM has many advantages related to cost, ease of use, reproducibility, and reliability, it was chosen for this experiment (17).

Calcium is an essential signal transduction element which plays significant roles in many eukaryotic cell functions including cell cycle progression (25). Control of intracellular level of calcium is of paramount importance for normal cell cycle progression and cell proliferation (26); therefore, calcium excess or disturbances of calcium signalization may cause cell death (27). Diltiazem is a calcium channel blocker which is more potent on L-type calcium channels. We found that diltiazem in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations had poor anti-angiogenic effect. However, the drug in $10^{-4}$M concentration was more potent inhibitor of angiogenesis. The findings show that, being more significant in high doses, diltiazem has poor anti-angiogenic effect.

Imatinib is a specific tyrosine kinase inhibitor that blocks the activity of the bcl-abl oncoprotein and the c-kit tyrosine kinase cell surface receptor. Imatinib is also an inhibitor of the PDGFR kinase (28). Protein kinases act as catalyzers in phosphorylation reactions in signaling cascades that affect cell growth and differentiation. These roles in cell progression make the kinases target agents for drug development in cancer. To the best of our knowledge, the effect of imatinib on angiogenesis on chorioallantoic membrane model has not been investigated to date. The results of our study indicate that imatinib in $10^{-4}$M and $10^{-5}$M concentrations has strong anti-angiogenic effect, whereas, $10^{-6}$M concentration of the drug has poor anti-angiogenic effect. Imatinib is more potent inhibitor of angiogenesis when used in higher concentrations. Our findings suggest that imatinib as a specific tyrosine kinase inhibitor which also blocks PDGFR has anti-angiogenic properties. This effect of the drug may have been caused by the blockade of PDGFR of which expression significantly increases during angiogenesis, by imatinib.

Bevacizumab is a recombinant humanized monoclonal antibody directed against VEGF. The drug has been used as the first-line treatment of metastatic colorectal cancer in combination with 5-fluorouracil since 2004 (28). In this study, bevacizumab in $10^{-4}$M, $10^{-5}$M and $10^{-6}$M concentrations was shown to have strong anti-angiogenic effects. However, the drug was more potent inhibitor of angiogenesis in $10^{-4}$M and $10^{-5}$M concentrations than $10^{-6}$M concentration.

Like other in vivo angiogenesis assays, the CAM assay has some disadvantages. CAM tissue contains a well-developed vascular network and the vasodilation that invariably follows its manipulation may be hard to distinguish from the effects of the test agent. Another limitation is nonspecific inflammatory reactions caused by the implant containing the study substance. Non-specific inflammatory reactions are much less frequent when the implant is made very early in the CAM development and the chick immune system is relatively immature (29).

In conclusion, in the CAM assay, for the evaluation of anti-angiogenic effect of study drugs, the average anti-angiogenic effect and comparison of median anti-angiogenic score provides comparable results. Bevacizumab has the strongest anti-angiogenic effect compared to the diltiazem and imatinib, and althought not reaching statistical significance imatinib has a strong anti-angiogenic effect than that of the diltiazem.

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# WEB BASED HONEYPOTS NETWORK

**Srivathsa S Rao[#1],Vinay Hegde[#2] , Boruthalupula Maneesh[#3], Jyothi Prasad N M[#4], Suhas Suresh[#5]**

*Abstract --* Honeypots are a modern approach to network security. A honeypot is used in the area of internet security and cryptography. It is a resource, which is intended to be attacked and compromised to gain more information about the attacker and the used implementations. It can be deployed to attract and divert an attacker from their real targets. Honeypots have the big advantage that they do not generate false alerts as each observed traffic is doubtful, because no productive components are running on the system. This fact enables the system to log every byte that flows through the network through and from the honeypot, and to relate this data with other sources to draw a picture of an attack and the attacker.

This paper would first give a brief introduction to honeypots- the types and its uses. We will then look at the other components of honeypots and the way to put them together. Finally we shall conclude by looking at what the future holds for honeypots.'

## I. INTRODUCTION

Global communication is getting more significant every day. At the same time, computer crimes are growing rapidly. Counter measures are developed to detect or prevent attacks - most of these measures are based on known facts, known attack patterns. As in the military, it is important to know, who your enemy is, what kind of strategy and plan he uses, what tools he utilizes and what he is aiming for. Gathering this kind of information is arduous but important. By knowing attack strategies, countermeasures can be improved and anomalies can be fixed. To gather as much information as possible is one main target of honeypot.

Generally, such information gathering should be done without the attacker's knowledge. All the gathered information provides an advantage to the defending side and can therefore be used on productive systems to prevent attacks.

## II.WHAT IS A HONEYPOT?

A honeypot is basically an instrument for information gathering and learning. A honeypot is an information system resource whose value lies in the unauthorized or illicit use of that resource. More generally a honeypot is a trap set to divert or discover attempts at unauthorized use of information systems. Essentially, honeypots are resources that allow anyone or anything to access it and add production value. Honeypots do not have any unprotected, unused workstation on a network being closely watched by administrators.
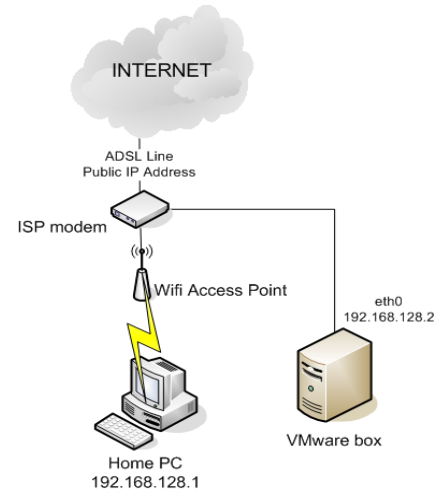


Fig.1 Honeypot

Its primary purpose is not to be an ambush for the black hat community to catch them in action and to press charges against them. The focus lies on a silent collection of as much information as possible about their attack patterns, used programs, and the black hat community itself. All this information is used to learn more about the black hat proceedings and motives, as well as their technical knowledge and abilities. This is just a primary purpose of a honeypot. There are a lot other possibilities for a honeypot- divert hackers from productive systems or seize a hacker while conducting an attack are just two possible examples.

## III. WHAT IS A HONEYNET?

Two or more honeypots on a network form a honeynet. Typically, a honeynet is used for monitoring and/or more diverse network in which one honeypot may not be sufficient. Honeynets are usually implemented as parts of larger network intrusion-detection systems. Honeynet is a network of production systems. Honeynets represent the extreme of research honeypots. Their primary value lies in research, gaining information on threats that exists in the Internet community today.

*The two main reasons why honeypots are deployed are*:
1. To learn how intruders probe and attempt to gain access to your systems and gain insight into attack methodologies to better protect real production systems.
2. To gather forensic information required to aid in the apprehension or prosecution of intruders,

## IV.TYPES OF HONEYPOTS

*Honeypots came in two flavors:*
1. Low interaction        2. High interaction.

Interaction measures the amount of activity that an intruder may have with honeypot. In addition, honeypots can be used to combat spam. Spammers are constantly searching for sites with vulnerable open relays to forward spam on the other networks. Honeypots can be set up as open proxies or relays to allow spammers to use their sites.
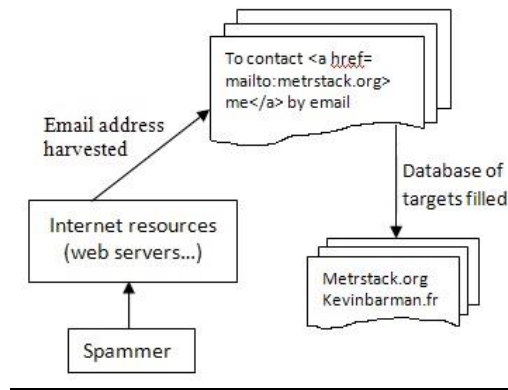
Fig.2 Spammer detection

This in turn allows for identification of spammers.
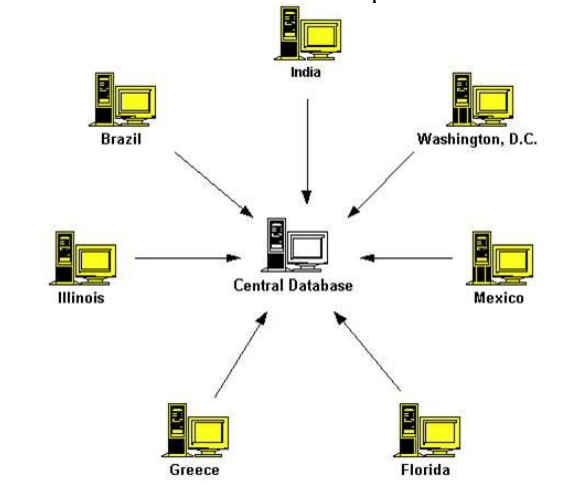


Fig.3

We will break honeypots into two broad categories, as defined by Snort, namely:

- Production honeypots
- Research honeypots

The purpose of a production honeypot is to help alleviate risk in an organization. The honeypot adds value to the security measures of an organization. Think of them as 'law enforcement', their job is to detect and deal with intruders.
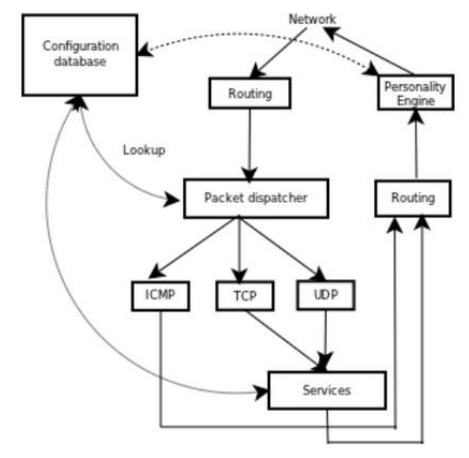


Fig.4 Honeyd architecture

Traditionally, commercial organizations use production honeypots to help protect their networks. The second category, research, is honeypots designed to gain information on the black

hat community. These honeypots do not add direct value to a specific organization. Instead they are used to research the threats organizations face, and how to better protect against those threats.

### V.HONEYPOT ARCHITECTURE:

1. *Structure of a LOW-INTERACTION HONEYPOT (GEN-I)*:- A typical low-interaction honeypot is also known GEN-I honeypot. This is a simple system which is very effective against automated attacks or beginner level attacks Honeyd is one such GEN-I honeypot which emulates services and their responses for typical network functions from a single machine, while at the same time making the intruder believe that there are numerous different operating systems. It also allows the simulation of virtual network topologies using a routing mechanism that mimics various network parameters such as delay, latency and ICMP error messages. The primary architecture consists of a routing mechanism, a personality engine, a packet dispatcher and the service simulators. The most important of these is the personality engine, which gives services a different 'avatar' for every operating system that they emulate.

*DRAWBACKS*:

- This architecture provides a restricted framework within which emulation is carried out. Due to the limited number of services and functionality that it emulates, it is very easy to fingerprint.
- A flawed implementation also leads to reduce itself to alerting the attacker.
- It has constrained applications in research, since every service which is to be studied will have to be re-built for the honeypot.

2. *Structure of a HIGH INTERACTION HONEYPOT (GEN-II)*:- A typical high-interaction honeypot consists of the following elements: resource of interest, data control, data capture and external logs ("known your enemy: Learning with Vmware, Honeypot project");
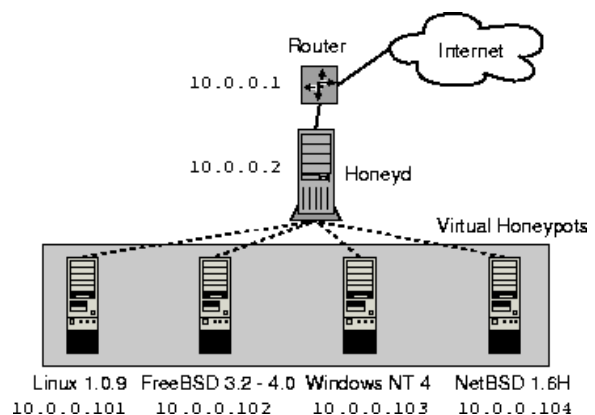


Fig.5 how Honeyd works

These are also known as GEN-II honeypots and started development in 2002. They provide better data capture and control mechanisms. This makes them more complex to deploy and maintain in comparison to low-interaction honeypots.
High interaction honeypots are very useful in their ability to identify vulnerable services and applications for a particular target operating system. Since the honeypots have full-fledged

operating systems, attackers attempt numerous attacks providing administrators with very detailed information on attackers and their methodologies. This is essential for researchers to identify fresh and unknown attack, by studying patterns generated by these honeypots.

*DRAWBACKS*:
- The number of honeypots in the network is limited.
- The risk associated with GEN-II honeypots is higher because they can be used easily as launch pads for attacks.
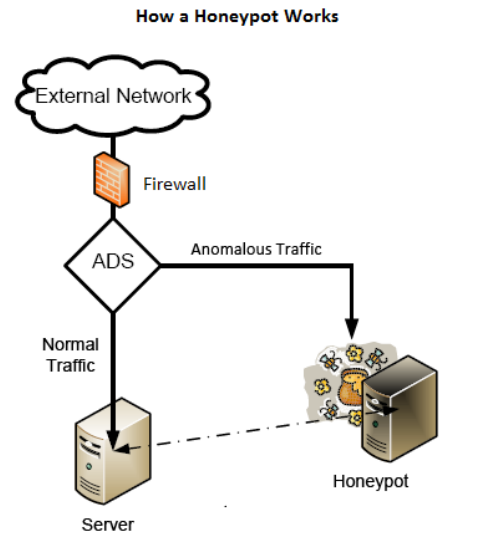


Fig.5 how Honeypot works

## VI.BUILDING a HONEYPOT:

To build a honeypot, a set of Virtual Machines are created. They are then setup on a private network with the host operating system. To facilitate data control, a stateful firewall such as IP tables can be used to log connections. This firewall would typically be configured in Layer 2 bridging mode, rendering it transparent to attacker. The final step is data capture, for which tools such as Sebek and Term Log can be used. Once data has been captured, analysis on the data can be performed using tools such as Honey Inspector, PrivMsg and SleuthKit.

Honeypot technology under development will eventually allow for a large scale honeypot deployment that redirects suspected attack traffic to honeypot. In the figure an external attacker
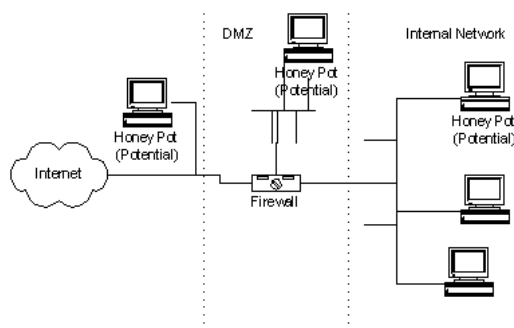


Fig.6 Building a Honeypot

➢ Penetrates DMZ and scans the network IP address.
➢ The redirection appliance.

➢ Monitors all unused addresses, and uses layer 2 VPN technologies to enable firewall.
➢ TO redirect the intruder to honeypot.
➢ This may have honeypot computers monitoring all types of real network devices.
➢ Scanning the network for vulnerable systems is redirected.

By the honeypot appliance when he probes unused IP addresses.

## VII.RESEARCH USING HONEYPOTS:

Honeypots are also used for research purposes to gain extensive information on threats, information few other technologies are capable of gathering. One of the greatest problems security professionals face is lack of information or intelligence on cyber threats. How can your organization defend itself against an enemy when you do not know who the enemy is? Research honeypots address this problem by collecting information on threats. Organizations can use this information for variety of purposes including analyzing trends, identifying the attackers and their community, ensuing early warning and prediction or understanding attacker's motivation.

*ADVATAGES OF HONEYPOTS*:
1. They collect small amounts of information that have great value. This captured information provides an in-depth look at attacks that very few other technologies offer.
2. Honeypots are designed to capture any activity and can work in encrypted networks.
3. Honeypots are relatively simple to create and maintain.

*DISADVANTAGES OF HONEYPOTS:*
1. Honeypots add complexity to the network. Increased complexity may lead to increased exposure to exploitation.
2. There is also level of risk to consider, since a honeypot may be comprised and used as a platform to attack another network. However this risk can be mitigated by controlling the level of interaction that attackers have with the honeypot.

## VIII.LEGAL ISSUES PERTAINING TO HONEYPOT:

Most of the research found in this area concluded that there are two major legal spectrums considering honeypots:
1. *ENTRAPMENT*: Entrapment is when somebody includes the criminal to do something he was not otherwise supposed to do. Honeypots should generally be used as defensive detective tool, not an offensive approach to luring intruders.
2. *PRIVACY*: The second major concern is what information is being tracked: operational data and transactional data. Operational data includes things like addresses of user, header information etc while transactional data includes key strokes, pages visited, information downloaded, chat records, e-mails etc. Operational data is safe to track without threats of security concern because IDS system routers and firewalls already track it. The major concern is transactional data.

## IX.SOME COMMERCIAL HONEYPOTS AND HELPFUL SOFTWARE:

1. *BACK OFFICER FRIENDLY BY NFR*: This product is designed to emulate a back officer server. BOF (as it is commonly called) is a very simple but highly useful honeypot developed by Marcus Ranum and crew at NFR. It is an excellent example of low interaction honeypot.

**2.** *TRIPWIRE BY TRIPWIRE*: This product is for use on NT and UNIX machines and is designed to compare binaries, and inform the service operator, which has been altered. This helps to protect machines from hackers and is an excellent way to determine if a system has been compromised.

**3.** *SPECTER*: Specter is a commercial product and low interaction production honeypot. It is similar to BOF, but it can emulate a far greater range of services and a wide variety of operating systems. Similar to BOF, it is easy to implement and has low risk. Specter works by installing on a Windows system. The risk is reduced as there is no real operating system for the attacker to interact with. Specters value lies in the detection. As a honeypot, it reduces both false positives and false negatives, simplifying the detection process, supporting a variety of altering and logging mechanisms. One of the unique features of specter is that it also allows for information gathering, or the automated ability to gather more information about the attacker.

**4.** *MANTRAP*: Mantrap is a commercial honeypot. Instead of emulating services, Mantrap creates up to four sub-systems, often called 'jails'. These 'jails' are logically discrete operating systems separated from a mater operating system. Security administrators can modify these jails just as they normally would with any other operating system, to include installing applications of their choice, such as Oracle database or Apache web server, thus making the honeypot operating system far more flexible. The attacker has a full operating system to interact with, and a variety of applications to attack. Currently, Mantrap only exists on Solaris operating system.

## X.CONCLUSION:

Honeypots are positioned to become a key tool to defend the corporate enterprise from hacker attacks it's a way to spy on your enemy; it might even be a form of camouflage. Hackers could be fooled into thinking they have accessed a corporate network, when they are actually hanging around in a honeypot-- While the real network remains safe and sound.

Honeypots have gained a significant place in the overall intrusion protection strategy of enterprise. Security experts do not recommend that these systems replace existing intrusion detection security technologies; they see honeypots as complementary technology to network-and host – based intrusion protection.

The advantages that honeypots bring to intrusion protection strategies are hard to ignore. In time, as security managers understand the benefits, honeypots will become an essential ingredient in an enterprise –level security operation.

We do believe that although honeypots have legal issues now, they do provide beneficial information regarding the security of a network. It is formulated to foster and support research in this area. This will help to solve the current challenges and make it possible to use honeypots for the benefit of the broader internet community.

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# Implementation of One-Step Scheme Interpolation Function for Solving Singular Initial Value Problem (IVP) In Ordinary Differential Equation

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*Abstract*- In this research paper, we consider the implementation of one-step scheme interpolation function for solving singular initial value problem in ordinary differential equation of the form:
$f_{(x)} = a_o + a_1x + b\tan(\rho x + \sigma)$, where $a_o$, $a_1$ and b are real undetermined coefficient, $\rho$ and $\sigma$ are complex parameters. We consider the linear multistep method in the

$$\sum_{j=0}^{K} \alpha_j\ y_{n+j} = h \sum_{j=0}^{K} B_j\ f_{n+j} \quad \text{where } \alpha_j \text{ and } B_j \text{ are constants and} \alpha_k \neq 0. \text{The Taylor's series expansion of } y(x_{t+1})$$

about $x = x_t$ is $y(x_{t+1}) = y(x_t) + \sum_{i=1}^{\infty} \frac{h^i y^i x_t}{1!}$ was also implemented to establish our result at k=5.

*Index Terms*- Interpolation Function, Stability, Consistency and Convergence

## 1.0 INTRODUCTION

In this research paper work, we shall consider one-step scheme interpolation function for solving Initial Value Problem (IVP) in ordinary differential equation in the form:

$$y^1 = f(x, y), y(x_o) = y_o, \quad a \leq x \leq b \tag{1.1.1}$$

The development of numerical methods for singular IVP systems of ordinary differential equations (ODEs) have been attracting much attention due to their needs in the solutions of problems arising from the mathematical formulation of physical situations in singular perturbation, chemical kinetics population models, mechanical oscillation, process control and electrical circuit theory which often leads in initial value problems (IVPs) in ordinary differential equation that are singular.

Many researchers have done a great deal of work in this area. Worthy of note are those of [ref:Lambert (1980), Fatunla (1980, 1981,1982), Abhulimen and Otunta (2007), Carver, M. B., (1977), Conte, S. D. and Carl De Boor (1972), Conte, S. D. and Carl De Boor (1972), Evans, D. J. and Fatunla, S. O. (1975), Hay, J. L. Crosbie, R. E., and Chaplin, R. I. (1973), Henrici, P. D. (1992), Luke, Y. K., Fair, W. S., and Wimp, J (1975), and O'Regan, P. G. (1996)]. In their different approaches, they show the method of one-step technique of interpolation function for solving singular initial value problem (ivp) in ordinary differential equation.

The problem for this research work is to find a numerical solution to the (IVP) which is represented by $y^1 = f(x,y)$, $y(x_o) = y_o$, $a \leq x \leq b$ where f (x, y) is defined and continuous in a region $D \subset (a, b)$ that are singular and f (x, y) also satisfy a Lipschitz condition with respect to y.

However, our aim in this paper research work is to implement the problem represented by (1.1.1), where f (x, y) must satisfy a Lipschitz condition with respect to y. To achieve our aims, we therefore set the following objectives;
(i)   To develop an interpolation function of singular ivp in the form.
      $F_{(x)} = a_o + a_1x + b\tan(\rho x + \sigma)$.
(ii)  To determine the performance, stability, characteristics, consistency and nature of convergence constructed in (i) above.
(iii) To develop a Fortran package for the implementation of our scheme.

## 1.2 SOME DEFINITIONS AND NOTATIONS

For the purpose of this research work, we have the following definitions.

(1)   **Definition of Consistency : Lambert (1980)**
The general one-step method $F_{(x)} = a_o + a_1 x + b \tan(\rho_x + \sigma)$                                                    1.2.1

is said to be consistence with the initial value problem in equation (1.1.1) if Ø(x, y, 0) = f(x, y). If the method in equation (1.2.1) is consistent with the initial-value problem, then y(x + h) − y(x) - hØ(x, y(x), 0) + 0(h$^2$) = 0(h$^2$).Since y$^1$(x) = f(x, y (x)) = Ø(x, y (x), 0), by definition (1). Thus a consistent method has order of at least one. The only linear multi-step method which falls within the class in equation (1.2.1) is Euler's rule which is obtained by setting Ø(x, y, h) = Ø$_E$ (x, y, h) = f(x, y) (The subscript E denotes "Euler"). The consistency condition of definition (1) is then obviously satisfied and a simple calculation shows that the order according to definition (1) is one.

**(2)    Definition of Local Truncation Error : Lambert (1980)**
The local truncation error at x$_{n+1}$ of the general explicit one-step method in equation (1.2.1) above is defined to be T$_{n+1}$ where T$_{n+1}$ = y(x$_{n+1}$) — hØ(x$_n$, y(x$_n$),h) and (x) is the theoretical solution of the initial—value problem. Then the local truncation error at xn+k of an explicit linear K—step method satisfies T$_{n+k}$= y(x$_{n+k}$) — y$_{n+k.}$ The relationship between global and local   truncation error is e$_{n+1}$ ≤ K T$_{n+1}$ where K is a constant. The local truncation error is directly proportional to the global error introduce at each step mostly when the derivation and computation of local truncation error is rigorous arid all previous solutions are exacts.

**(3)    Definition of Convergence : Lambert (1980)**
The general one-step method equation (1.2.1) above is said to be convergent to the initial value problem in equation (1.1.1) if the corresponding approximation y$_n$ satisfies $y_n \rightarrow y(x_n)$ as $n \rightarrow \infty$

(4)    The function f (x, y) in (1.1.1) is said to satisfy a **Lipschitz condition** in y, over a region D, if there exists a constant L such that

$$\| f(x, y_1) - f(x, y_2) \| \leq L \| y_1 - y_2 \|_{\square} \qquad (1.1.3)$$

In this case, L is called the Lipschitz constant and f (x, y) is said to be Lipschitzian.

(5)    A point x$_n$ in the interval (a, b) at which y$_n$ is being computed in called a **mesh point**.

(6)    The difference, h = x$_{n+1}$ − x$_n$ between the current point x$_n$ and the next point x$_{n+1}$ is called the **mesh size** of the subinterval (x$_n$, x$_{n+1}$) ⊂ (a, b).

**(7)    Region of absolute stability (RAS):**
A region D of the complex plane is said to be a region of absolute stability of a given   method, if the method is absolutely stable for $\overline{h}$ ЄD for a one-step integrator, D is RAS if $\left| s(\overline{h}) \right| < \left| \right|$ for every $\overline{h}$ ЄD.

**(8)    Interval of absolute stability (IAS):**
An interval $(\alpha, B)$ of the real line in said to be an interval of absolute stability of the method is absolutely stable for all $\overline{h} \in (\alpha, B)$. If the method is obviously unstable for all $\overline{h}$ it is said to have no interval of absolute stability (IAS). The interval of absolute stability is determined by the coefficients of the method.

**1.3  THE DERIVATION OF INTERPOLATION FUNCTION**

In this research paper work, we shall develop an interpolation function of singular initial value problem in (1.1.1) by using a function.

F$_{(x)}$ = a$_o$ + a$_1$ x + btan(ρ$_x$ + σ)          (1.3.1)

where a$_o$, a$_1$ and b are real undetermined coefficient, ρ and σ are complex parameters.

We define θ$_x$ = ρ$_x$ + σ          (1.3.2)

Substitute (1.3.2) in (1.3.1), we have

F$_{(X)}$   = a$_o$ + a$_1$ x + btan θ$_{(X)}$  = y          (1.3.3)

F$_{(Xt)}$   = a$_o$ + a$_1$ x$_t$ + btan θ$_t$  = y$_t$          (1.3.4)

F$_{(Xt+1)}$   = a$_o$ + a$_1$ x$_{t+1}$ + b tan θ$_{t+1}$ = y$_{t+1}$          (1.3.5)

Set        $\theta_{t+1} = \theta_t + \rho h$

Therefore (1.3.5) becomes

$F_{(Xt+1)} = a_o + ax_{t+1} + b \tan(\theta_t + \rho h)$ (1.3.6)

Differentiating (1.3.4), we have

$F^1(x_t) = a_1 + b(\sec^2\theta_t)\rho = f_t$ (1.3.7)

$\qquad = a_1 + \rho h(1 + \tan^2\theta_t) = ft$ (1.3.7b)

Differentiating (1.3.7) we have,

$F^{11}_{(Xt)} = 2\rho^2 b \tan\theta_t \sec^2\theta_t = f_t^{(1)}$ (1.3.8)

Making b the subject of the formula we have,

$$b = \frac{f_t^{(1)}}{2p^2\tan\theta_t\sec^2\theta_t}$$ (1.3.9)

From (1.3.7b)    $a_1 = f_t - \rho_h(1 + \tan^2\theta_t)$ (1.3.9a)

Putting (1.3.9) into (1.3.9a), we have

$$a_1 = f_t - \frac{f_t^{(1)}\rho(1 + \tan^2\theta)}{2\rho^2\tan\theta_t\sec^2\theta_t}$$

$$a_1 = f_t - \frac{f_t^{(1)}}{2\rho^2\tan\theta_t}$$ (1.3.10)

Substituting (1.3.5) from (1.3.4), we have

$F_{(Xt+1)} - F_{(Xt)} = a_1h + b(\tan\theta_{t+1} - \tan\theta_t)$ (1.3.10a)

Putting (1.3.10) into (1.3.10a), we have

$$F_{(Xt+1)} - F_{(Xt)} = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan\theta_t}\right\} + b\left\{\tan\theta_t + \tan(\rho h) - \tan\theta_t\right\}$$

$$F_{(Xt+1)} - F_{(Xt)} = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan\theta_t}\right\} + b\left\{\frac{\tan\rho h + \tan^2\theta\tan(\rho h)}{1 - \tan\theta_t + \tan(\rho h)} - \tan\theta_t\right\}$$

$$F_{(Xt+1)} - F_{(Xt)} = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan\theta_t}\right\} + b\left\{\frac{\tan\theta_t + \tan\rho h - \tan\theta_t + \tan^2\theta(\rho h)}{1 - \tan\theta_t + \tan(\rho h)}\right\}$$

$$F_{(Xt+1)} - F_{(Xt)} = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan\theta_t}\right\} + b\left\{\frac{\tan\rho h + \tan^2\theta\tan\rho h}{1 - \tan\theta_t + \tan(\rho h)}\right\}$$ [1.3.11]

Substituting b = $\dfrac{f_t^{(1)}}{2\rho^2\tan\theta_t\sec^2\theta_t}$  in the above expression, we have

$$F_{(xt+1)} - F_{(xt)} = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan_t}\right\} + -\frac{f_t^{(1)}}{2\rho^2\tan\theta_t\sec^2\theta_t}\frac{(1+\tan^2\theta_t)\tan(\rho h)}{(1+\tan\theta_t\tan(\rho h))}$$

$$F_{(Xt+1)} - F_{(Xt)} = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan_t}\right\} + \frac{f_t^{(1)}\tan(h)}{2\rho^2\tan\theta_t + (1-\tan\theta_t\tan\rho h}$$

$$\therefore y_{t+1} - y_t = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\tan\theta_t}\right\} + \frac{f_t^{(1)}\tan(h)}{2\rho^2\tan\theta_t + (1-\tan\theta_t\tan\rho h)} \qquad (1.3.12)$$

$\rho$ and $\theta_t$ are determined by using the definition of local truncated error denoted by

$$T_{t+1} = y(x_{t+1}) - y_{t+1} \qquad (1.3.13)$$

Where $y(x_{t+1})$ is the theoretical solution at $x = x_{t+1}$ and $y_{t+1}$ is the numerical solution obtained by adopting (1.3.12). Taylor's series expansion of $y(x_{t+1})$ about $x = x_t$ is

$$y(x_{t+1}) = y(x_t) + \sum_{i=1}^{\infty}\frac{h^i y^i x_t}{1!} \qquad (1.3.14)$$

With the assumption that there was no previous error $y_t = y(x_t)$ as well as using Macularin series expansion of $\tan(\rho h)$ and binomial expansion of $(1 - \tan\theta\tan^3\rho h)^{-1}$. we have

$(1-\tan\theta_t\tan\rho h)^{-1} = 1 + \tan\theta_t\tan(\rho h) + \tan^2\theta\tan^2(\rho h) + \tan^3\theta\tan^3(\rho h)$

$$\tan(\rho h) = h + \frac{(\rho h)^3}{3} + \frac{2(\rho h)^5}{15} + 17\frac{(\rho h)^7}{315} +$$

$$\tan^2(\rho h) = (\rho h)^2 + \frac{2}{3}(\rho h)^4 + \frac{17(\rho h)^6}{45} + \frac{2790(\rho h)^5}{14175} + \frac{4810(\rho h)^{10}}{7875} \qquad (1.3.15)$$

$$\tan^3(\rho h) = (\rho h)^3 + (\rho h)^5 + \frac{11}{15}(\rho h)^7 + .....$$

$$(1 - \tan\theta_t\tan(\rho h)^{-1} = 1 + (\rho\tan\theta_t)h + (\rho^2\tan^2\theta_t)h^2 + (\frac{\rho^3}{3}\tan\theta + \rho^3\tan\theta_t)$$

$$h^3 + \left(\frac{2}{3}\rho^4\tan\theta_t\right)h^4 + \left(\frac{2}{15}\rho^5\tan\theta_t + \rho^5\tan^2\theta_t\right)h^5 + \frac{17}{45}\rho^6\tan^2\theta_t + .... \qquad (1.3.16)$$

$$\therefore y_{t+1} - y_t = h\left\{f_t - \frac{f_t^{(1)}}{2\rho\rho\tan_t}\right\} + f_t^{(1)}\left\{\rho h + \rho^2\tan\theta_t\right\}h^2 + \left(\frac{\rho^3}{3} + \rho^3\tan\theta_t\right)h^3 + \left(\frac{2}{3}\rho^4\tan\theta_t + \rho^4\tan^3\theta\right)h^4$$

$$+\left(\frac{2}{15}\rho^5+\rho^5\tan^2\theta\right)h^5+\frac{\left(\frac{17}{45}\rho^6\tan\theta_t+\frac{4}{3}\rho^6\right)}{2\rho^2\tan\theta_t}h^6 \qquad (1.3.17)$$

$$y_{t+1}=y_t+hy_t^{(1)}+\frac{h^2y_t^{(1)}}{2!}+\frac{h^3y_t^{(3)}}{3!}+... \qquad (1.3.18)$$

Equating coefficient of h's in (1.3.17) and (1.3.18) we have,

$$f_t^{(1)}\frac{\left(\frac{1}{3}\rho^3+\rho^3+\tan\theta_t\right)}{2\rho^2\tan\theta_t}=\frac{f_t^{(2)}}{3!}$$

$$f_t^{(2)}\rho\left(\frac{1}{3!}+\tan^2\theta_t\right)=\frac{f_t^{(2)}\tan\theta_t}{3} \qquad (1.3.19)$$

$$f_t^{(1)}\frac{\left(\frac{2}{3}\rho^4\tan\theta_t+\rho^4+\tan^3\theta_t\right)}{2\rho^2\tan\theta_t}=\frac{f_t^{(3)}}{4!}$$

$$f_t^{(1)}\rho^2\left(\frac{2}{3}\tan^2\theta_t\right)=\frac{f_t^{(3)}}{12} \qquad (1.3.20)$$

$$T_{n+1}=h^5\frac{\left(\frac{2}{15}\rho^5+\rho^5+\tan^2\theta_t\right)}{2\rho^2\tan\theta_t}f_t^{(1)}-\frac{f^{(4)}}{5!}h^5$$

$$=h^5\rho^3\frac{\left(\frac{2}{15}+\tan^2\theta_t\right)}{2\tan\theta_t}f_t^{(1)}-\frac{f_t^{(4)}}{120}h^5 \qquad (1.3.21)$$

## 1.4 NUMERICAL EXPERIMENT, RESULTS AND CONCLUSION

### 1.4.1 Selection of Initial Value Problems

We now apply the formula derived to solve some tested initial value problems. The idea is to enable us see its level of performance and compare the results with those of the existing interpolation function.

To obtain the numerical solution $y_{t+1}$ at $x = x_{t+1}$ the function f(x, y) and its higher derivatives are evaluated at $x = x_t$. The values obtained are used in (1.3.12) and (1.3.13)

**Problem 1:** Our method, consider $y^1 = 1 + y^2$, with mesh size h = 0.05

**Table 1: Experimental Result**

| X | H | Theoretical solution $Y_t$ | Numerical Solution $Y_{t+1}$ | Error |
|---|---|---|---|---|
| 0.05 | 0.05 | 1.10535551 | 1.1054390 | $.763367369 \times 10^{-4}$ |
| 0.10 | 0.05 | 1.22304879 | 1.2232060 | $.128508053 \times 10^{-3}$ |
| 0.15 | 0.05 | 1.35608774 | 1.3563164 | $.168551889 \times 10^{-3}$ |
| 0.20 | 0.05 | 1.50849752 | 1.5087907 | $.200243872 \times 10^{-3}$ |
| 0.25 | 0.05 | 1.68579627 | 1.6861813 | $.228325494 \times 10^{-3}$ |
| 0.30 | 0.05 | 1.89576495 | 1.8962732 | $.268042910 \times 10^{-3}$ |

| 0.35 | 0.05 | 2.14974943 | 2.1504447 | .324247923 x10$^{-3}$ |
|------|------|------------|-----------|------------------------|
| 0.40 | 0.05 | 2.46496249 | 2.4659612 | .405001097 x10$^{-3}$ |
| 0.45 | 0.05 | 2.86888368 | 2.8708886 | .524302857 x10$^{-3}$ |
| 0.50 | 0.05 | 3.40822297 | 3.4106376 | .707985416 x10$^{-3}$ |
| 0.55 | 0.05 | 4.16936335 | 4.1735691 | .100771160 x10$^{-2}$ |
| 0.60 | 0.05 | 5.33185411 | 5.3400701 | .153856182 x10$^{-2}$ |
| 0.65 | 0.05 | 7.34043450 | 7.3595575 | .259838399 x10$^{-2}$ |
| 0.70 | 0.05 | 11.6813686 | 11.741792 | .514599444 x10$^{-1}$ |
| 0.75 | 0.05 | 28.2382227 | 28.592778 | .124001812 x10$^{-1}$ |
| 0.80 | 0.05 | 68.4798454 | 66.498083 | .298017906 x10$^{-1}$ |

**Table 2:** Lambert and Shaw (1965, 1966)

| X | Theoretical solution Y | - A (n) | N (n) | Initial Solution Error | Improved solution |
|---|------------------------|---------|-------|------------------------|-------------------|
| 0.1 | 1.223048,880 | 0.871,0524 | -1.459,5387 | 2x10$^{-7}$ | 2x10$^{-8}$ |
| 0.2 | 1.508,497,647 | 0.818,6067 | -1.2095811 | 5x10$^{-7}$ | 3x10$^{-8}$ |
| 0.3 | 1.895,765,123 | 0.797,0428 | -1.03901411 | 1x10$^{-6}$ | 6x10$^{-8}$ |
| 0.4 | 2.464,962,757 | 0.7887937 | -1.032,812,1 | 3x10$^{-6}$ | 1x10$^{-7}$ |
| 0.5 | 3.408,223,442 | 0.7861141 | -1.009,3671 | 5x10$^{-6}$ | 2x10$^{-7}$ |
| 0.6 | 5.331,855,223 | 0.7854784 | -1.001, 6126 | 1x10$^{-5}$ | 5x10$^{-5}$ |
| 0.65 | 7.354,436,575 | 0.7854150 | -1.000,4736 | 3x10$^{-5}$ | 1x10$^{-6}$ |
| 0.70 | 11.681,373,800 | 0.785,4002 | -1.0000712 | 7x10$^{-5}$ | 3x10$^{-6}$ |
| 0.75 | 28.238,232,850 | 0.785,3987 | -1.000020 | 4x10$^{-4}$ | 4x10$^{-5}$ |

**Table 3:** Shaw (1966) h = 0.05

| X | Theoretical solution Y | Error in numerical solutions | |
|---|------------------------|---------------|---------------|
| | | Rational (k=1) | Rational (k=2) |
| 0.1 | 1.223048,888 | 8x10$^{-8}$ | 1x10$^{-4}$ |
| 0.2 | 1.508,497,647 | 2x10$^{-7}$ | 3x10$^{-4}$ |
| 0.3 | 1.895,765,123 | 4x10$^{-7}$ | 6x10$^{-4}$ |
| 0.4 | 2.464,962,757 | 7x10$^{-7}$ | 1x10$^{-4}$ |
| 0.5 | 3.408,223,442 | 1x10$^{-6}$ | 3x10$^{-3}$ |
| 0.6 | 5.331,855,223 | 4x10$^{-6}$ | 7x10$^{-2}$ |
| 0.65 | 7.354,436,575 | 8x10$^{-6}$ | 1x10$^{-2}$ |
| 0.70 | 11.681,373,800 | 2x10$^{-5}$ | 4x10$^{-2}$ |
| 0.75 | 28.238,252,830 | 1x10$^{-4}$ | 3x10$^{-1}$ |

**Table 4 :**   $Y = 1 + Y^2$, $Y(0) = 1$, Theoretical Solution $Y(X) = TAN (X + \pi/4)$
Error in Non Linear Multistep Method Fatunla (1981)

| x | Theoretical solution Y | K = 1 | K = 2 | K = 3 | K = 4 | K = 5 |
|---|------------------------|-------|-------|-------|-------|-------|
| 0 | 1.000.000,000 | - | - | - | - | - |
| 0.1 | 1.223048,880 | 1.22816 (-2) | -8.2774 (-0) | - | - | - |
| 0.2 | 1.508,497,647 | 2.91873 (-2) | -1.89419 (-3) | -2.29807 (-4) | -5.95328 (-5) | - |
| 0.3 | 1.895,765,123 | 5.57996 (-1) | -3.51966 (-4) | -5.43415 (-5) | -5.43415 (-5) | 2.30964 (-5) |
| 0.4 | 2.464,962,757 | 1.04486 (-1) | -6.47338 (-3) | -1.68543 (-4) | -1.68543 (-4) | 2.40806 (-5) |
| 0.5 | 3.408,223,442 | 2.13434 (-1) | -1.31241 (-2) | -2.23773 (-4) | -2.23773 (4) | 7.23361 (-3) |
| 0.6 | 5.331,855,223 | 5.56258 (-1) | -3.40542 (-2) | -7.54129 (-4) | -7.54129 (-4) | 2.27200 (-4) |
| 0.65 | 7.354,436,575 | 1.10611 (0) | -6.63368 (-2) | -1.50951 (-3) | -1.50951 (-3) | 2.33836 (-4) |
| 0.70 | 11.681,373,800 | 3.09171 (0) | -1.76210 (-2) | -3.32208 (-3) | -3.32208 (-3) | 7.84943 (-3) |
| 0.75 | 28.238,232,850 | 2.90303 (1) | -1.07376 (0) | -1.89317 (-1) | -1.89317 (-1) | 4.90205 (-5) |

When we take a look at tables 1, 2, 3 and 4 results, it shows that our result obtained in table 1 compares favorably with that of Lambert and Shaw (1965,1966), Fatunla (1981) in table 2, 3 and 4 above.  The comparism is with a relative low level error.

**Problem 2:**  Consider $y^1 = y$, $y(0) = 1$ $0 \leq x \leq 1$ with exact solution $y = \exp(x)$, $h = 0.1$

| Xn | H | $Y_t$ | $Y_{t+1}$ | $e_n$ |
|---|---|---|---|---|
| 0.1 | 0.1 | 1.105170965 | 1.105170919 | 0.000000047 |
| 0.2 | 0.1 | 1.221402764 | 1.210341837 | 0.011060930 |
| 0.3 | 0.1 | 1.349858880 | 1.315512763 | 0.034346110 |
| 0.4 | 0.1 | 1.491824746 | 1.420683674 | 0.071141070 |
| 0.5 | 0.1 | 1.648721218 | 1.525854586 | 0.122866600 |
| 0.6 | 0.1 | 1.822118878 | 1.631025527 | 0.191093400 |
| 0.7 | 0.1 | 2.013752699 | 1.736196409 | 0.277556300 |
| 0.8 | 0.1 | 2.225541115 | 1.841367348 | 0.384173800 |
| 0.9 | 0.1 | 2.459603310 | 1. 94 6538288 | 0.513065000 |
| 1.0 | 0.1 | 2.718282223 | 2.051709171 | 0. 666573000 |

**Problem 2:**  Aashikpelokhai (1991) $y^1 = y$,  $y(0) = 1$,   $0 \leq x \leq 1$
with exact solution $y = \exp(x)$, $h = 0.1$

| Xn | $Y_t$ | $Y_{t+1}$ | En | Order 5 | Order 4 | Order 3 |
|---|---|---|---|---|---|---|
| 0.1 | 1.10517092 | 1.10517 | 9.2 x10-7 | -0.15622 | 0.60450 | 1.57761 |
| 0.2 | 1.22140028 | 1.22140 | 2.8 x10-7 | -0.17265 | 0.48289 | 1.74353 |
| 0.3 | 1.34985881 | 1.34985 | 4.7 x10-6 | -0.19081 | 0.38781 | 1.92690 |
| 0.4 | 1.49182470 | 1.49182 | 1.2 x10-6 | -0.21085 | 0.36697 | 2.12955 |
| 0.5 | 1.64872127 | 1.64872 | 8.8 x10-6 | -0.23305 | 0.321056 | 2.35355 |
| 0.6 | 1.82211880 | 1.82211 | 2.7 x10-6 | -0.25756 | 0.02256 | 2.60104 |
| 0.7 | 2.01375271 | 2.01375 | 9.3 x10-7 | -0.28465 | 0.35937 | 2.87460 |
| 0.8 | 2.22554093 | 2.22554 | 3.1 x10-6 | -0.31459 | 0.34473 | 3.17692 |
| 0.9 | 2.45960311 | 2.45960 | 1.8 x10-6 | -0.34765 | 0.30697 | 3.51104 |
| 1.0 | 2.71828183 | 2.71828 | 1.8 x10-6 | -0.38424 | 0.03830 | 3.88030 |

The above table confirms the improved performance of our new scheme interpolation function for solving ODE problem can cope favorably with the numerical integrator of Aashikpelokhai (1991) with the solution $y = e^x$

## 1.5   CONCLUSION AND RECOMMENDATION
From the result in tables 1, 2, 3, and 4 it becomes very clear that our proposed new linear multistep method of order 5 is more efficient and accurate when compared with the existing methods of Lambert, Shaw (1965, 1966) and Fatunla of (1982).
This package has facilitates easy computation, we say that users of this our method will find it very helpful in solving initial value problems. We therefore recommended it for users whose are currently working in this area of research.

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# Understanding the Current Practices of Cost Accounting Systems in the Libyan Agricultural Firm: Evidence from Six Libyan Agricultural Firms

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***Abstract-*** This paper used qualitative approach to understand the practice of cost accounting systems in the Libyan agricultural firms. Unstructured interview was used to collect data from the interviewees to achieve the research objectives. The study interviewed six employees from different Libyan agricultural firms to understand the current practices of cost accounting systems. The findings indicated that traditional costing is widely used in the Libyan agricultural firms, whereby, full absorption costing is used to calculate the product costs, to allocate overhead costs Libyan agricultural firms rely on volume-based methods such as cultivated area to allocate the indirect costs to products from plantation department, the most used methods to evaluate the inventory in the agricultural firms in Libya is First-in-first out method, the depreciation calculated using Straight-line method. Cost information mainly used for pricing decisions in the Libyan agricultural firms.

***Index Terms***- Cost accounting systems, agricultural firms, traditional costing, and activity based costing.

## I. INTRODUCTION

Agriculture in Libya is an important activity since long time ago, for instance when Garamantes were living in      south of Libya, their economy relied most on agricultural activities (Ayoub, 1967). whereas in West of Libya Romans considered the North West of Libya the breadbasket of the Roman Empire (Josh, 2010; Michael, 2009), in the same time Phoenixes were living in the North East of Libya, agriculture was their source of live hood. Most of the Libyan workforce were working in agricultural activities until 1960 (Porter & Yergin, 2006). In 1959 Libyan government discovered oil fields which has had a great impact on the agriculture, this made  agricultural sector the second most important sector after oil in Libya (Alsabbag & Alseheri, 1992). Furthermore, the government changed its attention to producing oil. However, agriculture in Libya is still an important sector although its contribution in national income has declined. In 1954 its contribution was 26% (Gandeel, 1978; Helen, 1987). This percentage influenced by discovering oil, the percentage became 5.6% in 1997, and 2.1% in 2007. However agricultural contribution in national income increased to 8.2% in 2009 as a result of the government's orientation towards the diversity of national income sources. As stated by General People's Committee for Agriculture, Livestock and Marine (2009) Libya is subsidizing agricultural firms with billions of dinars, during the last three decades, Libya spent 5.5 billion

Dinars on the agricultural sector and the Libyan government has set a five-years plan from 2006 to 2010 which allocated 3.3 billion dinars to support the agricultural sector (General People's Committee for Agriculture, Livestock and Marine, 2009). Although Libyan government is sending billions of dinars on agricultural sectors. Porter and Yergin (2006) argued that Libya agricultural sector are suffering from a low agricultural productivity because a lack of experts in management that lead to inefficient management to scarce resources, moreover making inefficient decision related to investment in technology and irrigation equipments. Moreover, as mentioned by Zentani (2005) one of the constraints that facing barley cultivation is high cost for local production. Therefore, practicing cost accounting systems properly will assist decision makers in the Libyan agricultural firms to make better decision in term of using scarce resources, investment decisions and reduce production costs.

The Libyan government encourages investment in farming in 1993 Libyan government invested 49.88% from its budget in the agricultural investment. Moreover the Libyan government announced law number 5 named "encouragement of investment decision" (Bureau of economic, energy and business affairs, in the year 2009), this law referred to the Libyan government intention to diversify its sources of income including agricultural sector to reduce the import of agricultural products, because Libya imported 75% from food requirements (Porter & Yergin, 2006). To prosper the agricultural firms in North of Libya the government built a massive project called Great Manmade River (GMR) to irrigate many agricultural firms in the North of Libya. This project cost 33.69 billion dollar to transfer water from the south to the north of Libya.

Although the agricultural firms in Libya  are covering an area of 3,600,000 acres of arable land (Gandeel, 1978), furthermore, those firms produce in massive production, the agricultural firms  do not pay attention to the cost accounting system in decision making processes, cost reduction, and cost control as in other sectors. Juchua, (1986) stated that in large agricultural firm which multi products, the need of management accounting systems for decision making are obviously considerable, this the case in the agricultural firms in the Libyan public sector, they are aiming to produce many products including cereals, fruits, vegetables and animal husbandry. Therefore, managers need information to make many decisions related to their firms. (Abo Al gasm, 2004) argued that although agricultural firms in Libya is large firms and they produce several types of product, they also facing competition from foreign companies they depend on simple information for

decision making (as cited in Aljazawe, 2006). H. Bawa (personal communication, January 1, 2012) ensured that agricultural firms in Libya are facing several accounting problems; therefore we hope accounting researchers conduct more researches in agricultural sector.

In this paper the researcher aims to answer four questions including: do Libyan agricultural firms practice cost accounting systems?, to what extent Libyan agricultural firms use cost accounting system information?, how Libyan agricultural firms allocate indirect cost to their products?, and how Libyan agricultural firms determine their product cost?. The rest of this paper organized as following review of the Literature, research design and data collection, data analysis, research finding and the discussion.

## II. THE LITERATURE REVIEW

In this paper review the literature including three parts namely the development of cost accounting systems in the agricultural activities, significance of cost accounting systems in the agricultural sector, and studies related to practice of cost accounting in the agricultural sector.

### II.1 The development of cost accounting systems in the agricultural activities

The development of cost accounting systems in the agricultural sector had its origins in the 18th century. According to Juchau (2002), Arthur Young is considered as the first person to pay attention to cost accounting systems for farming in the 18th and 19th centuries. He was unquestionably the most significant writer during the English Agricultural Revolution (Gazley, 1973). Despite farming being considered as the oldest activity for human beings, the development of cost accounting systems in this sector was delayed. According to Ernle (1961), many factors caused this delay before the 18th century. For instance, a lack of capital, markets and communication; also agricultural production was more for domestic consumption.

The 18th century saw technological development in agriculture, such as cultivation techniques, which saw increased agricultural production and use of capital; also improved crop rotation systems. Therefore, farmers needed cost accounting systems information in a timely manner. Arthur Young noted the absence of cost accounting records, which would enable the farmers to determine cost of crops, animals and different modes of farming (Juchau, 2002). However, in the 18th century, the practice of farm book-keeping was at an infancy stage (Juchau, 2002). Young seized the opportunity of absence of cost accounting practices in the agricultural sector to advocate improved farm accounting practices, especially by prescribing records required to support farm management decision making. In particular, Young advocated improved practices in cost management including cost comparisons, cost allocations and product costs which reflected the realities of operating a mixed-farm in the 18th century Britain (Juchau, 2002).

Accounting writers in the 18th century encouraged farmers to keep accounting records to assist the farmers to make better decisions about the performance of livestock and crops, so as to avoid relying on guesswork. For instance, they could know exactly how much money they spent on feeding their herds if they kept regular records; they could also know the costs of every kind of livestock (cattle, sheep, etc.). In mixed farms, it is important to determine the intermediate products costs to enable farmers to undertake cost analysis to determine which crops are profitable. Furthermore, practicing cost accounting systems in mixed farms can assist farmers to allocate overhead costs.

### II.2 Significance of cost accounting systems in the agricultural sector

Business organizations need cost information (Ning, 2005), especially large and multi-product farms. (Juchau, 1986) argues that for large agricultural firms that produce several products, management accounting systems for decision making is obviously needed. (Argiles & Slof, 2003; Hannan, 2008; Manalo, 2005; Wijewardena & Zoysa, 1999) stated that firms can benefit from cost accounting systems information in many ways, such as cost management, managerial decision making, product pricing, performance evaluation, budgeting and budgetary control, and preparing of financial statements.(Kaplan & Cooper, 1998) cost accounting systems achieve three goals including, the measurement of the cost of goods sold, valuation of inventory for financial reporting. It provides operators and managers with economic feedback about process efficiency; it determines the cost of activity, services, products, and customers. In brief, the agricultural firms can gain many advantages from the use of costing systems. It helps in making better administrative decisions in several ways, such as allocating overhead costs on cost centers in the fields, especially if a farm plants different types of crops and uses many kinds of machines. Cost accounting opens up new ways of looking at farming operations. It can provide a breakdown of income and expenses by acre and yield units, and enable comparison of performance of different fields, determine why one block maybe producing more than another and analyze optimal use of land. According to Jack and Jones (2007), farmers who practice costing systems will perform better than farmers who do not apply costing systems.

### I. 3 Studies related to practice of cost accounting in the agricultural sector

The evaluable accounting literature indicates that there are very few studies on cost accounting systems in the farming sector as argued by several researchers including (Jack & Jones, 2007). Juchua (2002) stated that the writer paid attention to cost accounting systems in farming was Arthur Young in the 18th century, who referred to the significance of cost accounting systems for agricultural activities. However, nowadays there are still accounting researchers who suggest that accounting researchers should pay more attention to cost accounting systems in the agricultural sector (Athanasios, Stergios, & Laskaridou, 2010). Athanasios et al., (2010) stated that the agricultural sector almost neglected from accounting researchers and practitioners, because of the low level of managerial sophistication and lack of economic means in agriculture firms. Practicing cost accounting systems in the agricultural firms has several advantages. According to Luening (1989) and Allen (1994), (as cited in (Argilés & Slof, 2001), implementation of cost accounting systems in agricultural firms can improve farm management and lead to better farm performance.

Tahir et al., (2004) mentioned that cost control in farming operations can increase profits. According to them, farm costing

is useful to monitor plantation expenditures that are increasing as farming becomes modernized. To achieve this, cost information ought to be supplied adequately and in a timely manner. (Lee & Kao, 2000) stated in their study, that they applied both the activity based costing (ABC) model and the simulation technique to analyze the operational costs in the Pu Shin wholesale fish market in Taiwan. The ABC system is a system that assigns costs to activities; then assigns these costs to units that consume that activity. Many industries have successfully employed the ABC system to improve operational performance and cost management. Lee and Kao (2000) hoped to use this system in the agricultural firms. They based this on the data obtained from a case study. To apply the ABC system in the wholesale fish market in Taiwan, they utilized four steps. Firstly, they determined the activities. They found six activities in five sections. The sections were the cultured fish (section A), cultured fish (section B), cold storage polyester box (section C), cold storage fish basket (section D) and imported fish (section E). The six activities included unloading, ordering, billing, grading, weighing, numbering, auctioning and administrative operations. Second, was the allocation of resource costs. According to Ostrenga (1990) (as cited in (Lee & Kao, 2000) allocations can be classified into two categories: direct charging and estimation, which means allocating resource costs by using resource drivers and arbitrary allocation. They used direct charging and estimation charging. The third step was the computation of the resource costs. To know the duration of each operation, they installed v8 camcorder. They recorded the time of every operation to determine how much each operation costs. They computed the processing cost of each kilogram of fish. They found using ABC helped managers to determine the product price accurately and this was better than using traditional costing. Jack (2008) argue that although target costing system is not used in agricultural activities, however, target costing is a potential system to be used in the agricultural sector. Jack and Jones (2007) referred the same idea in their study. Jack (2008) explained that farmers use what could be named as an intuitive form of target costing. Farmers depended on previous prices in the prioir year to estimate potential prices to set target costs and then redesign their operations in order to achieve that target. Jack (2008) found that there are some factors that make the practice of target costing in agricultural firms difficult, including the need for detailed cost information and monitoring reports. To achieve this factor, the firms need multidisciplinary teams. However, agricultural firms started to collect data which make target costing probably to be applied in farming, furthermore the logic of target costing as strategic tool fits with the decision making strategy in farming.

Just a few studies are concerned with the study of factors that influence the practice of cost accounting systems in the agricultural firms including Juchau (1986) who mentioned to the significance of practicing cost accounting systems in the agricultural sector to rationalize managerial decision making processes, and assist firms to use the scarce resources in a proper way. Juchau (1986) argue that for a large farm that produces several products, the landlord needs to implement management accounting systems to improve his decision. Many accounting researchers in other sectors (manufacturing and service) ensured Juchau's opinion, such as Al-Omiri and Drury (2007). However, none of the researchers examined the influence of these factors on agricultural firms. According to the contingency theory, there are no ready-made cost accounting systems for all organizations; researchers should determine what cost accounting systems are appropriate for the agricultural firms. Moreover, some researchers stated that legal requirements force firms to implement management accounting systems (Geiger, 1996); also this factor has been tested in manufacturing firms. Therefore, this study adopted these factors to study their affect on implementing cost accounting systems in the Libyan agricultural firms.

In Libya, the government spends billions of Diners on the agricultural firms which belong to the public sector. These firms produce massive products, including plantation and livestock. However, in the past, the agricultural firms in the public sector monopolized the local markets. In other words, all other farms were small farms which could not compete with public firms. Recently, agricultural firms from Italy and the USA are investing in the agricultural firms in Libya. Therefore, in this study, the researcher wanted to know if the agricultural firms' size, cost structure, the level of competition, product diversity, importance of cost information and legal obligation influenced the Libyan agricultural firms to implement cost accounting systems, because according to Aljazawe (2006), the implementation of cost accounting systems in the agricultural firms in Libya are very far from satisfactory.

## III. RESEARCH DESIGN AND DATA COLLECTION

This study relied on case study to understand the practice of cost accounting systems in the Libyan agricultural firms. As stated by Scapens (2006) if the researchers want to understand the practice of cost accounting systems, they should conduct deep interviews with the managers and management accountants. Therefore, this study used unstructured interview identify how Libyan agricultural firms practice cost accounting systems, an unstructured interview consisted from four sections including information about the interviewees, information about the firm, information about cost accounting systems, and the perspectives of the interviewees. Six interviews conducted with management accountants, financial accountants, and production manager as in the Table 1 below:

*Table 5.41*

### *Interviewees' information*

| Respondent ID | Current position | An interview date | Duration of an interview |
|---|---|---|---|
| 1 | Management accountant | 9-2-2012 | One hour |
| 2 | Management accountant | 7-3-2012 | Two and half hours |
| 3 | Production manager | 1-2-2012 | One and half hour |
| 4 | Financial manager | 5-2-2012 | One and half hour |
| 5 | Financial accountant | 26 & 27-2-2012 | Two hours |
| 6 | Financial manager | 3-2-2012 | One hour |

### IV.  DATA ANALYSIS

Following to collecting the data the researcher followed several steps to analysis the data including that suggested by (Taylor-Powell & Renner, 2003): first organizing the data in tables question by question as in the Table 2, first column includes the interviewees ID, the second column includes question number, the third column includes the response, and the forth column includes the code.

### *Table 2*
### *Organizing the Data*

| ID | Q | Response | code |
|---|---|---|---|
| 1 | 1 | Manager | position |
| 2 | 1 | Management accountant | position |
| 3 | 1 | Production manager | position |
| 4 | 1 | Financial accountant | position |

After the researcher entered all the questionnaires in the table, the second step was organizing the responses for every interviewee separately as shown in Table 3.

### *Table 3*
### *Organizing the Data for every respondent*

| ID | Q | Response | code |
|---|---|---|---|
| 1 | 1 | Manger | position |
| 2 | 1 | The firm use Activity-based costing | position |
| 3 | 1 | 50% direct cost and 50% direct | position |
| 4 | 1 | We use straight-line method | position |

Next step was sorting the answers for every question to make understanding the data easier, moreover, to compare between the respondents' answers.  For instance, Table 4 will represent all answers for every question together, therefore, the researcher can compare between the cost structures in the four firms.

### *Table 4*
### *Sorting the Responses*

| ID | Q | Response | code |
|---|---|---|---|
| 1 | 5 | 60% direct cost and 40% direct | Cost structure |
| 2 | 5 | 30% direct cost and 700% direct | Cost structure |
| 3 | 5 | 50% direct cost and 50% direct | Cost structure |
| 4 | 5 | 450% direct cost and 55% direct | Cost structure |
| 1 | 6 | The firm is using Full costing | Costing method |
| 2 | 6 | The firm use full costing method | Costing method |
| 3 | 6 | Full costing | Costing method |
| 4 | 6 | Full costing | Costing method |

To categorize the data the researcher developed the code for his data as seen in Table 5 below.

*Table 5*
*Code development*

| Code | Code Description |
|------|------------------|
| TP | Type of production |
| FS | Firm strategy |
| CASD | Cost accounting system department |
| DPC | Determining product cost |

Finally summarizing the data and writing the report, organizing and sorting the data assisted the researcher in writing the report in term of comparing the interviewees' answers and writing the finding related to the practicing of cost accounting systems in the Libyan agricultural firms.

## V.    THE FINDING AND DISCUSSION

The six interviewees stated that they implement cost accounting systems in the Libyan agricultural firms; specifically they use full absorption costing to determine the product cost. In addition, one of the interviewees argue that there are four cost elements in their firms that include labor cost, production requirements, operation and maintenance, and managerial expenses . Besides, interviewees stated that they divided the firms to three cost centres including cost centre for plantation production, cost centre for livestock production and cost centre for general expenses. Furthermore, the documentation collected from the Libyan agricultural firms also indicated that the Libyan agricultural firms practice cost accounting systems because they prepare cost statements.

Most of the interviewees argue that cost information mainly use for setting product prices. While three of the respondents stated that they use cost information in cost control and determine product cost. However, some of them argue that they use cost information in determining the minimum price, make comparison between the year's expenses, and determine the extra activities. Because Libyan government subsidies the agricultural firms, it determines the product prices. Therefore, cost accounting systems in this case used to determine the exact product costs to find the difference between the prices set by the government and the actual costs. If the actual cost less than the prices set by the agricultural ministry, Libyan government will compensate the agricultural firms by the difference between the cost and selling prices.

Although overhead costs should be allocated to all products most of the interviewees stated that they allocate overhead costs to one department namely plantation department ignoring livestock department, the interviewers justified this behavior because plantation department is the main activity in the Libyan agricultural firms. In one of the agricultural firm's expenditure statement in 2011, 88% from the expenditure spent on plantation department and 12% spent on livestock department. Therefore, they use cultivated area to allocate overhead costs to plantation products while livestock products loaded only by direct costs. Moreover, one of the interviewees stated that they use three

bases to allocate that include number of workers, field area, and working hours. Although the literature explained that activity based costing is suitable for farming activities all of the respondents stated that they use traditional costing. From the interviewees the Libyan agricultural firms rely on full costing to determine the product cost, they mentioned that there are four cost elements in their firms that include labor cost, production requirements, operation and maintenance, and managerial expenses, this findings supported by the  agricultural firms' documents.

This study conducted interviews in six different agricultural firms, however, every agricultural firm produce different products. Therefore, the study suggested that future researchers should conduct a case study to understand the practice of cost accounting systems in every agricultural firm, using deep interviews. A lack of literature related to cost accounting systems in the agricultural firms and the time available for data collection were the most important limitation of this study.

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# Image Retrieval from an Engineering Database using Shape and Depth Feature

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*Abstract-* Content based image retrieval is a technique which uses visual contents like shape, color and texture to retrieve images from large scale image databases. In content based image retrieval shape is one of the primitive feature for image retrieval. Many images are classified and detected based on shape description. In this paper we present the methods for retrieving images from the large database which consist of engineering objects or models. The proposed work uses the shape information from an image along with 3D information. The 3D information can be obtained by obtaining depth map, for this a linear approximation procedure that can capture the depth information using the idea of shape from shading has been used. Retrieval of objects is done using a similarity measure that combines shape and the depth information.

*Index Terms*- CBIR, shape, Depth , contour.

## I. INTRODUCTION

Content-based image retrieval (CBIR) is used to describe the experiments into automatic retrieval of images from a database. This term has been widely used to describe the process of retrieving desired images from a large collection on the basis of features such as color, texture and shape that can be extracted automatically from the image itself The advantages to find a desired image from a large databases has wide applications, such as, in crime prevention by automatic face detection, finger print, medical diagnosis and so on. Visual contents to search images from large scale image databases has been an active research area for the last decade. Advances in the internet and digital imaging have resulted in an exponential increase in the volume of digital images.

The earliest use of different image retrieval technique were based on the manual textual annotation of images, which is intensively large and also often it depends on that persons imagination. Texts alone are not sufficient because of the fact that interpretation of what we see is hard to characterize by them. Hence, contents in an image, color, shape, and texture, started gaining prominence.

Even though different combinations of contents that is shape and color or shape and texture or color and texture and their possible descriptions have been tried, it is increasingly evident that a system cannot cater to the needs of a general database which consists of 3D engineering objects. Hence, it is more relevant to build image retrieval systems that are specialized to domains.

In this paper, we propose an approach in which retrieving images from an engineering database which contains 3D objects has been presented. As the 3D objects are geometrically well-defined as compared to natural objects and also they rarely contain texture information, the appropriate feature to be used is shape. For every object the contour is captured which gives its two dimensional content along with its 3D embedding information, its depth profile at each pixel on the contour. Shape from an image is quite a powerful representation as it characterizes the geometry of the object. However, it is normally a planar profile, and is insufficient by itself to recognize objects that are typically 3D in nature. To take into account the third dimension, other parameters such as color and/or texture have been used. However, in our paper, we propose an approach that combines shape with the depth-map of the shape. The basic idea of our paper is illustrated in Fig. 1.
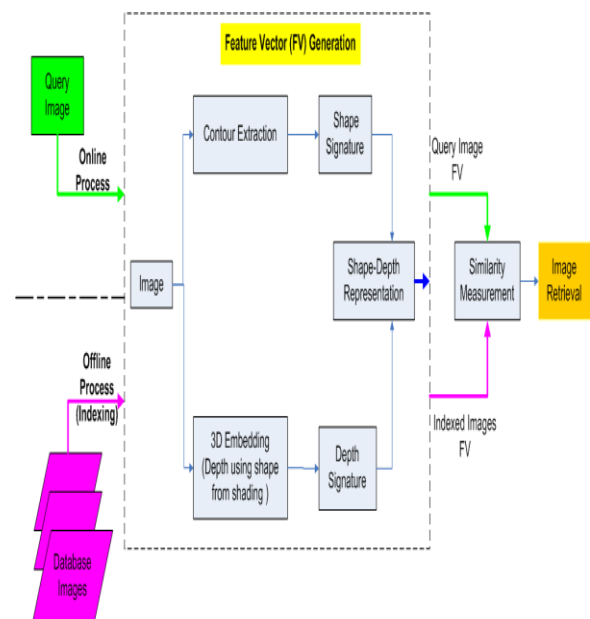


**Fig. 1. Proposed method indicating the basic idea used in this paper**

## II. SYSTEM MODEL AND RELATED METHODS

*A. Shape extracting method*

In the contour tracing algorithm shape contour can be obtained by using three steps as specified below the result of each of the step is given in fig.2.

1. Firstly convert the given image into gray scale image (Fig. 2(a)).

2. Then the converted gray scale image is binarized (Fig. 2(b)).

3. Contour from the binary image can be obtained by separating the object information from its background details.

Applying the contour tracing algorithm generates the boundary shape (contours) of the object (Fig. 2(c)).



(a)  (b)  (c)
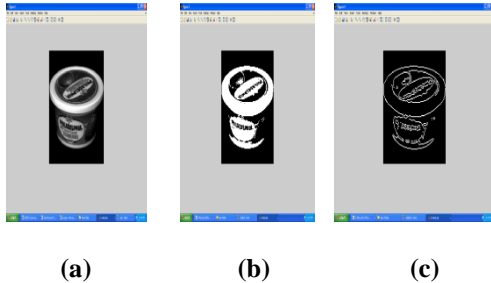
**Fig. 2. Processing an input image (a) Grayscale image (b) Binarized image (c) Contour extraction**

Shape signature, a one dimensional representation of the shape, is obtained by applying the 8-point connectivity technique on the 2D closed contour. As engineering/CAD objects have well defined centroid ($x_c, y_c$) and also retrieval has shown to be better with central distance [16], we use it as our shape representation. The feature vector representing the central distance between point on the contour $(x, y)$ and the centroid ($x_c, y_c$) is given by:

$$V_c = (x - x_c, y - y_c, 0) \tag{1}$$

$x_c = \frac{1}{N} \sum_{i=0}^{N-1} (x_i)$, $y_c = \frac{1}{N} \sum_{i=0}^{N-1} (y_i)$ and $N$ is the total number of pixels.

*B. Extraction of Depth Map from contour*

Once the contour from the given shape (by using contour tracing algorithm) is obtained (as described in Section 2), its 3D information is then computed. The 3D information can be computed in terms of depth Z, the surface normal ($n_x, n_y, n_z$), or surface gradient $(p, q)$.

However, in this paper, we use only a single image as query and not a set of images. Hence, a principle of shape from shading has been used to obtain the 3D embedding information. Lambertian model [17], is a reasonable approximation for engineering objects, where Lambertian is assumed that equal amount of light is reflected in every direction. The parameters which are used in Lambertian reflectance are albedo, which is assumed to be constant and illuminant direction, which can be computed, in general.

To compute the depth-map of an image, we use the approach proposed by [17]. The linearity of the reflectance map in the depth Z has been used instead of in $p$ and $q$. discrete approximations for $p$ and $q$ are employed and linearize the reflectance in $Z(x, y)$. The reflectance function for the Lambertian surface is as follows:

$$E(x, y) = R(p, q) = \frac{1 + p p_s + q q_s}{\left(\sqrt{1 + p^2 + q^2}\right)\sqrt{1 + p_s^2 + q_s^2}} \tag{2}$$

where $E(x, y)$ is the gray level at pixel $(x, y)$,

$p = \frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$, $p_s = \frac{\cos \tau \sin \sigma}{\cos \sigma}$, $q_s = \frac{\sin \tau \sin \sigma}{\cos \sigma}$

$\tau$ is the tilt of the illuminant and $\sigma$ is the slant of the illuminant. Discrete approximation of $p$ and $q$ are given by the following:

$$p = \frac{\partial z}{\partial x} = Z(x, y) - Z(x - 1, y),$$

$$q = \frac{\partial z}{\partial y} = Z(x, y) - Z(x, y - 1) \tag{3}$$

The reflectance equation can be then rewritten as:

$$0 = f(E(x, y), Z(x, y), Z(x-1, y), Z(x, y-1))$$

$$= E(x, y) - R(Z(x, y) - Z(x-1, y), Z(x, y) - Z(x, y-1)) \tag{4}$$

For a fixed point $(x, y)$ and a given image $E$, linear approximation (Taylor series expansion up through the first order terms) of the function $f$ about a given depth map $Z^{n-1}$ and solving using iterative Jacobi method results in the following reduced form:

$$0 = f(Z(x, y))$$

$$= f(Z^{n-1}(x, y)) + (Z(x, y) - Z^{n-1}(x, y)) \frac{df(z^{n-1}(x,y))}{dz(x,y)} \tag{5}$$

For $Z(x, y) = Z^n(x, y)$, the depth map at $n$-th iteration can be solved using the following:

$$Z^n(x, y) = Z^{n-1}(x, y) \frac{df(z^{n-1}(x,y))}{dz(x,y)} \tag{6}$$

Where

$$\frac{df(z^{n-1}(x,y))}{dz(x,y)} = -1 * \left( \frac{p_s + q_s}{\sqrt{1+p^2+q^2}\sqrt{1+p_s^2+q_s^2}} - \frac{(p+q)(p p_s + q q_s + 1)}{\left(\sqrt{1+p^2+q^2}\right)3\sqrt{1+p_s^2+q_s^2}} \right)$$

The depth map of the image is shown in Fig. 3. It is to be noted that in this paper only the depth values at the contour are used.
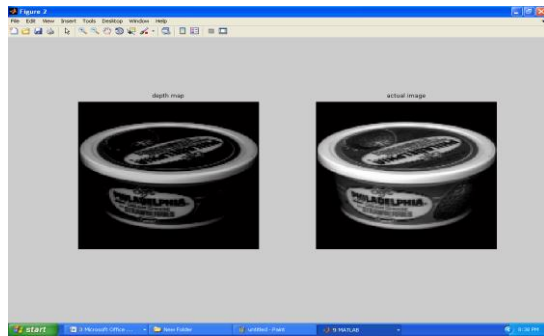
**Fig. 3. Depth map of the image**

The depth map is then represented in a way similar to the shape (Equation (1)). The feature vector representing depth is given by:

$$V_d = (0, 0, Z - Z_c) \qquad (7)$$

where $Z$ is the depth obtained from Equation (6) of the contour, and $Z_c$ denotes the third dimension of the centroid

## III. REPRESENTATION, INDEXING AND RETRIEVAL

In this section, shape-depth representation is described, followed by Indexing using Fourier Descriptors and then a similarity measurement to describe the retrieval.

### A. Representation of Shape-Depth

As we know that, shape alone is not sufficient to get a good retrieval. As we are dealing with well-defined geometric objects, our strategy is based on a 3D embedding has been adopted. Shape, in this paper, is combined with the corresponding estimated depth profile. Shape-Depth can be defined as. $I : R^2 \to R^3$ At each point on the contour, a vector is defined as follows:

$$V = ( x - x_c, y - y_c, Z - Z_c) \qquad (8)$$

This can be decomposed into $V_c$ (Equation (1)) representing the shape/contour and $V_d$ (Equation (7)) representing depth.

A weighted combination of the magnitude of the vectors $V_c$ and $V_d$ is used for retrieving images. Shape-Depth representation is defined as follows:

$$SD = \frac{w_c \cdot \|V_c\| + w_d \cdot \|V_d\|}{w_c + w_d} \qquad (9)$$

where $w_c$ and $w_d$ are the weights assigned to the shape-based similarity and the depth-based similarity, respectively and $w_c + w_d = 1$, $w_c > 0$ and $w_d > 0$. It can be observed that $\|V_c\|$ captures the central distance measure in the 2D domain and $\|V_d\|$ is a similar measure on the third dimension, the depth. hence it could prove to be a very useful one for retrieving objects/images.

### B. Fourier Transform of Shape-Depth and Indexing

The important requirement of any representation for retrieval is that it is invariant to transformations such as translation, scaling and rotation. Fourier transform is widely used for achieving the invariance. For any 1-D signature function, its discrete Fourier transform is given by:

$$a_n = \frac{1}{N} \sum_{i=0}^{N-1} (SD) \exp(-j2\pi it/N) \qquad (10)$$

Where, $n = 0, 1, \ldots, N - 1$ and $SD$ is given by Equation (9). The coefficients $a_n$ are usually called Fourier Descriptors (FD), denoted as $FD_n$. Since the shape and depth representations described in this paper are translation invariant, the corresponding FDs are also translation invariant. Rotation invariance is achieved by using only the magnitude information and ignoring the phase information. Scale normalization is achieved by dividing the magnitude values of the FDs with $FD_1$. The invariant feature vector used to index $SD$ is then given by

$$f = \frac{|FD_2|}{|FD_1|}, \frac{|FD_3|}{|FD_1|}, \ldots\ldots\ldots, \frac{|FD_{N-1}|}{|FD_1|} \qquad (11)$$

### C. Similarity Measurement

In this paper as we are using only single image as query and not a set of images and retrieval result is not a single image but a list of images ranked by their similarities with the query image. Since CBIR is not based on exact matching. For a model shape which is query image's shape indexed by FD feature $f_m = [\, f_m^1, f_m^2, \cdots, f_m^N \,]$ and a database indexed by FD feature $f_d = [\, f_d^1, f_d^2, \cdots, f_d^N \,]$, the Euclidean distance between two feature vectors can then be used as the similarity measurement:

$$d = \sqrt{\sum_{i=0}^{N-1} |\, f_m^i - f_d^i \,|^2} \qquad (12)$$

where $N$ is the total number of sampled points on the shape contour

## IV. EXPERIMENTAL RESULTS

For testing the above approach, we have used a total of 1400 engineering database image. The database has multiple copies of an image and also it has same image in arbitrary position and rotation. The query image is also one of the image from the database. Test results for some objects are shown in Figs. 4(a) to 4(e), where only first six retrieved images are shown for the query image on the left.

The different parameters that could affect the retrieval results in our approach are, number of sampling points to compute the FDs, weights $w_c$ and $w_d$ in Equation (8), and the factors such as light direction and number of iterations when computing the depth. There is always a tradeoff when the number of sampling points is chosen. The more number of sampling points is chosen will give a very good result at the cost of computation. On the other hand, using lesser number is computationally inexpensive but may not give accurate information.

In all the test results, it is to be noted that the query image is also retrieved, which indicates that the shape-depth representation is robust.



**(a)**



**(b)**



**(c)**



**(d)**



**(e)**

**Fig. 4. Retrieval Results for some Engineering objects**

The important advantage in using the depth content of the image is that we can represent objects close to how it is in its three dimensional space. As we are using only a single image to compute the depth map, it will be close to its real depth only if the image is in its most informative position. However, in this approach, as we are not only dependent on the shape information (that is its contour) but also its depth, we can also retrieve objects that are in different orientation.
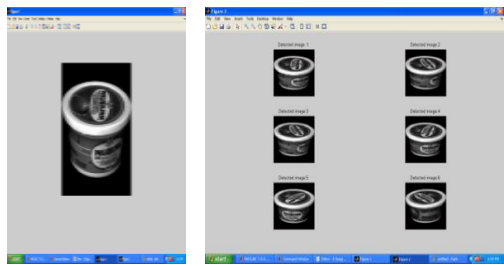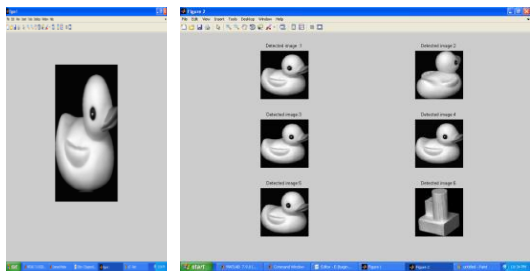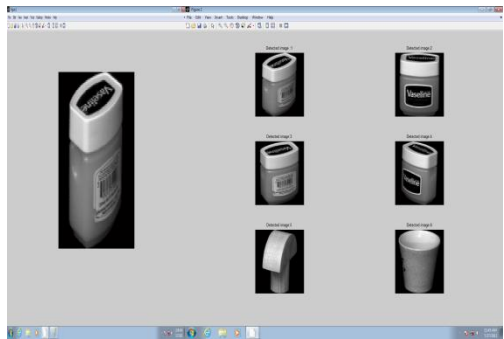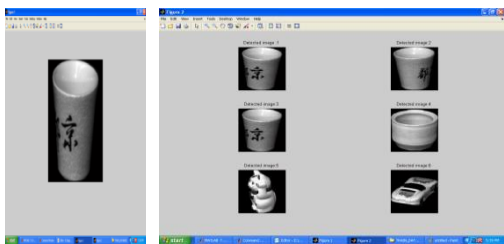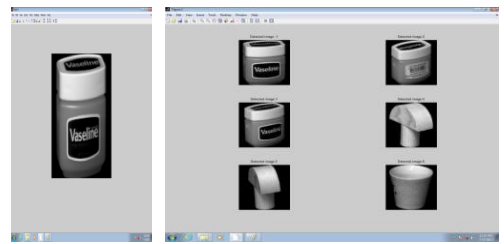
**Table:1**

| Input image | Matches |
|---|---|
| 1 | 1 |
| 2 | 0.8 |
| 3 | 0.6 |
| 4 | 0.5 |
| 5 | 0.5 |

**(a)**
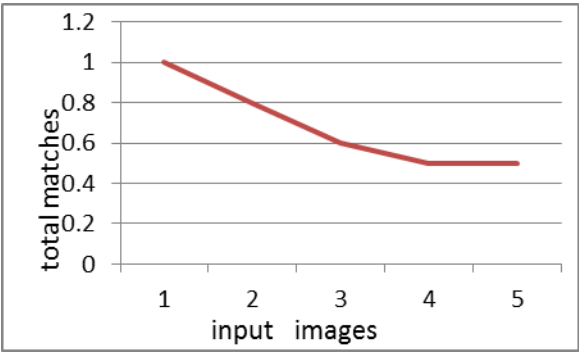


**(b)**

**Fig 5(a),5(b) shows the values and corresponding graph for total number of images matched.**

**Table:2**

| Input images | Accuracy |
|---|---|
| 1 | 100% |
| 2 | 90% |
| 3 | 80% |
| 4 | 60% |
| 5 | 60% |

**(a)**

**(b)**
**Fig 6(a),6(b) shows the accuracy for the input images.**

The above graph is drawn by using the values from table2 ,for each query image how much accurately it matches with database image is shown.
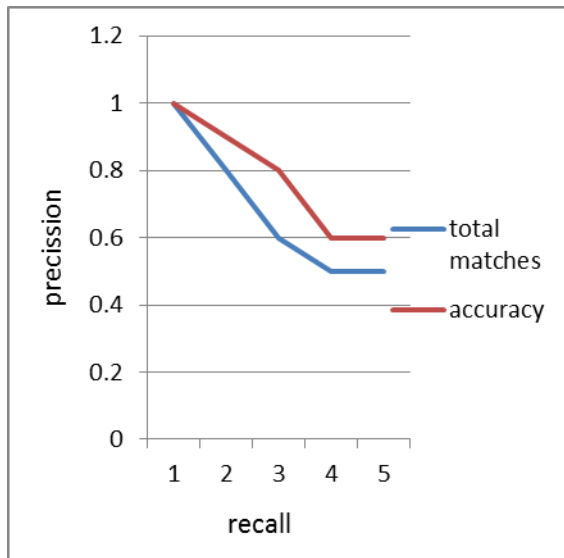


**Fig 7 the precession-recall graph of total matches and accuracy is drawn**

By using the above figures we plot the precession-recall graph which shows that as number of matches increases the accuracy also increases.

## V.  CONCLUSION

The work carried out in this paper is very useful in retrieving the objects from an engineering database. The basic idea used is to combine the shape information which is extracted from the contour tracing algorithm. Depth information is extracted from this contour. The extracted feature vector  are stored for all the database images. After applying  the query image same features are extracted and given to the matching stage which uses the Euclidian distance between the two feature vectors and top matched six images are displayed. This approach may be used in other application domain such as meteorology, medicine, space exploration, manufacturing, entertainment, education, law enforcement, defense, chemistry, forensics, mechanical CAD, paleontology, computer graphics and computer vision and protein search in molecular biology.

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# Requirement of Newer Parameters to replace Conventional Liver Function Tests for Differentiation of Liver Disease from Non-liver Disease

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**Abstract:** This cross-sectional study was conducted in 50 liver disease patients and 50 non-liver disease patients, who were examined clinically and confirmed sonographically for liver involvement. All the parameters of Conventional Liver Function Tests (CLFTs) including serum Bilirubin, SGPT, SGOT, ALP, Total Protein and Albumin were estimated and compared in liver disease and non-liver disease patients. Data was analyzed by non-parametric Mann-Whitney test and statistical significance was calculated. It showed that serum bilirubin was highly significant ($p<0.001$), while SGPT and SGOT were raised in liver disease patients, but they were not statistically significant ($p>0.05$). So none of the individual test can predict the liver disease and at times it can lead to a confusing situation between liver disease and non-liver disease. The present study concludes that more sensitive and specific parameters are needed to correctly diagnose liver disease and at the same time it must rule out non-liver diseases.

**Index Terms:** Conventional Liver Function Tests, Liver disease, Non-liver disease

## I. INTRODUCTION

Liver is a complex, unique and largest internal organ of the human body serving many functions crucial to sustain life. Liver has a broad spectrum of functions, therefore diseases causing hepatic impairment have repercussions throughout the body. Hepatocyte injury is common worldwide. Liver diseases are usually classified as hepatocellular, cholestatic or mixed diseases. In hepatocellular diseases, features of liver injury, inflammation, and necrosis predominate. In cholestatic diseases, features of inhibition of bile flow predominate and in a mixed pattern, features of both hepatocellular and cholestatic injury are present [1, 2].

Conventional liver function tests (CLFTs) include serum bilirubin, alanine aminotransferase (ALT, SGPT), aspartate aminotransferase (AST, SGOT), alkaline phosphatase (ALP), total protein and albumin. They are commonly used to define the pattern of liver disease, assessment of the severity and for follow up purposes. The CLFTs may be normal in certain liver diseases and they are also not specific for liver disease, because all the parameters of CLFTs may be elevated for pathological processes outside the liver [3, 4]. A number of pitfalls can be encountered in the interpretation of CLFTs. Normal CLFTs do not always mean that the liver is normal. These tests can be normal in patients with chronic hepatitis or cirrhosis [5]. Therefore, none of the individual test amongst CLFTs is of much importance in diagnosis of liver diseases, however when many of the liver function tests are abnormal at the same time, liver disease is the most probable diagnosis.

The present study was aimed to find out the alterations in the parameters of CLFTs in liver diseases and non-liver diseases and also to evaluate that whether these parameters are sufficient enough to diagnose liver disease or there is requirement of more sensitive and specific parameter to diagnose liver disease.

## II. MATERIALS & METHODS

This study was carried out on 50 liver disease and 50 non-liver disease patients. All liver disease patients were primarily evaluated by clinical examination and then confirmed sonographically for liver involvement. Amongst these, 17 patients were of cirrhosis and 17 were of chronic viral hepatitis C, while remaining 16 patients were of liver carcinoma. Non-liver disease patients were mostly presented with minor ailments or infections and liver involvement was ruled out in them by ultrasonography. All the patients were aged between 15-65 years and mean age was 44 years in liver disease and 43 years in non-liver disease patients. All patients were explained fully about the study and written informed consent was obtained from them. The study was approved by Institutional Review Board and Human Ethics Committee.

Blood was collected by venepuncture from each patient and serum was separated from clotted blood by centrifugation. Estimations of serum bilirubin, SGPT, SGOT, ALP, total protein and albumin were done in all serum samples. All the enzymes were detected by kinetic methods and bilirubin, total protein and albumin were detected by end-point methods [6]. All analyses were done on full auto analyzer – Miura (ISE, Italy).

The results were analyzed by non-parametric Mann-Whitney test. Statistical significance (p-value) was obtained and compared in liver disease and non-liver disease patients. Sensitivity and specificity of all the parameters were detected and were

compared in both the groups. International Biorad Internal Quality Controls (Level I & II) were run for all the parameters prior running patients' samples.

### III. RESULTS & DISCUSSION

Table 1 shows the mean, standard deviation and statistical significance (p-value) of serum total bilirubin, SGPT, SGOT, ALP, total protein and albumin in liver disease and non-liver disease patients. Amongst all the parameters of CLFTs, serum bilirubin was highly significant statistically, while SGPT and SGOT were found elevated but were not significant statistically. Even in non-liver disease patients, the levels of SGPT and SGOT were elevated. Such patients may be mistaken for liver disease patients and treated for the same for no reason. The results of this study has supported the data of the study carried out by M. G. Khan, who reported that many patients of moderate to severe liver diseases can have normal transaminases levels [7].

**Table 1: Conventional Liver Function Tests in Liver Disease (LD) and
Non-liver Disease (NLD) Patients**

| Parameter | Biological Reference Interval | LD Patients (n=50) Mean ± SD | NLD Patients (n=50) Mean ± SD | Statistical Significance (p-value) |
|---|---|---|---|---|
| Total Bilirubin (µmol/L) | Upto 18.8 | 109.4 ± 94 | 15.4 ± 5.1 | 0.001 |
| SGPT (IU/L) | 0-45 | 163 ± 369 | 78 ± 58 | 0.45 |
| SGOT (IU/L) | 0-35 | 121 ± 150 | 79 ± 63 | 0.09 |
| ALP (IU/L) | 98-279 | 346 ± 189 | 255 ± 115 | 0.02 |
| Total Protein (g/L) | 66-83 | 60 ± 8 | 63 ± 12 | 0.01 |
| Albumin (g/L) | 35-50 | 29 ± 6 | 33 ± 6 | 0.01 |
| Statistical analysis was done by Mann-Whitney test | | | | |

Table 2 shows the sensitivity, specificity, positive predictive value and negative predictive value of various parameters of CLFTs to diagnose liver disease. It clearly states that no single parameter of CLFTs is sensitive and specific enough to correctly diagnose liver disease. Sensitivity of SGOT was maximum (90%), but it was least specific (18%) for liver involvement. Although all the patients were confirmed for liver involvement by ultrasonography, but none of the individual test of CLFTs can correctly predict the liver disease. This can create a state of confusion in clinicians' mind that whether liver is involved or not and thus there is always a scope for performing more diagnostic tests to rule out liver disease. This can increase the healthcare costs and suffering to the patients. Many studies concluded that the effectiveness of CLFTs is of limited diagnostic value when used alone [3, 8].

**Table 2: Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of CLFTs in Liver Disease Patients**

| | Total Bilirubin | SGPT | SGOT | ALP | Total Protein | Albumin |
|---|---|---|---|---|---|---|
| Sensitivity (%) | 88 | 72 | 90 | 56 | 86 | 78 |
| Specificity (%) | 76 | 72 | 18 | 74 | 42 | 50 |
| Positive Predictive Value (%) | 78 | 50 | 52 | 68 | 60 | 61 |
| Negative Predictive Value (%) | 86 | 72 | 64 | 63 | 75 | 69 |

Amongst CLFTs, bilirubin was highly significant and its sensitivity (88%) and specificity (76%) was also higher than other parameters. Bilirubin is formed by enzymatic breakdown of heme in reticuloendothelial cells and its level can be increased in any hemolytic disease without involvement of liver [5]. In the present study, only 28 patients out of 50 liver disease patients had elevated alkaline phosphatase activity. Different isoenzyme forms of alkaline phosphatase are found in many locations throughout the body, including bone, small intestine, kidney, placenta and white blood cells [9]. Albumin and globulins except immunoglobulins are produced in liver, so total protein estimation may not be helpful to identify liver disease. Only 29 out of 50 liver disease patients had lower total protein levels. Similarly, serum albumin levels were also low in many non-liver disease patients. Albumin levels can be normal in some liver diseases [10]. So, no single parameter amongst LFTs can rule out liver disease.

## IV.  CONCLUSION

In conclusion, present study demonstrates that routinely used CLFTs are not sensitive and specific enough to correctly diagnose liver disease. Some vital parameters of CLFTs might be altered in many non-liver diseases and there may be chances of normal CLFTs in many liver diseases also, thus it creates a dilemma in clinicians' mind to rule out liver disease from non-liver disease. Commonly performed serum liver enzymes are also of limited value in diagnosis and monitoring of liver diseases. Development and application of laboratory tests that can identify liver disease at the earliest have the potential of reducing the healthcare costs and suffering associated with liver diseases.

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# Biopolymer production by Bacterial Species using Glycerol, a byproduct of biodiesel

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**Abstract-** Biopolymer   producing bacterial species (*Bacillus* and *Pseudomonas* )were isolated from   rhizosphere soil of *Jatropha curcas*  by using standard  morphological, cultural and biochemical  characteristics.PHB production by bacterial sps were screened  by Sudan black B staining method. The main aim of the present study to production of biopolymers using crude glycerol is a byproduct of biodiesel, act  as a sole carbon source for PHB  producing microorganisms, under the limitation of nitrogen  and phosphate . Ammonium molybdate and ammonium sulphate  were  used  in  nitrogen deficient  medium  instead of ammonium chloride. Maximum biopolymer production were noted  in  *Bacillus spp13*.3 gm/100ml.*Pseudomonas spp* yielded 11.2 gm/100 ml.

**Intex Terms:** *Bacillus cereus,* Crude glycerol*,* NDMM, PHB, *Pseudomonas aeruginosa,* Sudan black B.

## I.   INTRODUCTION

Our whole world seems to be wrapped up in plastic.  Almost every product we buy ,most of the food we eat and many of the liquids we drink come encased in plastics. Over the past 25 years, petrochemical derived plastics have become indispensable materials  in  modern life.   These plastics however are non biodegradable  and  cause  significant  waste disposal and contamination  problems.  Increasing awareness of the harmful effects of non biodegradable plastics on the environment together with the growing body of legislation prevents their use in various consumer products, and created much interest in the development of   biodegradable   plastic   material.(Sang   Yup Lee,1997).Biodegradable  plastic  is  an  alternative  for  the petrochemical plastics must be truly degradable, non-polluting and  economically  priced  polymer  (Rawte  *et  al*.,2001). Biodegradable plastics, can be degraded completely into natural compounds, such as $CO_2$, methane, $H_2O$  and biomass with in 1 year.  This process is carried out by microorganisms.

Polyhydroxyalkanoates  or  PHAs  are  linear  polyesters produced in nature by bacterial fermentation of sugar or lipids. They are produced by the bacteria to store carbon and energy resources. These are polyesters composed of repeating units of  3 hydroxyalkanoic  acid  which  can  vary  in  their  carbon  chain length(Fulal wang *et al*.,1997). In microorganisms, PHA plays an important role as a carbon and energy reservoir, it  helps in the sporulation  process .(  Rawte  *et  al*.,  2001).PHA  granules accumulated under the conditions of limiting nutritional elements such as N,P,O,S, Mg in the presence of excess carbon source. PHA are present in the cytoplasmic members of bacteria like *Azotobacter vinelandii*, *Bacillus subtilis*, *Haemophilus influenzae* and *Escherichia coli* and also in eukaryotic membranes like in mitochondria  and  microsomes  as  complexes  of  calcium  ions ($Ca^{2+}$) and polyphosphates in a ratio of 2 : 1 : 2 (Reusch,1992).

The  production  of  biodiesel  generates  significant quantities of co-product stream rich in glycerol. New uses for glycerol have been the subject of much research to alleviate a market glut of this commodity and to leverage the economics of biodiesel production. One potential use of glycerol is in industrial fermentation  where  it  can  be  employed  as  a  substrate  for microbial growth and the biosynthesis of microbial products. The utilization  of  crude  glycerol  will  be  of  immense  importance alleviating  its  disposal  problem  and  producing  a  value  added product. Its utilization in biodegradable polymer production will be  attractive.(  Raveendran  Sindhu  et  *al*.,2011).  Biodiesel production will generate about 10% (w/w) glycerol as the main byproduct. In other  words, every gallon of biodiesel produced generates approximately 1.05 pounds of glycerol. This indicates a  30-million-gallon-per-year  plant  will  generate  about  11,500 tones  of  99.9  percent  pure  glycerin.  It  was  projected  that  the world biodiesel market would reach 37 billion gallons by 2016, which  implied  that  approximately  4  billion  gallons  of  crude glycerol would be produced.( Anand *et al*.,2011).

Glycerol as the structural component of many lipids , is abundant in  nature.  Wide  glycerol  occurrence  in  nature  allows  different kinds  of  microorganisms  to  metabolize  it  as  a  sole  carbon  and energy source. Thus, in some industrial fermentation processes, glycerol can substitute traditional carbohydrates, such as sucrose, glucose, and  starch (Posada *et a*l.,2010)Since purified glycerol is a high value and commercial chemical with thousands of uses, the  crude  glycerol  presents  great  opportunities  for  new applications. For that reason, more attention is being paid to the utilization of crude glycerol from biodiesel production in order to defray the production cost of biodiesel and to promote biodiesel industrialization  on  a  large  scale.  Although  intensive investigations have focused on utilizing crude glycerol directly, review papers on crude glycerol utilization are scarce. Crude glycerol contains a high salt concentration and has a high pH. There is some chemical application to utilize waste glycerol ,but it requires the purification process to use it as a source of chemical. High salt and pH  tolerant bacterium effectively produce  bio  polymer  .The  present  study   mainly  address  the current  and  potential  value-added  applications  of  glycerol  from biodiesel production. PHB from glycerol requires a limitation of an essential nutrient such as: N, P, Mg, K, O or S, and an excess of a carbon source.

The  main  aim  of  the  work  is  the  production  of Biopolymers  by  using  crude  glycerol.  To  minimize  the production cost of Bioplastics and by which making the pollution free , Eco Friendly   environment from non - biodegradable plastics.

## II.MATERIAL AND METHODS
**Sample Collection**

Rhizosphere soil samples were collected from *Jatropha curcas* plants in Bodinayakanur, Theni(Dt)Tamil Nadu .Soil was taken from 20cm depth and stored at room temperature until analysis. *Bacillus* and *Pseudomonas* spp were isolated from rhizospere soil . The morphological and physiological and biochemical properties of the isolates were investigated according to Bergey's method of Determinative Bacteriology (Holt *et al.,* 1993). and the cultures were maintained on nutrient agar at 4ºC.

### Crude Glycerol Collection

Crude glycerol was collected during biodiesel production from *Jatropha* oil using alkali catalyst transesterification reaction. Un refined glycerol was used as a carbon source for PHB producers.

### Inoculum Development

A loop full of *Bacillus* and *Pseudomonas* culture from nutrient agar slants was inoculated in 100 ml of carbon rich growth medium containing $(gL^{-1})$ peptone, 10;yeast extract ,10;meat extract ,5; pH,$7.2\pm0.2$ . Medium was inoculated at the rate of 1 % inoculum and incubated at 30ºC for 24 hrs with constant shaking at 120 rpm.

### Nitrogen Deficiency Minimal Medium (NDMM) Preparation for PHB Production

For detecting accumulation of PHB, *Bacillus* and *Pseudomonas* were grown in nitrogen deficiency minimal medium (NDMM) containing $(gL^{-1})$ $Na_2HPO_4$,3.8gm;$KH_2PO_4$,2.65gm;$NH_4CL$,2gm; $Mgso_4$, 0.2 gm; glycerol, 2gm and trace minerals 1ml $L^1$ which contained $(gL^{-1})$EDTA,5 gm;$ZnSO_4$ $7H_2O$,2.2 gm; $CaCl_2$5.45 gm; $MnCl_2$ $6H2O$,5.06 gm;$H_3Bo_3$0.05gm; $Feso_4$ $7H_2O$,4.79 gm;$NH_4$ $MO$,24.4 gm;$Cocl_2$ 6 $H_2O$,1.6 gm and $CuSO_4$ $5H_2O$,1.57gm. The PH was adjusted to 7 with KOH. -(Rapske *et al.,* 1976).The culture was incubated at 30ºC for 48 hrs on a rotatory shaker at 120 rpm. Cells were stained with lipophilic stain Sudan black B (Murray *et al*.,1994) using slide and plate method.

### Isolation of PHB Producers

The PHB production by the microbes can be confirmed by staining with Sudan B black.

### a . Slide Method

The cultures were grown in NDMM medium were heat fixed on a slide and immersed in 0.5% (w/w) Sudan black B staining with ethylene glycol for 5min.Then the slide was air dried, the excess amount of stain was destained using xylene several times and blot dried with absorbent paper. Then the counter stain (0.5%w/v aqueous saffranin) was added for 5 to 10 seconds. The slide was washed with tap water and dried. The stained cells were observed under oil immersion microscope.

### b . Plate Method

Nitrogen Deficiency Minimal Medium agar plates were prepared and the test cultures were inoculated by using spread plate method. The plates were incubated at 37ºC for 48 to 72 hrs. After incubation, the plates were flooded with Sudan black B solution for 20min. Later, the solution was destained with ethanol solution .Finally the solution was drained off and observed for screening of PHB producers.

### PHB Production in shake flask

PHB production occurs only under nitrogen limiting conditions (Takahiro,1986),it was carried out in two steps: i) PHB producers were grown in 500 mL Erlenmeyer flask containing 100 mL carbon rich growth medium.(Jung *et al*.,1997).Flask were inoculated at the rate of 1% inoculums (v/v)and incubated at 30ºC for 24 hrs with constant shaking at 120 rpm and ii) after getting optimal cell concentration ,cell mass was centrifuged at 10000 rpm for 10 min, washed with sterile distilled water, inoculated in nitrogen deficient minimal medium and incubated for 48 hrs at 37ºC on a rotatory shaker(120 rpm).

### Optimization of cheap carbon source (Glycerol) and various nitrogen sources for PHB production.

- The effect of crude glycerol from biodiesel production on PHB production by *Bacillus,Pseudomonas spp* were performed in N and P limiting conditions.
- Nitrogen sources such as Ammonium molybdate, Ammonium sulphate were used for Biopolymer production instead of Ammonium chloride.
- Glycerol (carbon source) individually added at the rate of 2g/l in NDMM medium devoid of fructose. Over night culture of PHB producers was inoculated (1%)in to NDMM medium. After 24 h incubation at 30ºC with shaking (120 rpm) the culture was used for estimation of PHB.

### Dry weight measurement of PHB producers

48 hours incubated PHB producers in NDMM broth allowed centrifuged at 4000 rpm for 15 mins. The cell pellets were collected and washed with distilled water and kept allowed to dry, then the final weight measured and tabulated .

### Extraction of PHB

After 48 hrs incubation cell mass was harvested by centrifugation at 10000 rpm for 10 minutes. Supernatant was discarded and the pellet was treated with equal quantity of sodium hypo chloride and the mixture was centrifuged with 5000 rpm for 15 min and then washed with distilled water,acetone respectively for washing and extraction. After washing, the pellet was dissolved in 5 mL of boiling chloroform and allowed to evaporated on sterile glass plate and kept at 4°C. After evaporation the powder was collected for further analysis.

### Assay of PHB

Extracted PHB was dissolved in minimum volume(10ml) of chloroform and subjected to grarvimetric and spectrophotometric analysis. Sample containing 5 to 50 µg polymer in chloroform was transferred to a clean test tube, allowing chloroform to evaporate and 10 ml of concentrated $H_2SO_4$ was added the tube is capped with a glass marble and heated for 10 min at 100 °C in a water bath the solution was cooled and after thorough mixing, sample was transferred to a silica cuvette and the absorbance at 235 nm was measured against a sulfuric acid blank. standard curve was established with PHB concentrations ranging from 2-20µ g/ml PHB (Dekwer *et al*., 1999).

### Characterization of PHB
### Fourier Transform Infrared Spectroscopy (FTIR)

The presence of different functional groups in
PHB was checked by FTIR. Extracted PHB (2 mg)
was dissolved in 500 µl of chloroform and layered on
NaCl crystal. After evaporation of chloroform,
PHB polymer film was subjected to FTIR.

### Statistical Analysis
Significant differences between bacterial

treatments were tested by analysis of variance by using ANOVA.The results of different nitrogen sources  were subjected to identify significant differences between bacterial treatments. Probability ( P ) values of <0.05 were considered significant.

## III RESULTS & DISCUSSION
### *Screening of PHB producers*

Microbial isolates from rhizospere soil of *Jatropha curcas*  were subjected for partial identification based on various biochemical tests according to Bergey's method  of  systematic bacteriology and  confirmed as *Bacillus*  and *Pseudomonas*. PHB productions were screened in bacterial sps by plate and slide methods using Sudan black B  staining. In the plate method  blue blackish colored granules, the intensity of the color increases as the increased amount of PHB content more in the colonies.  In the slide method, blue colored granules were observed. Sudan black b is slightly basic  dye  and accumulate in the acidic groups of fat globules in  the PHB producers. This stain is specific for lipids.

### Effect of glycerol on  PHB production

Present study focused the effect of glycerol on PHB production under  nitrogen and phosphate limitation.PHB producers used crude glycerol as carbon  source. The total PHB accumulation was found to be slightly greater in the P- limit media than the N- limit media..The  PHB production were compared in constant pH(7)  ,temperature(37ºC),and  duration  (48  hrs)  using  two bacterial species. Maximum PHB biomass  production and yield were  noted in *Bacillu*s spp(13.3gm/ 100  ml). In *Pseudomonas* the biopolymer yield was 11.2gm/100 ml respectively ,when using 2% (v/v) Crude glycerol + methanol  as a feedstock over 48 h of growth in 37º C for 48 hrs.The relationship between biomass and PHB production yield were statistically significant (p<0.005).  Regarding PHB yield ,the results of this study compares similarly to those of Dobroth *et al*., (2011) (0.10 g PHB per g glycerol + methanol) and Zhao *et al*., (1993) (0.12 g PHB  per  g  methanol). However, PHB yields observed by Braunegg *et al*., (1999) (0.23 g PHB per g methanol + glycerol), Ibrahim and Steinbuchel (2010) (0.29 g PHB per g glycerol), and Cavalheiro *et al*., (2009) (0.36 g PHB per g glycerol) suggest that higher PHB yields on CG could be achieved.  PHB synthesis was driven by a macronutrient deficiency. In crude glycerol both glycerol and methanol used by PHB producers to produce PHB.The  bio-energetic  perspective  microbes (*Bacillus,Pseudomonas*) preferentially use methanol first (higher oxidation state).The results indicate methanol as a primary precursor for PHB synthesis . Dobroth *et al.,(*2011) reported that longer HRTs (Hydraulic residence time) were considered to be favorable for maximizing microbial growth and PHB production on the bio-available nutrient-poor CG. Notably, the reactor with no  ammonium  chloride  added   produced  no  PHB,  which suggested that a minimum amount of readily bio-available nitrogen must be added to stimulate PHB synthesis and glycerol concentrations remained relatively constant, while methanol concentrations were significantly reduced (to near complete depletion). Considering the favorable microbial energetics for methanol use over glycerol (i.e., methanol exhibits a higher oxidation state), these results and conclusion align with the observations  from  reactors  fed  glycerol  only.  Enriched

methylotrophic population was metabolizing methanol to form PHB.
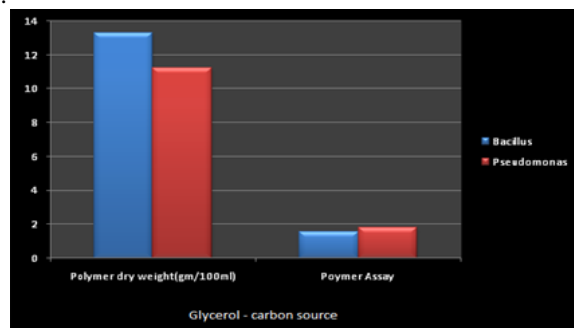


Fig .1 .Biopolymer yield and biopolymer assay in Crude glycerol Medium

### Optimization of Nitrogen and Phosphate limitation for PHB production

The maximum PHB production were observed in Ammonium sulphate  (0.19gm /30 ml )than other nitrogen sources in *Pseudomonas* spp. Ammonium molybdate yielded (0.11gm/30ml) maximum PHB concentration in *Pseudomonas* spp. Maximum PHB production(0.23mg/30ml) in phosphate deficiency noted in *Pseudomonas* spp. The values were statically significant (p<0.005).
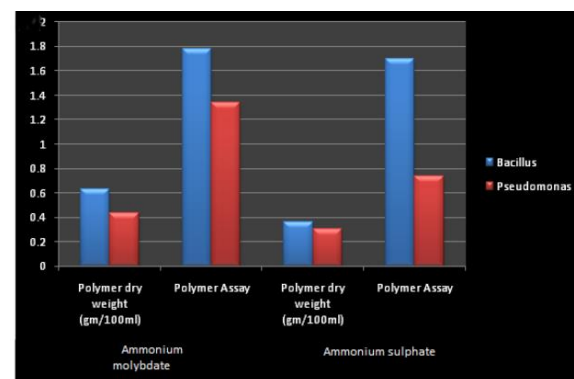


Fig. 2. Biopolymer yield and biopolymer assay in  various nitrogen sources.
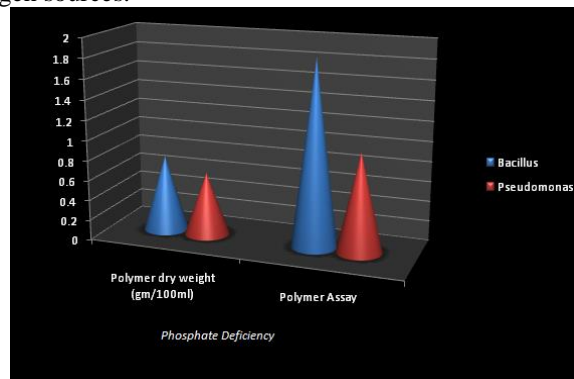


Fig.3. Biopolymer yield and biopolymer assay in  Phosphate deficiency medium.

### FT-IR Analysis

The FT-IR spectra are dominated by the absorbances for the major cellular constituents, namely, PHB (in the case of PHB-producing microorganisms) and cellular proteins from crude glycerol. FTIR spectra of extracted polymer shown  peaks at

1743.65 and 1649.14 cm$^{-1}$ corresponding to C=O stretch of methyl group present in the PHB molecular chain. The peak at 1523.76 and 1419.61 corresponding to N-H Bend. These are the amide I band at 1,649.14 cm$^{-1}$, which is due primarily to the amide(methanamide) carbonyl stretching vibration, and the amide II band at 1,523.76 cm$^{-1}$, which is due mostly to N-H bending vibrations. FTIR spectra revealed the functional groups of PHB.
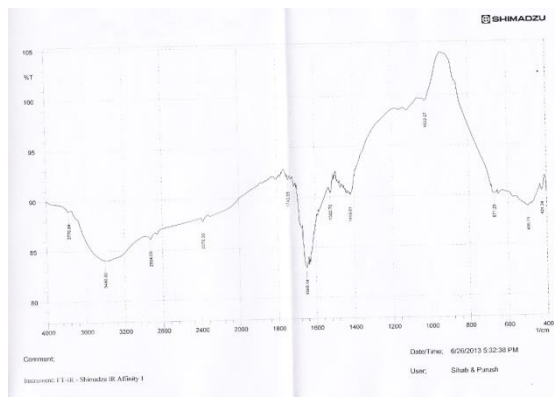


IV CONCLUSION

The research study presented that *Bacillus* and *Pseudomonas* have potential to produce PHB from crude glycerol with methanol .The PHB producers synthesise PHB from methanol from crude glycerol with PHB synthesis seemingly driven by a macronutrient deficiency under the optimized conditions using nitrogen and phosphate limitation .Crude glycerol reduce PHB production cost by using the inexpensive carbon source for industrial use.

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# STATIC ANALYSIS OF AIRLESS TYRES

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   *Abstract* **-** Airless tyres or Non-pneumatic tyres is introduced with a replacement of poly- composite materials in place of air in a definite structure. The construction and material study of these tyres is done by comparing it with pneumatic tyres. A brief structural study on spokes of airless tyres is done and is related with rolling resistance and fuel efficiency.

## I.   INTRODUCTION

The first pneumatic tyres for bicycle by Dunlop have been dominant since 1888. Its market was stable due to the following four advantages over rigid wheel: (I) low energy loss on rough surfaces, (II) low vertical stiffness, (III) low contact pressure and (IV) low mass. But as study says they do have four compensating disadvantages: (I) the possibility of catastrophic damage – flat while driving, (II) the required maintenance for proper internal air pressure, (III) the complicated manufacturing process**.[1]** In the next stage of development wire spokes in the tyre material were added to increase the resilience property. Engineers, in the aspect of overcoming the disadvantages of pneumatic tyres, invented non-pneumatic tyres by replacing air column with elastomers or polygon flexible spokes.

Airless tyres are similar to pneumatic tyres in that they carry significant loads at large deformations but are quite different in that they carry these loads without the benefit of inflation pressure. Whereas all pneumatic tyres of a given size, inflated to a particular pressure, will have nearly identical vertical stiffness and ground contact pressure, an airless tyre has it's stiffness and contact pressure governed by a host of geometric and material parameters.

## II.   CONSTRUCTION AND MATERIAL PROPERTIES OF AIRLESS TYRES

An important significance in its construction is the combination of tire and wheel. It consists of a metal hub, polyurethane fins and an outer ring as shown in the *fig1*. The design allows the tire to deflect under pressure similar to pneumatic tires. For a terrain with rough surface and uneven lane demands such kinds of design with high traction. It's flexible spokes bends and performs as a cushion; its property of regaining the shape is mainly because of polyurethane material. **[2]** The airless tires promises performance levels beyond those possible with conventional pneumatic technology because of its shear band design, added suspension and decreased rolling resistance. It delivers pneumatic like load carrying capacity, ride comfort and as it has no pressurized air cavity it cannot be punctured.
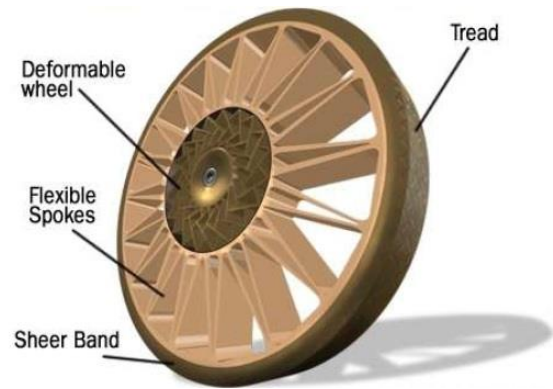


FIG.1 Part components of airless tyre

MATERIAL AND WEIGHT DISTRIBUTION

| Raw | Shear band | Tread | Spokes | Hub | Total weight |
|---|---|---|---|---|---|
| **Raw material** | Wt % | Wt % | Wt % | Wt % | Wt % |
| **Synthetic rubber** | 0 | 41 | 0 | 0 | 1.15 |
| **Natural rubber** | 0 | 4 | 0 | 0 | .10 |
| **Carbon black** | 0 | 10 | 0 | 0 | .26 |
| **Silica** | 0 | 28 | 0 | 0 | .77 |
| **Sulfur** | 0 | 1 | 0 | 0 | .02 |
| **Zno** | 0 | 1 | 0 | 0 | .03 |
| **Oil** | 0 | 11 | 0 | 0 | .29 |
| **Stearic acid** | 0 | 1 | 0 | 0 | .04 |
| **Recycled rubber** | 0 | 0 | 0 | 0 | 0 |
| **Coated wires** | 10 | 0 | 0 | 0 | .62 |
| **Textile** | 0 | 0 | 0 | 0 | 0 |
| **Polyeurathane** | 90 | 0 | 100 | 0 | 8.44 |
| **Steel** | 0 | 0 | 0 | 100 | 4.0 |
| **Total%** | 100 | 100 | 100 | 100 | |
| **Weight** | 6.35 | 2.75 | 2.65 | 4 | 15.75 |

*TABLE.1:- Material weight distribution*

## III.   POLYURETHANE

Several types of polyurethane exist today from solid elastomers to flexible foam for car seats. Only minimal data are available in Sima Pro's databases, but as the manufacturing processes can vary greatly between different types of polyurethane, it is important to analyze the specific production process used by manufacturers instead of finding data from other sources. Polyurethane makes up the spokes and the majority of the shear

band in an airless tyre, and Michelin's process of molding this product is different from other major polyurethane producers. [3]

### A. Cushioning

The cushioning ability of a tire is directly related to its durometer or hardness. The higher the durometer number, the harder the tire. Rubber tires will typically be in the range of 67-75 durometer

while polyurethane tires will fall between 83 and 95 durometer. Simply put, the softer the tire, the more impact it can absorb. Since polyurethane is typically harder, it is known for giving a rougher ride to the lift truck operator than rubber. Rubber is about 15 durometer points softer than the softest polyurethane compound. If a soft ride is important to a lift truck operator, then a rubber tire can be used efficiently and effectively. Polyurethane tires are not widely available in compounds softer than 83 durometer. Softer polyurethane quickly loose their overall toughness and load capacity. As loads have increased over the years polyurethane manufactures have developed compounds as hard as 95 durometer to increase performance. While these compounds can carry significantly more load, they offer little in the way of cushion to the operator. Many times the maintenance manager is faced with the difficult decision to sacrifice operator comfort for increased productivity that can be attained with the higher durometer polyurethane tire. Summarizing, 95 durometer polyurethane tire will offer about 15% additional load capacity than an 83 durometer. The additional load capacity may not sound like much, however it can mean getting the tonnage through a warehouse without the downtime from failing tires.

### B. Traction

Another difference between rubber and polyurethane can be found in each material's ability to grip the surface on which it operates. Rubber tires will always have a softer tread surface, while polyurethane tires will be harder. Since rubber is softer, it will provide a broader foot print on the surface than polyurethane. As a result, rubber will always provide the customer with better traction than even the softest polyurethane. However, polyurethane manufacturers have developed a process called "siping" or "routing" where various tread styles are machined onto the surface of the tire. After this process, polyurethane tires have significantly better traction without sacrificing load capacity.

### C. Load capacity

From a capacity standpoint, a polyurethane tire will carry twice the load of a rubber tire. For this reason alone, lift truck manufacturers have utilized polyurethane for load wheels and tires. Tires made of polyurethane will be much more resistant to splitting, tearing, or chunking out under load as rubber tires have a tendency to do. Since loads and speeds carried by all types of lift trucks seem to be constantly increasing in recent years, premature failure caused by continuous overloading seems to be the main cause of failure for both rubber and polyurethane.

### D. Wear and Abrasion Resistance

While rubber will offer a softer ride, it will not wear as well as polyurethane. In fact, as a general rule polyurethane tires will outlast rubber tires by about four times. As the rubber tire is used, it looses fragments of its tread because of surface conditions and general abrasion. On the other hand,
Polyurethane does not experience similar wear due to its overall toughness. Polyurethanes tend to excel under sliding abrasion while rubber performs less effectively.

### E. Cutting and Tearing Resistance

Due to its overall toughness, the polyurethane tire will withstand rough floor conditions and debris
much better than rubber. Rubber does not exhibit high cut / tear strengths. Once torn or cut, a rubber tire will see the cut or tear area propagate. Polyurethane is resistant to both cutting and tearing. In fact, the items that would normally cut and tear a rubber tire will become imbedded in the
Polyurethane tread without causing it to cut or tear. However, it should be noted that the cutting and
tearing of both rubber and polyurethane, ultimately reduces the life of each compound.

### F. High Speed Operation

Polyurethane tires do not dissipate internal heat well. As the speed of the truck is increased, the polyurethane tire becomes less desirable. Internal
Combustion and propane lift trucks generally travel too fast for polyurethane tires and operate outside,
So a rubber tire is the preferred choice in this application. Most electric lift trucks travel at speeds of 6-8 miles per hour. Within this speed range, polyurethanes excel. Rubber dissipates heat well and will hold up in the higher speed applications.

### G. Floor Marking

Polyurethane tires do not mark the floor of a warehouse. Even though polyurethane tires come
in a wide array of colors, the basic chemistry used will not allow any colorant to mark floors. A polyurethane tire can pick up dirt off the floor and lay it back down on the coated surface. This can leave one with the impression that the polyurethane tire is marking the floor. Dirt that has impregnated the coated surface does look like particles from the tire. Rubber on the other hand does mark floors if one is using a standard rubber compound. Carbon
Black used in rubber is the primary culprit. There are non-marking rubber products on the market that
generally do not mark the floor. These tires are typically grey in color as they lack the carbon black
Additive.

### H. Chemical Resistance

Another comparison between rubber and polyurethane tires can be made in the area of chemical resistance. As an example, a rubber tire exposed to solvents may tend to loose its ability to have good tear strength and chunk resistance while the polyurethane is unaffected after long term exposure. However, it should be noted that harsh solvents like methyl ethyl ketone, methylene chloride or acids can destroy polyurethanes as well.

### I. Price

From a pricing stand point it is difficult to precisely compare a polyurethane and rubber tire. One can

Always be sure of one thing; the polyurethane tire will be more expensive due to raw material costs.

Conversely, rubber raw materials are much less expensive. Depending on the compounds, a rubber

tyre can cost 25-50% less than a polyurethane tire. Since rubber tires can be used in a wider array of applications and will always cost less, rubber will always be the most prevalent product used in the material handling industry. However, if the lift truck is an electric and the load requirements are high, then a polyurethane tire is used in spite of the additional costs. But remember, while a polyurethane tire can cost twice as much as a rubber tire, the polyurethane tire can last up to four

times longer.

## IV.  STATIC STRUCTURAL ANALYSIS

The overall vertical stiffness of the airless tyre is controlled by the bending and extensional stiffness of the ring combined with the radial stiffness of the spokes.

The alteration of the geometry of the structure or the composition of the polyurethane composite used, offers a wide range of operation applicable for various load. Once an application has been identified for designing an airless tyre, the first step in the design process is to define the technical targets against which the design iterations can be measured. The following list is typical of the technical characteristics that might be specified for a new design:

- Overall tyre Geometry (Diameter, Width)
- Hub Geometry (Diameter, Width)
- Mass
- Stiffness (Vertical, Lateral, and Longitudinal)
- Ground Contact Pressure (Average and Peak)
- Rolling Resistance
- Durability
- Maximum Speed
- Impact Resistance

At a minimum, the designer must define the following parameters:

- Ring Shear Layer Material modulus
- Ring Shear Layer Thickness
- Spoke Modulus
- Spoke Thickness
- Spoke Count
- Spoke Curvature
- Spoke Length

The structural analysis of airless tyre for passenger vehicle application was done.
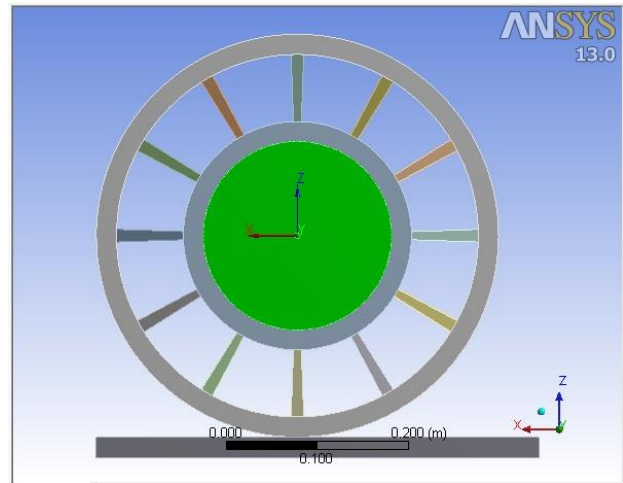


*FIG.2 Ansys model of airless tyre.*
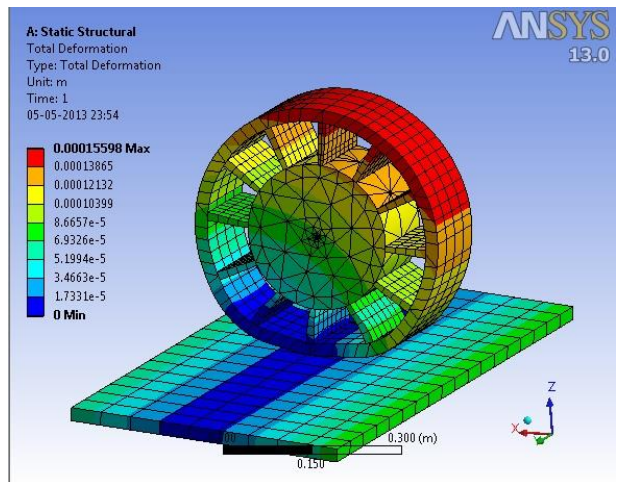


*FIG.3 Total deformation on static loading.*

The analysis is that of a passenger vehicle with an airless tyre in statically loaded condition. The deflection of the tyre for various loads was done and the results were compared with that of a pneumatic tyre of the same dimension. While the pneumatic tyre acts as a hardening spring, the airless tyre acts as a softening spring. Note that the two tires have the same load at a deflection of about 0.011 M. Looking at the 0.011 M point where the secant stiffness of both tires is the same, we can see that the tangent stiffness of the airless tyre is about half that of the pneumatic tire. We have the paradoxical situation of low deflection and low stiffness.
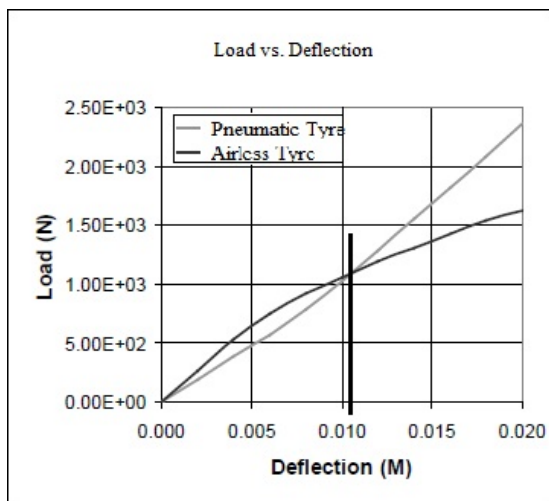
*FIG.4 Comparison of load deflection.*

The greater is the deflection of the airless tyre at higher loads offering greater cushioning to the vehicle and thereby reducing the rolling resistance by a considerable value when compared to the pneumatic tyre. Therefore it is more efficient at higher load applications. The dependence of rolling resistance on load is discussed in the following sections.

## V.  ROLLING RESISTANCE

In the graph, load Vs. Rolling resistance efficiency curve has been plotted. It conveys that it is a linear function which always have a positive slope which means they are proportional.[9]
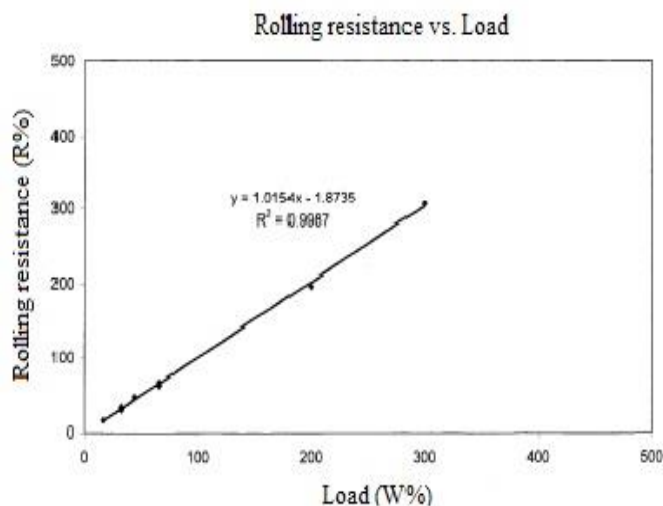


*FIG5:- Load VS Rolling resistance.*

The effect of increase in rolling resistance on the fuel consumed is analyzed. It can be assumed that the tyres are loaded 100% and the increase in the rolling resistance is also 100% at same inflation pressure p1. Applying schuring's rolling losses it could be concluded that the 100% weight increase leads to 25-30 % increase in the fuel efficiency. It is shown that the increase in pressure by 50% to 1.5 p1 leads to decrease in rolling resistance by 63%; the fuel consumption is decreased by 8-10%. Since this is the case of pneumatic tyres, when tried to relate with non-

pneumatic tyre stiffness factor and the contact patch angle matters. Here the absence of air makes lot of changes. The polyurethane spokes are stronger and stiffer to maintain the tyre as a pneumatic tyre with regular size.[10] This could be achieved only by increasing the stiffness of the wheel and reducing the contact thread angle. The stiffness factor is of no doubt that the spokes will take care.

## VI.  CONCLUSIONS

Hence in this paper different parameters affecting the rolling resistance and also different cross-section of Tweel or airless tyre has been discussed. For the airless tyre to perform with low rolling resistance and give better fuel efficiency following conditions are decided :(i) since polyurethane composite has the capacity of  both elasticity  and stiffness at the same time , it becomes ideal to perform better than pneumatic tyre in case of rolling resistance. (ii) From the structural analysis, it can be concluded that polyurethane offers a wide range of operation applicable for various load applications. This is done by altering the geometry of the structure or by altering the properties of the polyurethane composite used. (iii) From the material study it can be inferred that the absence of rubber and the higher domination of polyurethane for the manufacturing of an airless tyre makes it more ecofriendly and increases the fuel efficiency in a greater extent. Therefore rolling resistance is brought less than 3% whereas in conventional tyres it is 4—5%.

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# Study of Dry Sliding Wear Behavior of Aluminium/SiC/Al₂O₃/Graphite Hybrid Metal Matrix Composite Using Taguchi Technique

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**ABSTRACT:-** The experimental investigation of hybrid metal matrix composites with SiC, Al₂O₃ and graphite reinforced aluminium alloy (Al 6061T6) composites samples, processed by stir casting route are reported. The aluminium alloy was reinforced with 10 wt. % (SiC, Al₂O₃) and 5 wt. % of graphite to mixture the hybrid composite. Dry Sliding Wear of the hybrid composite were tested it was found that when the wear resistance of the hybrid composites can be increased when compared to Al6061 T6 alloy. The parameters such as load, sliding speed and sliding distance were identified will affecting wear rate. The design of experiments (DOE) approach using taguchi method was employed to analyze the wear behaviour of hybrid composites. Signal-to-noise ratio and analysis of variance (ANOVA) were used to investigate the influence of parameters on the wear rate.
*Key words*- Aluminium Alloy, Graphite, Wear, DOE, Taguchi's orthogonal array, ANOVA, Regression analysis

## 1.   INTRODUCTION

Metal matrix composites (MMCs) have proved their importance to conventional alloys in high strength and stiffness application in industries like auto-mobile, aerospace and mineral processing. To improve the mechanical and tribological properties, reinforcement phase such as hard ceramic particles or fibers are uniformly distributed in the soft matrix phase. The composite materials have emerged as the important class of advanced materials giving engineers the opportunity to tailor the material properties according to their needs. Basically these materials differ from the conventional engineering materials from the viewpoint of homogeneity. Particulate metal matrix composites are most commonly manufactured by melt incorporation and stir casting technique. These properties along with good specific strength, modulus makes them good materials for many engineering situations where sliding contact is expected.

Wear is an important property in the selection of discontinuous reinforced Al MMCs. Wear is not an intrinsic material property but characteristics of the engineering system which depend on load, speed, temperature, hardness, and the environmental conditions. Wear performances of aluminium matrix composites reinforced with various reinforcements ranging from very hard ceramic particulates such as SiC and Al₂O₃ to a very soft material such as graphite have been reported to be superior when compared with unreinforced alloys. In this present investigation an attempt is to find the influence of wear parameters on dry sliding wear and to establish correlation between sliding speed, load, sliding distance and combined effect of these parameters on dry sliding wear of the aluminium and its composite using taguchi and analysis of variance techniques.

### 2. Taguchi Method

The design of experiments (DOE) approach using Taguchi technique has been successfully used by researchers in the study of wear behaviour of DRAMMCs. The DOE process is made up of three main phases: the planning phase, the conducting phase, and the analysis phase. A major step in the DOE process is the determination of the combination of factors and levels which will provide the desired information. Analysis of the experimental results uses a signal to noise ratio to aid in the determination of the best process designs. The Taguchi technique is a powerful design of experiment tool for acquiring the data in a controlled way and to analyze the influence of process variable over some specific variable which is unknown function of these process variables and for the design of high quality systems. This method was been successfully used by researchers in the study of wear behavior of aluminium metal matrix composites. Taguchi creates a standard orthogonal array to accommodate the effect of several factors on the target value and defines the plan of experiment. The experimental results are analyzed using analysis of means and variance to study the influence of parameters. A multiple linear regression model is developed to predict the wear rate of the hybrid composites. The major aim of the present investigation is to analyse the influence of parameters like load, sliding speed and sliding distance on dry sliding wear of aluminium/SiC/graphite hybrid metal matrix composites using Taguchi technique.

### 3. Experimental Details

### 3.1. Material

The matrix material selected was commercially available pure aluminium Al6061T6. The chemical composition of the matrix material is given in the **Table 1**. The reinforcement was SiC and $Al_2O_3$ average size of 400 µm, and graphite (200µm). There are sufficient literatures elucidating the improvement in wear properties through the addition of SiC and $Al_2O_3$. Addition of Silicon carbide and alumina oxide into aluminium base matrix, results into improved wear resistance, high strength, low density, low coefficient of thermal expansion and high thermal conductivity of metal matrix composite. Graphite imparts excellent self lubricating property to the hybrid composite.

**Table 1- Chemical Composition of Al6061T6 alloy**

| Element | Si | Fe | Mn | Mg | Cu | Zn | Ti | Cr | Al |
|---------|------|------|------|------|------|-------|------|-------|-------|
| Wt% | 0.76 | 0.14 | 0.29 | 0.84 | 0.33 | 0.004 | 0.02 | 0.006 | 97.61 |

### 3.2. Preparation of the Composite

Liquid metallurgy route was used to synthesise the hybrid composite specimens. The matrix alloy was first superheated above its melting temperature and then the temperature was lowered gradually until the alloy reached a semisolid state. A vortex was created in the melt due to continuous stirring by a stainless steel mechanical stirrer with a rotational speed of 350 rpm. At this stage, the blended mixture of preheated SiC, $Al_2O_3$ and graphite particles 10% and 5% respectively were introduced into the slurry and the temperature of the composite slurry was increased until it was in a fully liquid state. Small quantities of magnesium were added to the molten metal to enhance wettability of reinforcements with molten aluminium. Stirring was continued for about 5 minutes until the interface between the particle and the matrix promoted wetting and the particles were uniformly dispersed. Then the hybrid composite melt was degassed using hexachloroethane tablets. The melt was then superheated above the liquidus temperature and solidified in a cast iron permanent mould to obtain cylindrical samples. Sliding wear test specimens were machined from as-cast samples, to obtain cylindrical pins of diameter 12 mm and length 30 mm. The specimen faces were then metallographically polished on 320 grit size emery paper.



Fig.1 Stir Casting Setup              Fig.2 Pin on Disc wear testing machine TR20CH DUCOM

### 3.2. Wear Behaviour

A pin on disc test apparatus was performed to determine the sliding wear characteristics of the composite. Specimens of size 12 mm diameter and 30 mm length were cut from the cast samples, machined and then polished. The contact surface of the cast sample (pin) has to be flat and will be in contact with the rotating disk. During the test, the pin is held pressed against a rotating EN32 steel disc (hardness of 65HRC) by applying load that acts as counterweight and balances the pin. The track diameter was kept constant 60mm for each batch of experiments and the parameters such as the load, sliding speed and sliding distance were varied in the range given in Table 2. A LVDT (load cell) on the lever arm helps determine the wear at any point of time by monitoring the movement of the arm. Once the surface in contact wears out, the load pushes the arm to remain in contact with the disc. This movement of the arm generates a signal which is used to determine the maximum wear and the coefficient of friction is monitored continuously as wear occurs. Weight loss of each specimen was obtained by weighing the specimen before and after the experiment by a single pan electronic weighing machine with an accuracy of 0.0001g after thorough cleaning with acetone solution.

### 3.3. Plan of Experiments

The experimental plan was formulated considering three parameters (variables) and three levels based on the Taguchi technique. The three independent variables considered for this study were load, sliding speed and sliding distance. The levels of these variables chosen for experimentation are given in Table 2.

**Table 2: Parameters and their levels**

| Controllable factors | Load(L) (N) | Sliding Speed(S) (m/s) | Sliding distance(D) (m) |
|---|---|---|---|
| Level 1 | 24.53 | 1.5 | 700 |
| Level 2 | 29.43 | 2 | 1400 |
| Level 3 | 34.34 | 2.5 | 2100 |

In the present investigation, a L27 orthogonal array was selected and it has 27 rows and 13 columns. The selection of the orthogonal array is based on the condition that the degrees of freedom for the orthogonal array should be greater than, or equal to, the sum of the variables. Each variable and the corresponding interactions were assigned to a column defined by Taguchi method. The first column was assigned to load (L), the second column to sliding speed (S), the fifth column to sliding distance, and the remaining columns were assigned to their interactions. The response variables to be studied were wear rate and coefficient of friction. The experiments were conducted based on the run order generated by Taguchi model and the results were obtained. This analysis includes the ranks based on the delta statistics, which compares the relative value of the effects. S/N ratio is a response which consolidates repetitions and the effect of noise levels into one data point. Analysis of variance of the S/N ratio is performed to identify the statistically significant parameters. The analyses of the experimental data were carried out using MINITAB 15 software, which is specially used for DOE applications. The experimental results were transformed into signal-to-noise (S/N) ratios. S/N ratio is defined as the ratio of the mean of the signal to the standard deviation of the noise. The S/N ratio indicates the degree of the predictable performance of a product or process in the presence of noise factors. The S/N ratio for wear rate using 'smaller the better' characteristic, which can be calculated as logarithmic transformation of the loss function, is given as:

$$S/N = -10 \log [1/n \, (\Sigma y2)] \text{ -------(1)}$$

Where y is the observed data (wear rate and cof) and n is the number of observations. The above S/N ratio transformation is suitable for minimization of wear rate.

## 4. Results and Discussion
The experiments were conducted as per orthogonal array and the wear rate results obtained for various combinations of parameters are shown in Table 3. The experimental values were transformed into S/N ratios for measuring the quality characteristics using MINITAB 15. The S/N ratio obtained for all the experiments are shown in Table 3.

### 4.1. S/N Ratio Analysis
The influence of control parameters such as load, sliding speed and fly ash content on wear rate has been evaluated using S/N ratio response analysis. Process parameter settings with the highest S/N ratio always yield the optimum quality with minimum variance. The control parameter with the strongest influence was determined by the difference between the maximum and minimum value of the mean of S/N ratios. Higher the difference between the mean of S/N ratios, the more influential will be the control parameter.

**Table 3-Result of L$_{27}$ orthogonal array**

| Expt. No. | load(N) | speed(m/s) | distance(m) | wear rate | S/N(db) | COF | S/N(db) |
|---|---|---|---|---|---|---|---|
| 1 | 25 | 1.5 | 700 | 0.003354 | 49.489 | 0.4595 | 6.7537 |
| 2 | 25 | 1.5 | 1400 | 0.003454 | 49.234 | 0.4192 | 7.5523 |
| 3 | 25 | 1.5 | 2100 | 0.0032855 | 49.668 | 0.4375 | 7.1802 |
| 4 | 25 | 2 | 700 | 0.0315548 | 30.019 | 0.5268 | 5.5669 |
| 5 | 25 | 2 | 1400 | 0.021888 | 33.196 | 0.5223 | 5.6412 |
| 6 | 25 | 2 | 2100 | 0.0177563 | 35.013 | 0.4783 | 6.4062 |
| 7 | 25 | 2.5 | 700 | 0.0484922 | 26.287 | 0.7372 | 2.6482 |
| 8 | 25 | 2.5 | 1400 | 0.053598 | 25.417 | 0.4086 | 7.7748 |
| 9 | 25 | 2.5 | 2100 | 0.0404794 | 27.855 | 0.3768 | 8.4787 |
| 10 | 30 | 1.5 | 700 | 0.0058953 | 44.59 | 0.4258 | 7.4168 |
| 11 | 30 | 1.5 | 1400 | 0.0060108 | 44.421 | 0.4169 | 7.5989 |
| 12 | 30 | 1.5 | 2100 | 0.0056569 | 44.948 | 0.3197 | 9.904 |
| 13 | 30 | 2 | 700 | 0.0835952 | 21.556 | 0.4992 | 6.0354 |
| 14 | 30 | 2 | 1400 | 0.0497451 | 26.065 | 0.5508 | 5.1801 |

| 15 | 30 | 2 | 2100 | 0.0363433 | 28.792 | 0.4292 | 7.3477 |
| 16 | 30 | 2.5 | 700 | 0.00565 | 44.959 | 0.051 | 25.854 |
| 17 | 30 | 2.5 | 1400 | 0.0126981 | 37.925 | 0.5399 | 5.3533 |
| 18 | 30 | 2.5 | 2100 | 0.0100904 | 39.922 | 0.5369 | 5.4027 |
| 19 | 35 | 1.5 | 700 | 0.0202996 | 33.85 | 0.6395 | 3.8834 |
| 20 | 35 | 1.5 | 1400 | 0.9852 | 0.1295 | 0.5325 | 5.4736 |
| 21 | 35 | 1.5 | 2100 | 0.09134 | 20.787 | 0.4892 | 6.2103 |
| 22 | 35 | 2 | 700 | 0.1295556 | 17.751 | 0.479 | 6.3927 |
| 23 | 35 | 2 | 1400 | 0.0696936 | 23.136 | 0.5111 | 5.8305 |
| 24 | 35 | 2 | 2100 | 0.0510615 | 25.838 | 0.5696 | 4.8886 |
| 25 | 35 | 2.5 | 700 | 0.05324 | 25.475 | 0.5712 | 4.8642 |
| 26 | 35 | 2.5 | 1400 | 0.0654 | 23.688 | 0.5854 | 4.6509 |
| 27 | 35 | 2.5 | 2100 | 0.07123 | 22.947 | 0.5543 | 5.1251 |

**Table 4- Response Table for Signal to Noise ratios- Smaller is better (Wear rate)**

| Level | load(N) | speed(m/s) | distance(m) |
|-------|---------|------------|-------------|
| 1 | 36.66 | 36.19 | 31.81 |
| 2 | 37.02 | 25.16 | 29.25 |
| 3 | 20.24 | 32.57 | 32.86 |
| Delta | 16.78 | 11.03 | 3.62 |
| Rank | 1 | 2 | 3 |



Main Effects Plot for SN ratios
Data Means

Signal-to-noise: Smaller is better
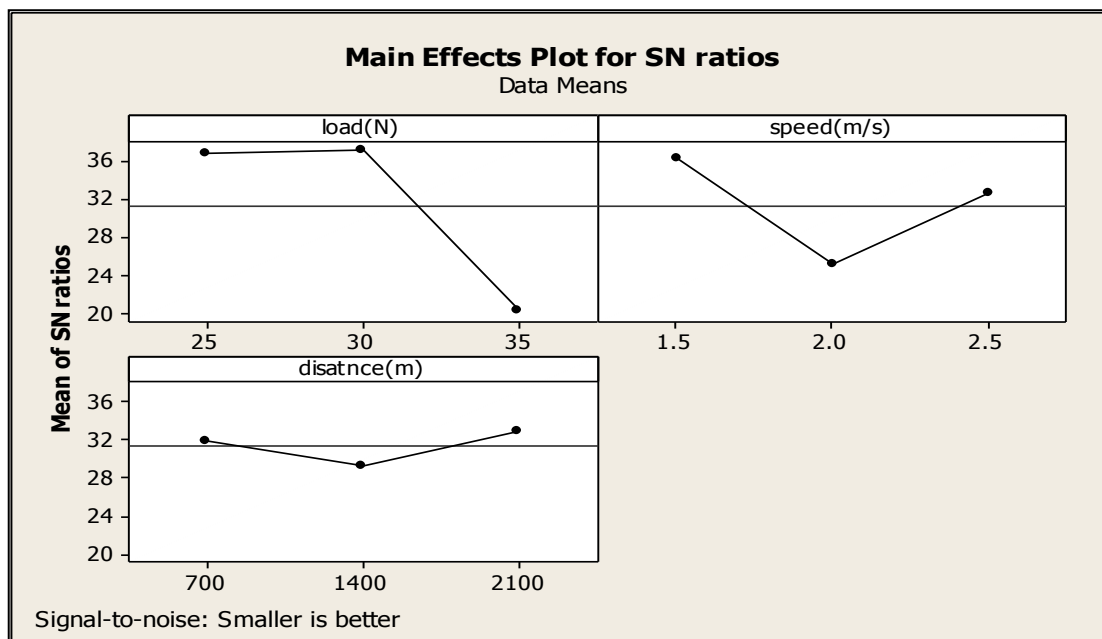
**Table 5-Response Table for Means- Smaller is better wear rate**

| Level | load(N) | speed(m/s) | distance(m) |
|-------|---------|------------|-------------|

| | | | |
|---|---|---|---|
| 1 | 0.02299 | 0.13107 | 0.04665 |
| 2 | 0.02397 | 0.06063 | 0.14085 |
| 3 | 0.17691 | 0.3217 | 0.03636 |
| Delta | 0.15392 | 0.09891 | 0.10449 |
| Rank | 1 | 3 | 2 |



| | | | |
|---|---|---|---|
| 3 | 5.258 | 7.795 | 6.772 |
| Delta | 3.642 | 1.874 | 1.596 |
| Rank | 1 | 2 | 3 |
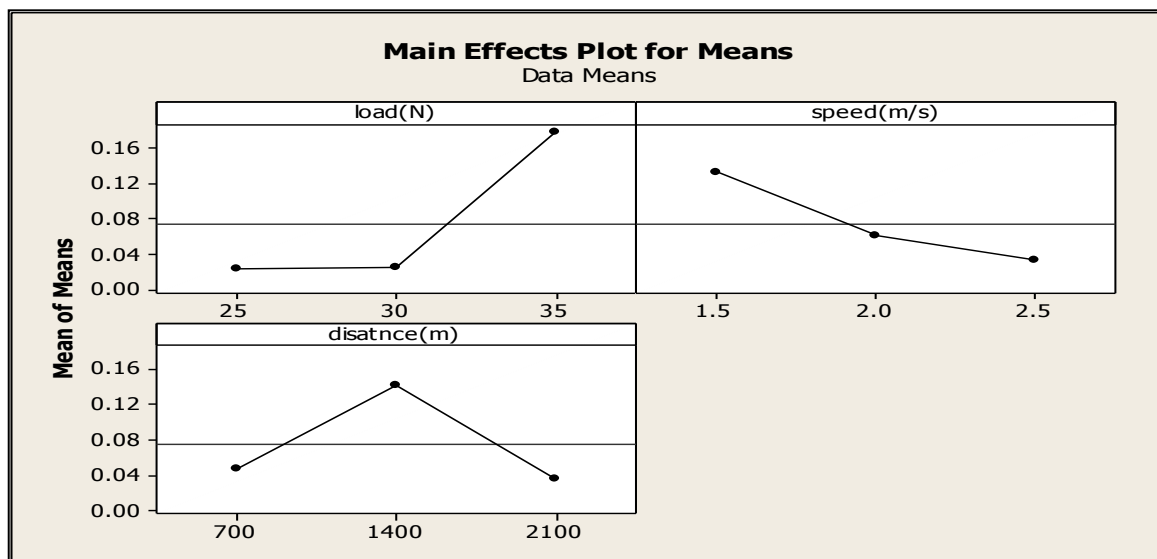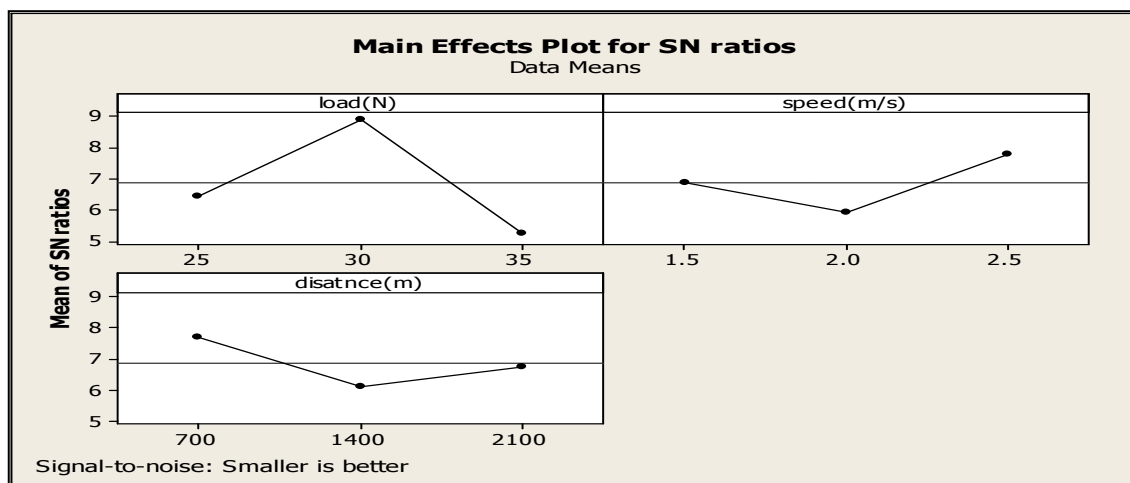


**Fig.5-Main Effects Plot for SN ratios-coefficient of friction**

**Table 7- Response Table for Means- Smaller is better (Coefficient of friction)**

| Level | load(N) | speed(m/s) | distance(m) |
|---|---|---|---|
| 1 | 0.4851 | 0.46 | 0.4877 |
| 2 | 0.4188 | 0.5074 | 0.4985 |

| 3 | 0.548 | 0.4846 | 0.4657 |
| Delta | 0.1292 | 0.0474 | 0.0328 |
| Rank | 1 | 2 | 3 |



**Main Effects Plot for Means**
Data Means
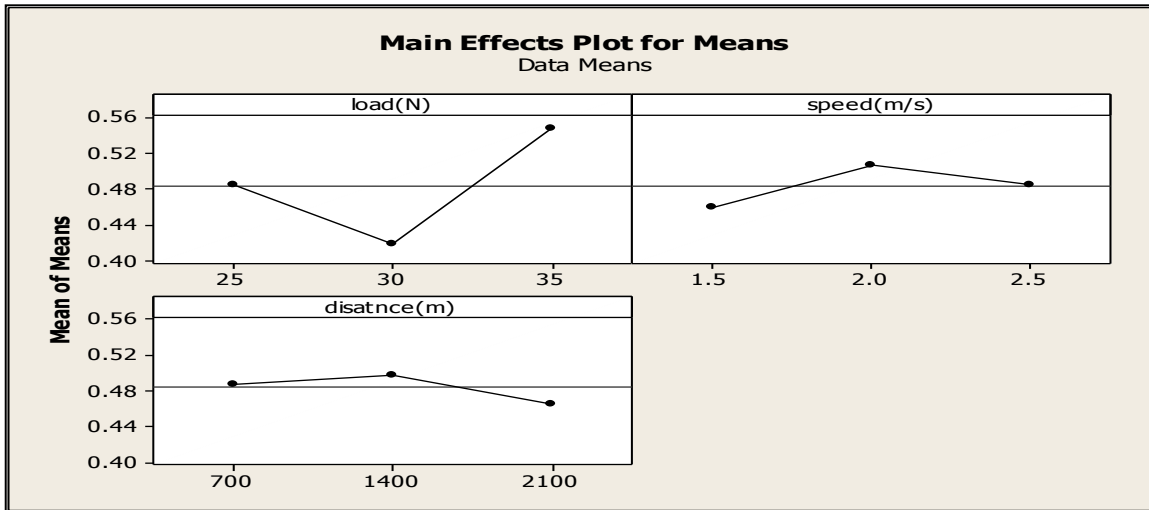
**Table8- Analysis of Variance for SN ratios- Wear rate**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P | % |
|---|---|---|---|---|---|---|---|
| Load(N) | 2 | 1652.76 | 1652.76 | 826.38 | 20.08 | 0 | 45.5596 |
| Speed(m/s) | 2 | 569.21 | 569.21 | 284 | 9.67 | 0.007 | 15.6907 |
| Distance(m) | 2 | 62.33 | 62.33 | 31.16 | 1.06 | 0.391 | 1.71817 |
| Load(N)*speed(m/s) | 4 | 982.68 | 982.68 | 245.67 | 8.35 | 0.006 | 27.0883 |
| Load(N)*distance(m) | 4 | 43.49 | 43.49 | 10.87 | 0.37 | 0.824 | 1.19884 |
| Speed(m/s)*distance(m) | 4 | 81.75 | 81.75 | 20.44 | 0.69 | 0.617 | 2.2535 |
| Residual Error | 8 | 238.48 | 238.48 | 29.43 | | | 6.57388 |
| Total | 26 | 3627.69 | | | | | |

**Table 9- Analysis of Variance for SN ratios- coefficient of friction**

| Source | DF | Seq SS | Adj SS | Adj MS | F | P | % |
|---|---|---|---|---|---|---|---|
| Load(N) | 2 | 62.08 | 62.08 | 31.041 | 1.43 | 0.296 | 14.356413 |
| Speed(m/s) | 2 | 15.8 | 15.8 | 7.901 | 0.36 | 0.707 | 3.653855 |
| Distance(m) | 2 | 11.58 | 11.58 | 5.79 | 0.27 | 0.773 | 2.677952 |
| Load(N)*speed(m/s) | 4 | 43.69 | 43.69 | 10.923 | 0.5 | 0.736 | 10.103603 |
| Load(N)*distance(m) | 4 | 81.26 | 81.26 | 20.314 | 0.93 | 0.491 | 18.791915 |
| Speed(m/s)*distance(m) | 4 | 43.76 | 43.76 | 10.94 | 0.5 | 0.736 | 10.119791 |
| Residual Error | 8 | 54.25 | 54.25 | 21.781 | | | 12.545673 |
| Total | 26 | 432.42 | | | | | |

ANOVA was used to determine the design parameters significantly influencing the wear rate (response). Table 8 and Table 9shows the results of ANOVA for wear rate and COF. This analysis was evaluated for a confidence level of 95%, that is for significance level of $\alpha=0.05$. The last column of Table 8 and Table 9 shows the percentage of contribution (P %) of each parameter on the response, indicating the degree of influence on the result. It can be observed from the results obtained that L was the most significant parameter having the highest statistical influence (45.55%) on the dry sliding wear of composites followed by S (15.6%) and D (1.7%).When the P-value for this model was less than 0.05, then the parameter or interaction can be considered as statistically significant. This is desirable as it demonstrates that the parameter or interaction in the model has a significant effect on the response. From an analysis of the results obtained in Table 8, it is observed that the interaction effect L*S (18.78%) is significant model terms influencing wear rate of composites. Coefficient of friction was highly influenced by L (14.3%), S (3.6%) and D (2.6%) respectively and interaction term L*D (18.7%) was found most influencing term among different interaction parameters. The coefficient of determination ($R^2$) is defined as the ratio of the explained variation to the total

variation. It is a measure of the degree of fit. When R2 approaches unity, a better response model results and it fits the actual data. The value of R2 calculated for this model was 0.9611, i.e., reasonably close to unity, and thus acceptable. It demonstrates that 96.11% of the variability in the data can be explained by this model. Thus, it is confirmed that this model provides reasonably good explanation of the relationship between the independent factors and the response.

### 4.3. Multiple Linear Regression Model Analysis

A multiple linear regression analysis attempts to model the relationship between two or more predictor variables and a response variable by fitting a linear equation to the observed data. Based on the experimental results, a multiple linear regression model was developed using MINITAB 15. A regression equation thus generated establishes correlation between the significant terms obtained from ANOVA, namely, load, sliding speed, sliding distance and their interactions. The regression equation developed for wear rate is:

Wear rate($mm^3$/m) = - 0.179 + 0.0154 load(N) - 0.0989 speed(m/s) - 0.000007 distance(m) **-(1)**

COF = 0.268 + 0.00628 load(N) + 0.0246 speed(m/s) - 0.000016 distance(m)  **-(2)**

The above equation can be used to predict the wear rate of the hybrid composites. The constant in the equation is the residue. The regression coefficient obtained for the model was 0.964 and this indicates that wear data was not scattered. From the above regression equations for wear rate and coefficient of friction, we found that wear rate of composite is directly proportional to applied load and inversely proportional to speed and distance and Coefficient of friction is directly proportional to applied load and sliding speed. The coefficient of friction and wear rate associated with load (L) in the regression equation (2) is positive and it indicates that as the load increases, wear rate of the composite also increases.

### 5. Conclusions

1) Wear rate (Al6061T6/10%Sic/10% $Al_2O_3$/5% Graphite MMC) was highly influenced by applied load, sliding speed and sliding distance respectively and interaction term L*S (Load*Speed) [27.08%] was found most predominant among different interaction parameters.

2) Coefficient of friction(Al6061T6/10%Sic/10% $Al_2O_3$/5% Graphite MMC)  was highly influenced by applied load, sliding speed and sliding distance respectively and  interaction term L*D (Load*Distance) [18.78%] was found most influencing term among different interaction parameters.

3) From the regression equations for wear rate and coefficient of friction(Al6061T6/10%Sic/10% $Al_2O_3$/5% Graphite MMC), we found that wear rate of composite is directly proportional to applied load and inversely proportional to speed and distance and Coefficient of friction is directly proportional to applied load and sliding speed.

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# A Survey on IP Configuration of Mobile Ad Hoc Networks with and without DAD Mechanism

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   *Abstract-* A Mobile Ad hoc Network (MANET) is an instant infrastructure less self-organizing network, in which each node functions as an end host and a wireless relay. This form of wireless network is created by mobile nodes without any existing or fixed infrastructure. The nodes in the MANET need mutually exclusive identities before participating in any form of communication. In particular, each end host in the MANET needs to be uniquely addressed so that the packets can be relayed hop by hop and delivered ultimately to the destination. Existing routing protocols in MANETs have all assumed a priori that mobile nodes are configured with a valid (conflict free) network address. Because of the multi-hop routing, the MAC address at the link layer level cannot serve for this purpose. On the other hand, address configuration in wired networks, such as DHCP, requires the presence of a centralized DHCP server. It does not work well for MANETs due to the mobility of the nodes and the lack of a central authority. There have been several approaches proposed for dynamic addressing scheme. However, mostly all approaches depend on broadcasting for address solicitation and/or duplicate address detection. As a result, several types of security threats in dynamic IP configuration can be observed. Address allocation schemes can be classified into state full schemes or stateless schemes. The state full schemes keep state information in a database that keeps track of which addresses have been assigned to which computers. Stateless schemes let the computers select an address by themselves and perform a procedure, called Duplicate Address Detection (DAD).Thus this paper focuses on the various IP allocation schemes for MANETs with and without DAD.

## I. INTRODUCTION

A Mobile Ad hoc Network (MANET) is an instant infrastructure less wireless independent self-organizing network, in which each node functions as an end host and a wireless relay. This form of wireless network is created by mobile nodes without any existing or fixed infrastructure. Since the mobile hosts usually have limited transmission range, bandwidth and battery power, multiple hops are generally required in MANETs to exchange data between nodes. The nodes inside the MANETs needs to be identified mutually before communicating with other devices, in particular, each host in the MANET needs to be addressed uniquely so that the packets can be relayed hop by hop and delivered ultimately to the destination. There is wide classification of existing routing protocols [1] in MANETs that assumes a priori taking into account that mobile nodes are configured with valid IP address. Also due to multi-hop routing the MAC address at the link layer level cannot serve for this IP allocation purpose. When it's to be seen at the other side, address configuration in wired networks, such as the Dynamic Host Configuration Protocol (DHCP) [8], requires the presence of a centralized DHCP server. Due to the mobility of the nodes and the lack of a central authority DHCP doesn't works over here. Given these uniqueness, address allocation in MANETs has attracted a significant amount of research. The purpose of address allocation in MANETs is not only to manage the address space efficiently and effectively but also to cope up with scalability, robustness and security. A un configured node should be able to allocate a unique network address in a timely manner, without costing excessive network traffic overhead. When a node leaves the network, its address should be reclaimed for future usage. All these needs should be well adapted to the distributed and dynamic nature of MANETs. In particular, we have to address the network partitions and mergers. Due to the mobility of the nodes, MANETs can be split into several disjoint partitions with no communications. These network partitions may or may not merge back later. And such partitioning or merging is often invisible to individual mobile hosts. In this paper, we will present a comprehensive survey on the state-of-the-art of address allocation schemes and their comparative study of MANETs. The rest of the chapter is organized as follows. Section 2 presents the background and introduces traditional address allocation

schemes for IP-based networks. Section 3 describes System model describing the requirements of the system. Section 4 surveys the existing mechanisms of MANETs IP address allocation. Section 5 presents the comparative study of the schemes and Section summarizes the chapter.

## II.  BACKGROUND

In this section, we describe the traditional address allocation schemes and explain why they cannot be directly applied in MANETs. The address allocation schemes can be in general classified into stateful schemes or stateless schemes. The stateful schemes keep state information in a database that keeps track of which addresses have been assigned to which computers; while the stateless schemes allows  the computers to  select an address by themselves and perform a procedure, called Duplicate Address Detection (DAD)[11].

*2.1. Traditional Stateful Schemes*

**2.1.1. Reverse Address Resolution Protocol (RARP):** RARP protocol that belongs to TCP/IP group allows a computer to obtain its IP address from a RARP server in the bootstrap procedure [22]. Before obtaining an IP address, a computer has to use its MAC address to communicate with others. It first broadcasts a RARP request that specifies itself as a target. The RARP server on the same network keeps the database of IP addresses. Upon receiving a RARP request message, the RARP server looks up the IP address based on the requester's physical address and replies to the requester. RARP has the following limitations. First, the reply from the server contains only the 4-octet IP address; second, it cannot be used on networks that dynamically assign physical addresses.

**2.1.2. Bootstrap Protocol (BOOTP):** BOOTP was developed to overcome some of the drawbacks of RARP [23]. It uses UDP to carry messages and hence it can be implemented with an application program. Before obtaining an IP address, a computer can broadcast an IP datagram on the local network by using the limited broadcast IP address 255.255.255.255.The BOOTP server then broadcasts the reply message on the local network, which contains the requester's IP address, the router's IP address, etc. BOOTP is designed for a relatively static environment, and it provides only a static mapping from the physical address to the corresponding network parameters. It is not suitable for a dynamic environment.

**2.1.3. Dynamic Host Configuration Protocol (DHCP):** DHCP was developed as a predecessor to BOOTP [8].This provides configuration parameters to internet hosts that consists of two components: first one is a protocol for delivering host-specific configuration parameters from a DHCP server to a host and second one is a mechanism for allocation of network addresses to hosts. DHCP is built on a client-server model, in which designated DHCP server hosts allocate network addresses and deliver configuration parameters to dynamically configured hosts. DHCP supports three mechanisms for IP address allocation. In "automatic allocation", a permanent IP address is assigned to a client. In "dynamic allocation", an IP address is assigned to a client for a limited period of time (or until the client explicitly relinquishes the address). In "manual allocation", a client's IP address is assigned by the network administrator, and DHCP is used simply to convey the assigned address to the client. A particular network will use one or more of these mechanisms, depending on the policies of the network administrator. Dynamic allocation is the only one of the three mechanisms that allows automatic reuse of an address that is no longer needed by the client to which it was assigned.

*2.2. Traditional Stateless Schemes*

**2.2.1. IPV6 Stateless Address Auto Configuration:** IPv6 stateless address auto configuration is performed only on multicast capable links [24]. A node starts the auto-configuration mechanism by generating a link-local address for its interface. This link-local address is generated by appending the interface's identifier to the well-

known link-local prefix. Before assigning the link-local address to its interface, a node must attempt to verify that this link-local address is not used by another node on the same network. This is done by the Duplicate Address Detection (DAD) procedure. Specifically, it sends a Neighbor Solicitation message that contains the tentative address as the target address. Notice that this message uses the well-known un specified address as source IP address, and the solicited-node multicast address as the destination IP address. If another node is also using that address, it will return a Neighbor Advertisement message using the all-nodes multicast address as the destination IP address. If a node finds that its tentative link-local address is not unique in the network, auto-configuration process stops and manual configuration of the interface is required. On the contrary, if a node determines that its tentative link-local address is unique in the network, it assigns the address to itself and starts to communicate with all other nodes using this address.

**2.2.2. Zero Configuration Networking (ZEROCONF):** Address configuration without a dedicated server has been investigated by the Zero Configuration Networking (Zeroconf) working group of the Internet Engineering Task Force (IETF). The goal of the Zeroconf Working Group is to enable networking in the absence of configuration and administration. The Internet draft [25] describes a method for dynamic configuration of IPv4 link-local addresses used for local communications. When a node wishes to configure a link-local address, it selects an address pseudo-randomly, uniformly distributed in the range 169.254.1.0 to 169.254.254.255. Then it tests whether or not this address is already in use by broadcasting an ARP request for the desired address. If no conflicting ARP reply has been received after a predefined time limit, then it can successfully claim the desired link-local address. Otherwise, it needs to select a new pseudo-random address and repeat the process.

*2.3. Issues of traditional address allocation schemes*

The traditional stateful address allocation schemes for IP-based networks require a centralized server to assign addresses to new nodes. Since MANETs have a highly dynamic topology and the centralized server may not always be reachable they cannot be directly applied to MANETs. The traditional stateless schemes cannot directly apply to MANET either because they require all nodes to be reachable via single-hop broadcast messages, which is generally not the case of MANETs. The Zeroconf solution also performs the DAD based on ARP request/reply messages, which may not be possible for MANETs. IPv6 stateless auto-configuration assumes the 48-bitIEEE-assigned globally unique MAC addresses. This hardware-based addressing scheme has the following limitations: (1) The 48-bit MAC address is too long for an IPv4 address. (2) The 48-bitMAC addresses may not be unique [26].It is also possible to change the MAC address by reprogramming the EEPROM or by modifying the MAC address in the OS memory. (3) Some devices in MANETs do not use a 48-bit MAC address. (4) The identity of a node can be easily determined from the network address, which raises privacy concerns.

## III.   REQUIREMENTS ANALYSIS

*3.1. A protocol for assigning IP addresses should meet the following requirements:*

(i) A node should obtain an IP address from MANET dynamically.
(ii) No conflict in IP address assignment, i.e., at any given instant of time there should not be two or more nodes with the same IP address.

(iii) When an IP is assigned, it is not guaranteed that the node will always be inside that particular network. When the node departs the network, its IP address should become available for assignment to other nodes.

(iv) If any of the nodes has a free IP address, this address should be assigned to the requesting node.

(v) The protocol should handle network partitioning and merging. When two different partitions merge, there is a possibility that two or more nodes have the same IP address. Such duplicate addresses should be detected and resolved.

(vi) The protocol should make sure that only authorized nodes are configured and granted access to network resources.

3.2. *Objectives*

Objectives of an optimal ad hoc network address configuration protocol:

**(I) Dynamic Address Configuration:** Nodes should be able to dynamically obtain IP addresses without manual or static configuration

**(II) Uniqueness:** Nodes should obtain unique addresses for correct routing and communication

**(III) Robustness:** The addressing protocol should adapt to the dynamics of the network, including partitions and merges

**(IV) Scalability:** The protocol should avoid significant performance degradation as the size of the network increases.

**(V) Security:** Without authentication, several types of security threats can be seen at the time of address allocation. Therefore, security is also a prime concern for the address allocation protocol of a MANET.

*3.3. Partitioning Of MANET*

The split of network into more than two sub-networks is known as partitioning which leads to IP address leakage. So MANEs partitioning can be of two types: graceful departed and graceless departure.

**3.3.1. Graceful Departure:** If nodes leave their network after informing their neighbors by sending their current status and information by signed RELEASE message to its ancestor then it is said to be graceful departure. Every node maintains recycle LIST for updating the allocation status for its departed children. After receiving the signed RELEASE message from its children, the parent checks the authentication of the children as well as the signature of RELEASE message. If the authentication is successful, the parent node updates its recycle LIST and sends a signed OK message to the children that depart. If the departing node receives a signed OK message from its parent before the timer expires then the departing node departs gracefully. If the root node wants to leave, it informs its greatest descendent to be the new root.

**3.3.2. Graceless Departure:** A node goes gracelessly departed due to several reasons. (a) Due to loss of packet (b) When two MANETs merge (c) If a MANET splits into two or more MANETs. Therefore it is necessary to detect the graceless departure of a node so that its IP address leakage can be avoided and the address can be reused. To prevent this first every node scans IP addresses of its children. If the parent node discovers that a child node is missing, it then updates the recycle LIST for the missing child node to reuse the IP address later. By periodically broadcasting signed HELLO messages of AODV routing protocol graceless departure or address leak problem can be detected. In the figure 3.1(a), Cluster I has four nodes with address 192.168.1.11, 192.168.1.12, 192.168.1.13 and192.168.1.14. When Cluster I undergoes partition, as in figure 3.1(b), it partitions into Cluster I (a), having the mobile nodes 192.168.1.11 and 192.168.1.13, and Cluster I (b), having

the mobile nodes 192.168.1.12 and 192.168.1.14.According to Graceful departure, the nodes in the original cluster (Cluster I) can update their address list (i.e.) remove the leaving node from the list.

## 3.4. Merging Of Several Manets

When more than two or more networks combine together as a new network then it is called merging. This situation occurs when independent networks come into range of each other that causes IP address conflict. In the figure 3.1(c), Cluster I (a), Cluster I (b) and Cluster II merge to form a single cluster. Cluster II has two nodes with address 192.168.1.11 and 192.168.1.15.When the merging occurs both Cluster I (a) and Cluster II has the node with address 192.168.1.11 so the problem of duplicate addressing occurs in the new cluster that is formed after merging. Therefore when a message packet arrives for the node with the address 192.168.1.11 of Cluster I (a), it can be erroneously routed to the node with the address 192.168.1.11 of Cluster II .In order to overcome this, a Duplicate Address Detection (DAD) is used. As reviewed in MANETconf[18] two nodes exchange their identifiers that initiate a communication. If identifiers are different, then they realize that their networks have merged. Then they act as configured initiators and start reconfiguration of nodes with conflicting address in their own network. In ZAL [28] nothing needs to be done when networks were part of the same larger network because address spaces at different sub-networks were disjoint. Partition ID is used to find out that they belong to the same larger network. If merging networks never met before, ZAL proposes to convert addresses of nodes in smaller networks to that of larger networks. Only addresses in one of the networks can be preserved. The others have to convert. It is a gradual process in which first nodes at the boundaries of smaller networks and then slowly innermost are converted. It is desirable to minimize overhead by minimizing number of address conversions based on distributed algorithms.

## 3.5. Duplicate Address Detection (DAD)

DAD is required when either a new node joins a MANET or independent networks merge. When a new node picks up a tentative IP address, DAD process determines whether this address is available or not. All the nodes having a valid IP address participate in DAD to protect their IP address being used accidentally by new node. The uniqueness check is based on sending a Duplicate Address Probe (DAP) and expecting an Address Conflict Notice (ACN) back in a certain timeout period. If, after 'n' number of retries, no ACN is received, the node may assume that address is not in use. This process is illustrated in Figure 3.1. But in networks where message delays cannot be bounded, use of timeouts can lead to unreliability. So duplicate addresses may occur in MANET. In case of merge, many nodes may have duplicate addresses and thus overhead of the network would increase suddenly due to start of DAD process for every node. Address auto configuration method must treat it as a special case. [11] Introduces Strong DAD & Weak DAD. Strong DAD allows at least one node to detect duplicate immediately after it has been chosen by another node. Practically it is not possible. Weak DAD is based on enhancement of link state routing. Each node of network owns a unique identifier. A node sends control packet indicating its link state along with its identifier. Each node keeps state of the links it is connected to, corresponding addresses & identifiers. If a node N receives a control packet from a known address but with different identifier, then it has detected a duplicate. 'N' begins to announce duplicate and keep sending packets to the node it previously knows. MANETConf [18] proposes a reliable DAD process. It has two phases: initiation & validation. A new node (requester) takes help of a configured neighbor (initiator) to obtain address. Initiator broadcasts an address for the requester. All nodes have to answer this request. This ensures that requester would not use the address of a temporarily disconnected node. If a node does not answer after a number of tries, its address can be treated as unassigned.

MANET Cluster before Partitioning
(Cluster I)

**(a)**

Cluster I(a)

Cluster I(b)

Cluster II

MANET Cluster after Partitioning
&before Merging (Cluster I & II)

(b)

MANET Cluster after Merging
(Cluster I & II)

**(c)**
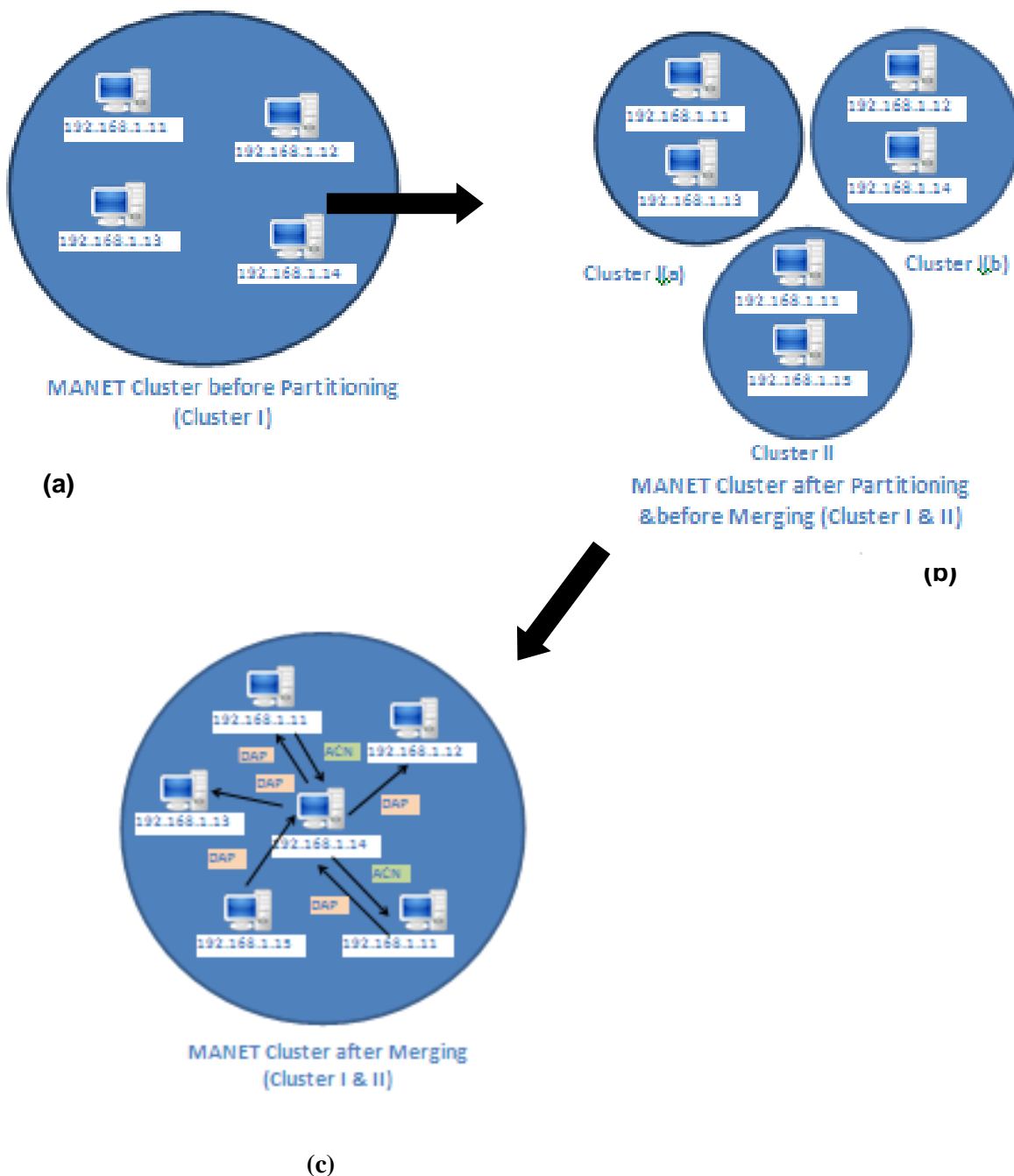
**Figure 3.1**

The Duplicate address detection can be further understood from the Figure 3.2. The existing MANET consists of the nodes based on their node address, Node A, Node B, Node C, Node D, Node E, Node F and Node G. The new node which joins the MANET approaches the nearest node, Node E and asks for address to be allocated. The Node E allocates the address G for the new node. The Node E then checks with the other nodes in the MANET if the address already exists. During the check, Node G identifies that the address is duplicated and returns the DAD to Node E. Thus the DAD mechanism identifies the occurrence of duplicate addresses in the MANET.
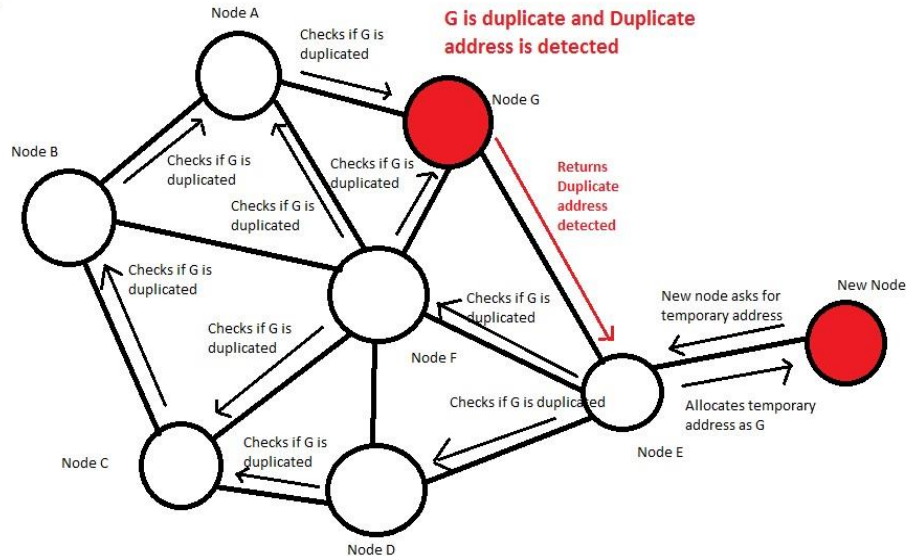
**Figure 3.2**

## IV. ADDRESS CLASSIFICATION

The proposed addressing schemes for ad hoc networks are categorized into three groups: Best Effort Allocation, Leader Based (centralized) Allocation and Decentralized Allocation approaches [10].

In Best effort allocation a node assigns its address without involving any other node in the network, example is Prophet Scheme [14] (generation of random numbers).The advantage in this mechanism is Low addressing latency and low communication overhead. The drawback is that even with a large address space, address conflicts may exist in the network which is resolved by passive DAD [12] or weak DAD [11]. Hence DAD mechanisms also come under Best effort Allocation mechanism. In Leader based approach nodes obtain valid IP addresses from an elected leader or server of the network and hence this eliminates the need of DAD. Some of the schemes are: 1.DHCP [8] (Client-Server Architecture), 2.DACP [15] (Address Authority-temporary address is used to verify the uniqueness),3.VASM[16](Initiator gets IP from Allocator and assigns to Requester),4.Lightweight secure address configuration scheme[17] (uses VASM address configuration scheme).In decentralized allocation the host acquires an IP address either itself or from a neighbor and then performs the DAD to ensure the uniqueness of the address. Some of the schemes are: 1.MANETconf [18] (every node keeps track of the addresses already allocated in the network), 2.AAA [19] (uses randomly selected addresses from the address range of 169.254/16, then applies DAD), 3. Prime DHCP [20] (address can be allocated to the new host without broadcasting it over the whole of MANET-PNAA algorithm), 4. AIPAC[21](Automatic IP address configuration - The Initiator negotiates for the Requester's valid IP address in the allocation phase, corrects the configuration, and then offers it to the requester) 5. Secure host auto-configuration scheme [29] (a node has to answer a question to prove its identity. It uses the buddy system technique to allocate the IP address) 6. Quadratic residue based address allocation [30] (the first node in the network configures itself with an IP address and also generates the number of distinct cycles and length of each long cycle (address block)). 7. Secure auto-configuration scheme [9] (uses self-authentication technique-using one-way hash function) 8. MMIP[31](every node in the network act as proxies and binds the MAC address with the IP address at the time of address allocation)9.ADIP[32](utilizes nodes in the network as proxies and can generate IP addresses from its own IP for a new authenticated host)10. IDDIP algorithm [6] (ID based Dynamic IP) 11. IDSDDIP Algorithm [33] (This scheme is similar to IDDIP but has been proposed for IPv6).

## 4.1. Best Effort Allocation

**4.1.1. Prophet Scheme** [14]**:** Here a function f(n) generates a series of random numbers for address allocation. The first node A in the MANET generates a random number and sets its IP address. It also uses a random state value as the seed for its f (n). Another node B can get an IP address from node A along with a state value as the seed for its f (n). Whenever a node joins the MANET, the same process continues for the address allocation.

**4.1.2. Weak Dad:** This mechanism prevents a packet from being routed to a wrong destination, even if duplicate addresses exist [11].The technique is that a unique key for each node is included in the routing control packets and in the routing table entries. Hence, suppose if two nodes happen to have selected the same IP address, they can still be identified by the use of their unique keys. Hence every node is identified by a unique tuple <address, key>.Usually the authors of [22] suggest using a node's MAC address as its key.

**4.1.3. Passive DAD:** This is a modification of DAD again where in the nodes use periodic link state routing information to notify other nodes about their neighbors. This is a very hectic measure and hence usually very costly and will result in serious redundancy, contention, and collision, which leads to broadcast storm problem [13].

## 4.2. Leader Based Allocation

**4.2.1. DHCP** [8] (**Dynamic Host Configuration Protocol**)**:** DHCP is developed as a successor to BOOTP [23].Here a DHCP server that has been designated allocates network addresses and delivers all the configuration parameters to dynamically configured computers. The most positive aspect of DHCP is its dynamic address assignment, in which the DHCP server does not need to know the identity of the client in prior. Auto-configuration becomes possible if the DHCP has been provided with a set of available IP addresses. At present, DHCP is widely used in Ethernets and Wireless LANs.

**4.2.2. DACP** [15] (**Dynamic Address Configuration Protocol**)**:** In DACP, the leader is an elected Address Authority (AA) that maintains the state information of the all the nodes in MANET. Then using DAD mechanism a temporary address is used to verify the uniqueness of the allocated address .The main drawback of this protocol is due to DAD that causes overhead and also due to address authority that causes high periodic flooding.

**4.2.3. ODACP** [10] (**Optimized DACP**)**:** To overcome the overhead caused by DACP, this is introduced without DAD and thus results in pure leader based approach. Here the leader is elected in the same way as in DACP, with every node registering with the leader without flooding address requests. The leader verifies or denies the registration according to the address availability in network. In both DACP and ODACP, the detection of merges and partitions is implemented by leader advertisement.

**4.2.4. VASM** [16] (**Virtual Address Space Mapping**)**:** The concept of VASM is that it uses virtual address space for addressing new nodes that joins a network. The technique is that it maps one point of virtual address sheet to exactly one new node. The term "virtual" is used to specify that the whole corresponding address space is a 2D flat sheet and each point of this sheet is virtually mapped to a node in MANET. For generation of address the protocol uses coordinate values. In this protocol, nodes are classified into four categories: *Allocator*: Maintain the address space. They allocate new addresses for joining nodes. *Initiator*: An intermediate node between *Allocators* and *Requester* node that exchange all messages between them. *Requester*: new node that needs to get IP addressing order to join the network. *Normal*: all other nodes are in this category. Each *Allocator* in the network contains a disjoint address space. Therefore, address space overlap between *Allocators* is none.

**4.2.5. A Lightweight Secure Address Configuration** [17]**:** This is based on Virtual Address Space Mapping (VASM).It uses VASM address configuration scheme for allocation of address which is based on a zero knowledge approach. It also uses secret key and symmetric cryptographic function to avoid Man in Middle attack.

*4.3. Decentralized Allocation*

**4.3.1. MANETCONF** [18]**:** Manetconf prevents concurrent assignment of the same address by maintaining an additional allocation table for pending allocations. A new node obtains an IP address by broadcasting a **neighbor query** message throughout the network. The existing node performs an **address query** throughout the network on the new node's behalf. This address allocation requires a positive acknowledgment (ACK) from all known nodes indicating the address is available for use. Each node in the network also agrees on a partition ID to detect partitions and merges. A network partition is detected when the node performing address assignment for a new node fails to obtain ACKs from all other nodes in the network. After the detection, the set of nodes from whom an ACK was not received is deleted from each node's list of in-use addresses. The nodes then agree on a new partition identifier. When partitions merge, nodes in different partitions are required to exchange their set of allocated addresses so that duplicates can be detected. The disadvantage is that high tolerance to message losses, network partitioning and mergers. Its advantage is that it has low latency and communication overheads.

**4.3.2. AAA** [19] **(AD-HOC ADDRESS AUTO-CONFIGURATION):** In AAA addresses are randomly selected from the address range 169.254/16.Duplicate address detection (DAD) is performed by each node to guarantee the uniqueness of the selected address. During this process, a node floods an **Address Request** message in the network to query for the usage of its tentative address. If the address is already in use, an **Address Reply** message is unicast back to the requesting node so that a different address can be selected. The absence of an Address Reply indicates the availability of the requested address. The disadvantage of this approach does not consider complex scenarios such as network partitions and merges.

**4.3.3. PRIME DHCP** [20]**:** It can allocate addresses to the hosts of a MANET without broadcasting over the whole MANET. It makes each host a DHCP proxy of the MANET and run a prime numbering address allocation algorithm individually to compute unique addresses for address allocation. The concept of DHCP proxies and the prime numbering address allocation algorithm (PNAA) together eliminate the needs for broadcasting in the MANET. It can significantly reduce the signal overhead and the latency for hosts to acquire addresses. Some of its disadvantages are (i) Nodes working as DHCP servers would not always remain active or connected while the network exists, (ii) Since energy resources of devices are limited, the configuration protocol should not overload some specific nodes for managing addresses, (iii) The bandwidth of wireless communication links is limited, so the configuration of nodes (especially in large networks) should take place with distributed approaches.

**4.3.4. AIPAC** [21] **(AUTOMATIC IP ADDRESS CONFIGURATION):** This protocol assigns unique IP address to each node and manages possible duplicate addresses due to the mobility of nodes in the network. It avoids the storage of large amounts of data and makes use of procedures that minimize the number of exchanged packets. It also provides a new mechanism, called Gradual Merging of networks that causes the merging process of networks according to their evolution. The disadvantage is that it makes use of network identifiers, but allows different network to coexist. It avoids overloading nodes and communication channels whenever two networks merge.

**4.3.5. Secure Host Auto Configuration Scheme** [29]**:** The scheme employs the concept of challenge, where a node has to answer a question to prove its identity. It uses the buddy system technique to allocate the IP

addresses. In the buddy system allocation scheme, each node maintains a block of free addresses. A configured node which receives an Address Request from a new node, assigns the requesting node an IP address from its block of free addresses. It also divides its block of free addresses into two equal parts and gives one half to the requesting node and the other half it keeps with itself for future use. However, it is always difficult for the individual nodes to manage such type of address blocks in a MANET. Also, it is complex to be implemented.

**4.3.6. Quadratic Residue Based Address Allocation** [30]**:** Here, the first node in the network configures itself with an IP address and also generates the number of distinct cycles and length of each long cycle (address block).

**4.3.7. Secure Auto-Configuration** [9]**:** This uses self-authentication technique. By using one-way hash function, it binds a nodes address with public key. Address owner can use corresponding public key to unilaterally authenticate itself. The scheme handles network partitioning/merging by employing the concept of passive DAD mechanism.

**4.3.8. MMIP (MAC Mapped IP)** [31]**:** This scheme proposes a technique to map the MAC addresses of the nodes along with the IP addresses which are assigned at the time when a node enters the network. Performance analysis shows that this addressing scheme has less addressing latency and control overhead compared to the similar existing schemes.

**4.3.9. ADIP** [32]: This scheme utilizes nodes in the network as proxies and can generate IP addresses from its own IP for a new authenticated host. The address configuration authentication is done with the help of trusted third party and as such capable of handling the security threats associated with a general dynamic IP configuration.

**4.3.10. IDDIP Algorithm** [6]**:** In this scheme, an ID based dynamic IP configuration scheme has been presented that can securely allocate IP addresses to the authorized hosts for a mobile ad hoc network without broadcasting over the entire network. Each host in the MANET can generate a unique IP address from its own IP address for a new host. This scheme provides authentication for address configuration without the help of a trusted third party while taking care of the security threats associated with dynamic IP configuration. Additionally this solves the problem of network partitions and mergers along with the arrival and departure of a host efficiently and securely. Most important is no DAD mechanism is used here.

**4.3.11. IDSDDIP Algorithm** [33]**:** This scheme is similar to IDDIP but has been proposed for IPv6 named as ID based secure distributed dynamic IP configuration. This does not require the need for broadcasting messages over the entire MANET during the address allocation process. In this scheme, each host in the MANET can generate a unique IP address for a new authorized host. It generates node ID as a node identifier which is evaluated using its public key and a secure one way hash function for node authentication purpose. This scheme can handle the problem that may arise due to host failures, message losses, mobility of the host and network portioning or merging.

## V.   COMPARATIVE STUDY

Metrics comparison of all the existing dynamic addressing approaches

**Table 4.1**

| Metrics | Prophet | DHCP | ODACP | Manetconf | AAA | Prime DHCP | AIPAC |
|---------|---------|------|-------|-----------|-----|-----------|-------|

| Uniqueness | No | Yes | Yes | Yes | No | Yes | Yes |
|---|---|---|---|---|---|---|---|
| Latency | O(2t) | O(4td) | O(2td) | O(2td) | O(2td) | O(2t) | O(2t) |
| Overhead | $O(n/2)$ | $O(n^2)$ | $O(2l)$ | $O(n^2)$ | $O(n^2)$ | $O(n/2)$ | $O(n/2)$ |
| Complexity | High | Low | Low | High | Low | Low | Low |
| Periodic Message | No | Yes | Yes | Yes | No | Yes | Yes |
| Security | No | No | No | No | No | No | No |

**Table 4.2**

| Metrics | Buddy | Quadratic Residue | Secure Auto | MMIP | ADIP | IDDIP | IDSDDIP |
|---|---|---|---|---|---|---|---|
| Uniqueness | Yes | No | No | Yes | Yes | Yes | Yes |
| Latency | O(2td) | O(2td) | O(2td) | O(2t) | O(2t+m) | O(2t+p) | O(2t+p+c) |
| Overhead | $O(n^2)$ | $O(n^2)$ | $O(n^2)$ | $O(n/2)$ | $O(n/2)$ | $O(n/2)$ | $O(n/2)$ |
| Complexity | High | Medium | Medium | Low | Low | Low | Low |
| Periodic Message | Yes | No | No | No | Yes | Yes | Yes |
| Security | No | Yes | Yes | Yes | Yes | Yes | Yes |

**Table 4.1 & 4.2** shows the comparative analysis of all the existing schemes. It has been focused on qualitative evaluation of all approaches. The denominations are as below:

n- No. of mobile nodes in the network
l- No. of links
t- Average 1-hop latency
d- Network diameter
p- Complexity of public key digital signature

The existing Prophet [14] scheme cannot guarantee uniqueness, but the latency of Prophet, PrimeDHCP and AIPAC [21] is 2*t since they send request to their neighbors for IP address. Their communication overhead is average degree (n/2) of each node in network. DHCP [8] gives the guarantee of uniqueness but cannot be deployed in the network. Moreover, DHCP needs to locate the server and thus its latency is 4*t*d and communication overhead is $O(n^2)$.In ODACP[10] all the nodes as to register with  an address authority to reduce the communication overhead from $O(n^2)$ to O(2l) and the latency has to be reduced from 4*t*d to 2*t*d. Moving to the decentralized  mechanism MANETconf[18],this requires a positive acknowledgement from all known nodes indicating that the address is available for use. Since DAD is necessary for this the latency of MANETconf is 2*t*d and communication overhead is $O(n^2)$.In AAA [19], the network is flooded by address

request message to query the availability of the requested address and hence the latency is 2*t*d and communication overhead is O ($n^2$).Buddy scheme [7] uses free address pool and partitions the pool of address into two. This address will be given on request by other nodes and hence here each node should maintain address blocks which becomes complicated. Hence the latency depends on the network diameter which becomes 2*t*d and communication overhead is O($n^2$).Since quadratic residue[30] method involves with distinct cycles and its corresponding cycle length the latency and communication overhead is same as the buddy scheme. In secure auto configuration [9] DAD message is flooded all over the network and hence the latency is 2*t*d and communication overhead is O ($n^2$).The last four schemes considers security aspects during allocation process. And so if recognized properly the latest scheme developed by Uttam and Raj [6] needs no DAD mechanism, also it provides security by secure one way hash function (for authentication) and RSA algorithm. Hence the latency for MMIP [31], ADIP [32], IDDIP [6] and IDSDDIP [33] are 2t, 2t+m, 2t+p, 2t+p+c respectively. It has been identified that m, p & c denotes the complexity of the public key signature (RSA algorithm) and the encryption/decryption algorithms. Hence the latency is only fairly good for the last three methods. The communication overhead is the average degree (n/2) for each node of the network.

## VI.  CONCLUSION

This report has been worked out with all possible dynamic address allocation mechanisms considering the duplicate address detection mechanism and also tried investigating the problems of dynamic addressing in a mobile ad hoc network. Short descriptions of basic addressing schemes have been given to help have an overview of this field in MANET. We also studied the current solutions by categorizing and qualitatively analyzing latency and other performance properties of the approaches.

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# Thrombocytopenia in Children with Malaria – A Study from Tertiary Care Hospital Delhi, India

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*Abstract*- **Objective**: To study the occurrence and severity of thrombocytopenia in children with malaria

**Method:** It was a retrospective study, done at Vardhman Mahavir medical college and safdarjang Hospital, Delhi, India. Data regarding positive cases of malaria <12 years of age admitted in the hospital between January 2010 to January 2013 were obtained. Patients were further assessed for thrombocytopenia and its severity. Data were analysed by Chi square test using SPSS version.

**Result-** A total of 140 cases were included in the study. Plasmodium vivax was indentified in 98 (70%) patient while plasmodium falciparum in 28 (20%) and mixed infection in 14 (10%) patients. Thrombocytopenia was observed in 98 (70%) cases of which 36 (25.71%) cases have mild 20 (14.28%) cases moderate and 40 (28.50%) cases had severe thrombocytopenia. Thrombocytopenia was found equally in vivax and falciparum infection.

**Conclusion:** - Thrombocytopenia is commonly seen malaria. In any acute febrile illness with thrombocytopenia malaria should be kept in differential diagnosis.

*Index Terms*- Thrombocytopenia, malaria, Plasmodium vivax, Plasmodium falciparum, mixed infection.

## I. INTRODUCTION

Malaria is estimated to be directly responsible for around one million deaths annually worldwide (1). The morbidity and mortality burden cased by malaria is nearly 3% (2). Even though Africa accounts for 90% of the mortality burden for malaria, south-east Asia still suffers considerable mortality and morbidity. India contributes 75%-77% of the total malaria in south East Asia and about 95% of the population of moderate to high risk of malaria in Southeast Asia region is living in India (3). Malaria is caused by protozoa parasite of the genus plasmodium which infects and destroys red blood cells. Four species of plasmodia (plasmodium falciparum, plasmodium vivax, plasmodium malaria, plasmodium ovale) causes malaria in humans of which plasmodium falciparum is the most common cause of severe (life threatening) malaria. Malaria parasite affects multiple organs of the body like liver, spleen, brain, gastrointestinal tract, pancreas, kidney, blood vessels, and placenta. So, the clinical pictures could be of wide spectrum ranging from simple malaria to life threatening central nervous system symptoms. Thrombocytopenia has been reported to be associated with malaria, with an incidence ranging from 60%--80%, with some

studies reporting a lower incidence in vivax malaria as compared to falciparum malaria (4). A number of observational studies have confirmed the association of thrombocytopenia to malaria but till date the cause of thrombocytopenia is poorly understood. The speculated mechanism leading to thrombocytopenia are coagulation disturbances, splenomagely, bone marrow alteration, antibody mediated platelet destruction, oxidative stress, and the role of platelets as cofactors in triggering severe malaria (5,6,7). In view of paucity of data in children from Indian studies, we conducted this study to find out occurrence and severity of thrombocytopenia in children with malaria and to correlate the low platelet count and type of malaria.

## II. MATERIALS AND METHODS

This was a retrospective study of medical records of children, admitted to Vardhman Mahavir Medical College and Safdarjang Hospital, New Delhi, India, with the diagnosis of malaria. The study period was between January 2010 to January 2013. The inclusion criteria was children <12 years with a diagnosis of malaria. Patients with history or clinical features suggesting chronic liver disease and those with history of bleeding disorder, haematological malignancy, diagnosed cases of Idiopathic thrombocytopenic perpura were exclude from the study.

Thrombocytopenia was defined as platelet count of less than 150000 cells/µL, patients were divided into three subgroups based on platelet count. Thrombocytopenia was considered severe if platelet counts were less than 50000 cells/µL, moderate if between 50000 and 100000 and mild if between 100000 and 150000 cells/µL. Data were analyzed by Chi- Square test using the SPSS version. P value of < 0.05 was taken as significant.

## III. RESULTS

A total of 146 patients had malaria during the study period, out of which 140 patients [84(60%) males, 56 (40%) females] met the inclusion criteria (Table 1). Majority of patients were between 7 to 9 year (32.14%) (Table1). Thrombocytopenia was observed in 70% and its severity is shown in Table 2. Platelet count ranged from 5000 to 300000 cells/µl. Least documented platelet count was 5000 cells/µl which was in plasmodium Vivax malaria. In the study group of 140 patients, 98(70%) had vivax, 28 (20%) had falciparum and 14 (10%) had mixed infection (both vivax and falciparum).Out of 98 cases detected with vivax malaria 66 (68%) cases had platelet count less than 150000/µl,

out of which 25 patient(38%) had a platelet count less than 50000/µl. Out of 28 patients detected with falciparum malaria 18 patients (65%) had platelet counts less than 150000/µl in which 8(44%) patients had platelet count less than 50000/µl. It was noted that severe thrombocytopenia was more common with plasmodium falciparum than vivax infection. (Table2). However, these differences were not statistically significant. Twenty patients had bleeding manifestation and required platelet transfusion.

**Table 1.**

Age and sex distribution of patients with malaria

| Age group (years) | No of cases | Male | Female | Percentage |
|---|---|---|---|---|
| 1-3 | 31 | 20 | 11 | 22 |
| 4-6 | 37 | 22 | 15 | 26 |
| 7-9 | 45 | 23 | 22 | 33 |
| 9-12 | 27 | 19 | 8 | 19 |
| Total | 140 | 84 | 56 | 100 |

**Table 2**

Platelet counts in patients with different type of malaria [n (%)]

| Category | >150000/ µL | 150000-100000/µL | 100000-50000/µL | <50000/µL | Total |
|---|---|---|---|---|---|
| P.vivax | 32(32.26) | 28(28.57) | 13(13.26) | 25(25.5) | 98 |
| P.falcip. | 10(35.71) | 6(21.42) | 4(14.28) | 8(28.5) | 28 |
| Mixed | 2(14.28) | 2(14.28) | 3(21.42) | 7(50) | 14 |
| Total | 44(31.42) | 36(25.71) | 20(14.28) | 40(28.5) | 140 |

## IV. DISCUSSION

Malaria is endemic in many parts of India. Though, Delhi comes under low risk zone of malaria but in recent few years, number of malaria cases has increased. Malaria affects almost all blood components and is a true haematological infectious disease. Thrombocytopenia and anaemia are the most frequently malaria associated haematological complication of malaria. In endemic areas, malaria has been reported as the major cause of low platelet count and is a sensitive but non-specific indicator of infection with malaria parasite. Platelet counts of less than 150000/µl increases the likelihood of malaria by 12-15 times [8,9]. Plasmodium vivax was the common species in our study. Faseela et al (6) in her study found similar results which were attributed to endemicity for malaria in that area. Colonel et al (10) from Pakistan reported thrombocytopenia in 72% patients with malaria infection. Jamal et al (11) in their study on paediatric patients from Karachi, Pakistan have reported low platelet counts in 72% of their patients who were suffering from material infection. The prevalence of thrombocytopenia in malaria was reported as 85% (falciparum) and 72% (vivax) in the study by Horstmann et al (12). But few studies (8,13) reported slight lower incidence of thrombocytopenia like 40% and 59%. In our study thrombocytopenia was found in 70% of patients. Mild to moderate more common than serve thrombocytopenia. There was no significant difference in severity between species. The vivax malaria is commonly associated with mild haematological abnormalities. Although sever thrombocytopenia is commonly reported to be associated with Plasmodium falciparum infection and has been reported to occur in patients co infected with both Plasmodium falciparum and Plasmodium Vivax, its occurrence has been rarely reported in cases of Plasmodium vivax malaria (14).In our study thrombocytopenia was observed in 68% of patients with vivax malaria, in that 38%

had severe thrombocytopenia. The least platelet count documented in our study was 5000/µl, and it was seen in vivax infection.

The exact mechanism of thrombocytopenia is not well understood however, immune mediated lysis, sequestrating in the spleen have been documented. An abnormality in platelet structure and function has been described as a consequence of malaria parasites themselves. Decreased thrombopoiesis has been ruled out, because platelet-forming megakaryocytes in the marrow are usually normal or increased [8, 15, 16].

## V. CONCLUSION

We found significant thrombocytopenia in almost three fourth of our patients with malaria. In any acute febrile illness with thrombocytopenia malaria should be kept in differential diagnosis. Presence of thrombocytopenia is not a distinguishing feature between the two types of malaria.

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# Sportivisation impact of physical éducation on state anxiety and Mood states of secondray students

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   *Abstract-*This study focuses on the phenomenon of sportivisation in Physical Education School through the state of anxiety and mood perceptions of 200 students of third year male and female secondary states. The sportivisty of Physical Education is characterized by an emotional grip which can be translated by an inability to manage the state of anxiety generated by a purely sports situation which leads to the emergence of negative mood in the student. The students studying three educational institutions, it was possible to show that because of the sporty character of the meeting of Physical Education, the concept of state anxiety is associated with the notion of state mood as assessed by questionnaires (STAI) identifying the state anxiety score and (PANAS) identifying scores of positive and negative affects in sport. The results of our research showed a perfect positive correlation between state anxiety and negative affect. No correlation was observed between state anxiety and positive affect. The comparison based on gender showed no significant difference. This study, however, shows that the sportivisation of Physical Education is a source of high anxiety and negative moods in the student. The phenomenon sportivisation was not studied by us, from a scientific point of view in physical education, and advanced following the completion of this research provide suggestions to better understand the future.


   *Index Terms:* positive affect, sport, negative moods, education

## I-INTRODUCTION

Physical Education and Sport (EPS) is a unique discipline in the school system. On the one hand, this is the only brand singularity based on the driving behavior of students, on the other hand, it is also the only one who is confused with the media it uses, it is ie the physical and sporting activities. Indeed, from the student or parent, it is common to share the idea that the physical practice in schools is reduced to the sport. In other words, EPS, it is not because of the EPS, but the sport! However, in a sports club, it is not likely to physical education (Arnaud, 1992). The means and ends are transparent: athletes, runners, jumpers or team sports players are prepared to go higher, further and stronger in short, to be competitive, because the competition is a winner and a loser, first and last, or validate a record. So why the confusion is it unilateral? In other words, why do we confuse the means and ends in EPS? We will not discuss at this level content and educational objectives of the EPS which obviously differ from those of sport, but just remember the injunction supported official texts of 1994 stating that the EPS should not be confused with the Sports and Physical Activities (APS) that uses, and the EPS Teacher is not a coach or a sports teacher. He chose "support activities" according to educational standards and depending on the desired learning objectives.

   Another issue deserves our attention: why EPS means they are mainly sport? The sport, however, is only part of the set of physical practices, one link in the chain ludomotrice.Why do other physical activity categories are they part of the submerged part of the iceberg? Do they have special features that cause teachers to neglect or ignore them? What kind of logic leads educational institution and school physical education teachers to choose physical activities that they believe correspond with the desired educational effects? In other words, what schooling process accompanies social physical practices to facilitate the development of

students ludomoteur?  This modest working memory based on the results of several studies in the field who have guided us, and mainly the work of Eric Dugas which states that there are three types of logic in which fits the choice of physical practices in schools On the one hand, an institutional logic (Sport), on the other hand, a sense of legitimacy and / or prestige, and finally, a pragmatic logic that takes into account environmental constraints and educational teachers. According to sociologist Pierre Parlebas (1981), sports institutionalized differ from other (traditional games or leisure activities) because they are the only ones to meet the following three distinctive characteristics: sport is a driving situation, competition and set a institutionalization of rules under the aegis of international federations. Sports therefore represent the highest degree of institutionalization because they have a body of rules and rules governed by international bodies body.

In summary, the influence of sport extends across the globe and marks the culmination ludomoteur physical activities. The various surveys on school practices and reveal long and convergent manner that sport also extends its hegemony within the PE sessions in college (Didon,1897), And the triplet "team sports, athletics and gymnastics" still has a bright future ahead of him.Standardization of EPS land and the legitimate need of the institution to assess the national level students on a limited and common physical practice range, this can only lead to recurrent observation. All what you just described leads us to wonder about the possible effects of the choice of teaching content in EPS, centered on sports activities on the mood of the student, including the level of anxiety estate, including the relationships that can be established between these two psychological clues that have been the subject of several fieldwork (Woodman & Hardy, 2001). Our modest contribution is to explore the educational sphere taking into account the institutional features, effective and environment of school.

Following consultation of the scientific literature on the subject, we have developed the object of our memory work. This is to study the possible influence of this phenomenon portivisation physical education on mood states and the level of anxiety-state students third year of secondary school. Under the guidance of our Director of memory, we decided to carry out the experiment beyond the third year of secondary school students, regardless of sections, first, the third graders are not facing an anxiety-producing situation such as the bachelor. Second, they are able to understand and complete the questionnaires presented in French with fewer mistakes and estimates, so less work for methodological bias. At the choice of questionnaires, we opted for the STAI and PANAS, we found worthy to measure what we want to measure. Both questionnaires were investigative tool of a large number of jobs, something that encouraged us to administer our study population. We want to work through this memory to what extent the purely sporting situation on the EPS is sitting on the psychomotor status of the student. In other words, we explore the influences on both the cognitive and the motor level (Vallerand, 1997) From there, we postulated the hypothesis that state anxiety and affect states measured during a meeting EPS change proportionally. In particular, changes in state anxiety affect both girls and boys compared to a theoretical model.

In this study, we want to test the hypothesis that the sporty character of the EPS is sitting on the anxiety of students and also contributes to mood disorders affecting their motor engagement. We also try to show that these are manifest psychomotor among both girls and boys and are comparable to specific academic standards. To do so, the 2011-2012 school year served as a reference to carry life this modest work. We chose to perform our experiments on three educational institutions located in the Greater Tunis, out trying to hit three different governments (Tunis, Ariana, Ben Arous), to promote the representativeness of our sample. The analysis focuses on a sample of 200 students in the third year of secondary school.This is to test the level of state anxiety and positive and negative mood states after a PE session.

## II-METHODS

*1-Participants*

The three central variables of this work are the type of student the one hand and the state of anxiety resulting from a potentially threatening situation secondly, plus changes in mood states. The choice of a population of relevant research seems essential in the

preamble to the development of studies to the relationship between these variables can be analyzed. This choice must move towards a population likely to be confronted with a state of anxiety generated by a sports situation in the EPS session. The sessions of EPS containers individual partical of sport have relevant to our problem characteristics.Thus, after setting out the scientific reasons for this choice will be presented the characteristics of these activities. o make this work, we were able to interview a total population of 200 students (101 boys and 99 girls) operating within the three schools previously appointed and practicing EPS average of 2 hours per week.

## *2-Test protocol*

We opted for the achievement of our research, the questionnaire as an investigative technique. The questionnaire is in fact a set of ordered questions used to collect information from a defined population. According to Madeleine Grawitz (1996: 615) "the questionnaire should reflect the purpose of the research in question and arouse the respondents sincere and can be analyzed in terms of the purpose of the survey responses ...".

*STAI (Speilberger, 1964)) :* The STAI is a questionnaire to measure the level of intensity states of cognitive and somatic anxiety of sport, as well as its degree of confidence. The original questionnaire consists of 27 items that the sports meet from a Likert-type scale with four points. It consists of three subscales of nine items each, measuring respectively the cognitive state anxiety, somatic state anxiety and self-confidence. For this study, a version of the questionnaire previously validated in French was used.Then, as suggested by Jones and Swain (1992), one ("very unfavorable") wide "direction" from -3 to +3 ("very favorable") method was added to allow each participant to estimate the extent to which each symptom intensity proven appeared to him in favor or not) to unfavorable future performance.

Positive Affect Negative Affect in Sport (PANAS, Watson, Clark, & Tellegen, 1988).The PANAS is a affective states inventory to measure the emotional experience of the sport. The French version consists of 24 adjectives, 12 and 12 describe positive emotional states of negative emotional states. For each emotional state, sports evaluates the intensity of his feelings on a scale of 5 points Lykert type ranging from "very little or not at all" to "extremely." For this study, a wide direction from -3 (strongly disagree) to +3 (very positive) was added to allow each participant to estimate to what extent the proven strength of each symptom seemed to him rather favorable or unfavorable for future performance.

## *3-Procedure*

At the end of the EPS session, participants were asked to complete the PANAS and the CSAI-2 presented in retrospective form, recalling the spirit in which they were just before the test during their best service performed during a major competition of the season just ended. Then, participants were again asked to complete the PANAS and the CSAI-2 in retrospective form, but in reference to their poorer performance achieved during a PE session just ended. The period between two sessions was at least two weeks in order to avoid the influence of the former on the latter. In addition, each time the PANAS was presented voluntarily before CSAI-2, to prevent the latter affects the answers to the first.Indeed, the PANAS, with a balanced both positive and negative emotional states, seemed unlikely to affect responses then made to the CSAI-2. Instead, the CSAI-2, consisting mostly proposals outlining the components of negative affective state, seemed likely to introduce a bias in the answers then made to the PANAS.

## *4-Selected variables :*

*The Genre-* Gender, sociological concept, it expresses the social relations of gender, social construction characteristics, values and attached to both men and women by culture standards, education, institutions ... These social relations between women and men, who transforming and evolving at different times and contexts, are marked in all regions of the world, a hierarchy and inequality against women. In particular, men are dominant in terms of power and decision-making at political and economic level, while free domestic work and household women, which is the basis for the organization of society and productive human labor remains invisible and not taken into account in national wealth.Gender relations as a social construction are codified, hierarchical, asymmetrical, but also

variable in space and time, and the socio-cultural environment. Social constructs, gender relations can be deconstructed and move towards greater equality. Gender and gender training, as a method of analysis and set of practical tools supports these changes.

*The state of anxiety*-state anxiety, which is the behavioral response derived from perception of the threat is defined as << Speilberber a behavioral disposition aquise predisposing an individual to receive a wide variety of circumstances, not objectively dangerous as threatening, andrespond with anxiety reactions disproportional compared to the magnitude of the danger objective. >>

*The mood states*-The state of mood is more diffuse and lasts longer than emotion. It is linked to both what we feel in the present moment and what is expected to experience because of our interactions (Batson, Shaw, & Oleson, 1992). Finally, the state of moods can be considered to include the emotions, feelings and emotional states.

*5-Statistical Analyses:*

Means and SDs were calculated using standard statistical methods. The simple linear correlation coefficient, called Bravais-Pearson (or Pearson) is a normalization of the covariance by the product of standard deviations of the variables. The correlation coefficient is a measure of the intensity of linear connection between two variables. There are also other interpretations of the Pearson correlation coefficient. Among the most interesting include the geometric interpretation that equates r the cosine of the angle between the two vectors n. We chose to make the general correlation for our population without differentiation based on gender in order to study the general trends in relations between our variables used.The ANOVA is used when you want to compare the means of different groups according to one or more categorical variables, ie sex, received the treatment, etc.. We talk ANOVA I or one-way ANOVA in English when comparing the average of at least three groups based on a single explanatory variable.

<div align="center">III-RÉSULATATS</div>

The results showed a significant positive correlation between state anxiety scores of the subjects and their scores of negative emotions, ($r = 0.90$, $p < 0.05$). In other words, the more a situation was recognized as anxiety, more negative emotions are high intensity, indicating a low controllability of the situation. Anxiety is a generalized negative mood condition that can often occur without an identifiable stimulus. As such, it is distinguished from fear, which is an emotional response to perceived threats.Additionally, fear is related to the specific behaviors of escape and avoidance, whereas anxiety is related to situations perceived as uncontrollable or unavoidable. An alternative view defines anxiety as "state-oriented future in which the individual soul is expecting negative responses." Conversely to the previous correlation made between the scores of positive affect states and state anxiety scores of the subjects showed a lack of significance ($r = 0.03$, $p < 0.05$).This relationship disproportionality refers to the dominance of negative affect and state anxiety generated by a sports situation, which clash with the outbreak affects positive preachers a comfortable situation. The comparison of average state anxiety scores recorded among girls and boys, showed a non-significant difference, ($f = 0, 21$, $p < 0.05$). This lack of significance is opposed to theoretical postulates giving great importance to the kind of subject, considered a strong factor affecting the state anxiety intensity. The comparison of means through ANOVA revealed a non-significant difference between positive scores recorded affects girls and boys, ($f = 0, 21$, $p < 0.05$). This lack of significance indicates that triggers negative moods affect girls and boys equally. Thus, gender can not be considered as differential element, comparable to literature results.

<div align="center">IV-DISCUSSION</div>

The first part of this work has helped build a theoretical overview taking consider the EPS state anxiety and mood states in the student. This model is intended to serve the investigative tools used for the confrontation of a student in an educational situation potentially stressful, as is the case in sports situations EPS. It appears important to consider gender as a central element, especially among young students because they are in full construction of the sense of self worth. In addition, sports situations EPS play an important role in the development of state anxiety and mood states. Indeed, they can judge its level relative to others, and to collect assessments issued by significant people in the entourage, as the teacher or peers. It was then a question of putting this model to the test of facts. A population of 200 students in the third year of secondary school was chosen as the school year preceding the Bachelor has emerged as a pivotal period in the development of this model. Indeed, social and cognitive development of children at this age

have a significant impact on the construction of mood states, but also on the different elements of the anxiety process, including cognitive assessments, understanding the issues. .. A retrospective protocol was implemented because it allowed to highlight the evolution of the model through the first evaluation of social situations and their progressive multiplication.

This protocol would allow, firstly, whether the anxiety process was appropriate for children. Then it came to check up mood states in this model, even though the situations faced students were involved in its construction. Then, the type proved to be important to take into account in the model. Thus, the second hypothesis was to identify the role of this variable in the state of anxiety and affect states of process. Furthermore, quantitative analyzes provide more answers, but these are only suitable for very special cases. It is therefore impossible to generalize these results. In contrast, comparison of the results of this form of analysis underpins the explanatory hypotheses of the results of statistical tests. It is in this context that the various hypotheses will be explored. For the first hypothesis, it is test anxiety proposed by Speilberger (1964) state processes and affects states (PANAS, Watson, Clark, & Tellegen, 1988) with a population of 200 third graders secondary. Thus, the existence of links between these two processes was tested.

First, it is expected that the links between the state of perceived anxiety and different issues as a direct result of this process the transaction between the student and the sports situation. Thus, students who receive important issues were supposed be particularly demanding and less forgiving in their performance, as it is sports or school. Instead, students who do not have particularly perceived challenge the situation would have been no reason to focus on their mistakes, or give them any importance. In turn, the perceived success is assumed to have an impact on issues perceived, since the questioning takes place at the end of the EPS session, and it is difficult to know if the issues are related to the session itself or perceived success in the sports situation. Indeed, the perceived success could be a source of stress for students, especially if it is mediocre, provided that students are able to understand the issues related thereto. The state of anxiety processes emerged as being the process to better understand the interactions between the student and the situational demands. (Woodman, 2001). It was therefore expected that the correlations between state anxiety, especially its cognitive aspect, and the various components of mood. In this sense, a student with high anxiety would consider the situation as threatening, so a perception with more important issues, and would subsequently moodiness. Similarly, a child with a lower anxiety have evoked less important issues, as it has been justified under the assumption 1, and this would have a negative impact on your mood so that the scores of negative emotions are high. The Correlations were indeed observed between the components of the state of anxiety and mood, but the results are not all going in the direction of our hypothesis, a significant positive correlation e was found between state anxiety and negative affect, however, no correlation marks the relationship between anxiety and positive affect. In addition, contrary to what was expected, no significant differences were found between the means of the state of anxiety, affect (positive and negative) and the kind of student for any of the three phases of the protocol.

## V-CONCLUSION

The study has been presented has to be imaged, and thus to better visualize the state of anxiety and mood process. Indeed, the quantitative analysis showed that the different elements of the process does not take the same meaning for all students. The interplay of relationships between the different components of the model was also detailed. We saw, for example, what were the key issues for some children, or how the perception of these issues could cause a sense of challenge or threat. It was also highlighted that épandait of particular significance was of the situation for each student, as well as strategies to-face that he was involved. Similarly, the place that is the kind of student in the model has been better defined. Indeed, promoting the proliferation of situations social assessment, they would change or improve, meaning that these last take for students. In all cases, they are close enough situations school sports in the way children live, as it was demonstrated in these analyzes. In addition, they are the place of practice skills to effectively cope with a stressful situation of social evaluation. In addition, it may be appropriate to expand the population in an age more wide, for example upon entry to kindergarten, and then later in childhood and adolescence. Indeed, this work has focused on students in the third year of secondary school, so between 16 and 19 years, because this period is a crucial period in the development of students.

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# Woman Entrepreneurs of Small and Medium Enterprises in Rajshahi Area: Opportunities and Challenges

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**Abstract:** Woman entrepreneurship development, especially among women largely focuses on the empowerment of women through developing skills in small to medium-sized enterprise (SME) and business ventures by taking risk of making investment decisions. This study reveals various aspects of woman entrepreneurs of SMEs. The opportunities and challenges faced by the woman entrepreneurs of SMEs in Rajshahi area is the main focus of the article. The study finds out the role of woman entrepreneurs of SMEs, various SME industries for woman entrepreneurs, financial and technical aids for the women, problems faced by entrepreneurial activities and opportunities to increase entrepreneurial skills among the woman entrepreneurs as well as it recommends suggestions as well. The study has some sort of limitations.

**Index Terms:** opportunities, strengths, threats, and weaknesses

## I. INTRODUCTION

Bangladesh, a largely populated country in the world of about 161,083,804 (July 2012 est.)[1] people live here, is one of the leading developing countries among the 'third world countries' (according to UNDP report)[2]. The economy is based on agriculture and agro-based industries but due to exponential population and economic crises, the country is far behind. One of the basic reasons of this backwardness is ignorance of women in the participation of different professions or occupations. Women in Bangladesh almost half of the total population and the ratio is about 0.95 male(s)/female (2011 est.) [3].

The overall economic development of a country depends on many sides. The cumulative sectorial economic growth of various industries stimulates the pace of development in an economy. The women are the large part of our country about half of the total population. This large part of our population can largely produce significant support to the overall development of the country. But most of the women of our country ultimately combine them into household chores and family rituals. Nowadays, these women are not confining them at home. They are now initiating new ventures, small to medium-sized businesses, and small enterprises. This epoch-breaking initiatives are producing these women as more confident to the individual economic freedom and on the other side they are indirectly adding contribution to the national economic growth.

Terms used: In this article, the term 'small ventures', 'SMEs' (Small and Medium-sized Enterprises) and 'small enterprises' have been used interchangeably to mean the same thing.

## II. STATEMENT OF THE PROBLEM

This section of the paper highlights the problem of the mostly affected section, the potential negative consequences and the relevant evidences that will support the work's relevance. Many research works have done on woman entrepreneur. Different works are carried on different perspectives. Some researchers emphasized on identifying the demographic character of woman entrepreneurs, some shows problems of the woman entrepreneurs, and some of them recommends possible suggestions. Most of the research works highlights one side only or some sort of meager aspects of woman entrepreneurship development.

This study represents an outline of woman entrepreneurs in Rajshahi area, showing their contribution toward the economic growth of the area as well as finding out the problems and recommending the suggestions. The woman entrepreneurs and the decision makers in this connection can get aid from this study.

## III. RESEARCH METHODOLOGY

This study has been carried out relying on both primary and secondary data. Primary data has been obtained through a sample survey via self-completion questionnaires from 150 respondents of SMEs from Rajshahi area. The participants were from various

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[1] Bangladesh Demographics Profile 2013 [http://www.indexmundi.com/bangladesh/demographics_profile.html]

[2] www.undp.org/hdi

[3] Bangladesh Demographics Profile 2013 [http://www.indexmundi.com/bangladesh/demographics_profile.html]

locations of Rajshahi area. The judgment sampling method is used which involves the selection of a group from the population on the basis of available information thought. This sampling is used in this study because knowledge of the researchers can be best used in this technique of sampling and this technique of sampling is also economical. The design of the questionnaire involves a combination of both open-ended and close-ended questions. The secondary sources of information were used from various publications e.g., thesis papers, journals, books, newspapers, magazines and websites. A well design structured questionnaire used as a data analysis tools.

## IV. OBJECTIVES OF THE STUDY

1. To explore the existing strengths the woman entrepreneurs have.
2. To explore the existing weaknesses the woman entrepreneurs possess.
3. To find out the main opportunities existing in the sector.
4. To find out the major challenges facing by the woman entrepreneurs of SMEs in the area.
5. To recommend possible suggestions to the prospective woman entrepreneurs of SMEs in the area.

## V. LITERATURE OF REVIEW

1) Mujeri (2005)[4] in his work of small and medium enterprise development and poverty reduction described the development of SMEs and how does it assists in reducing poverty from Bangladesh on the basis of some selected issues.

2) Anjum (1995)[5] outlines an overview on the entrepreneurial development in the northern Bangladesh and finding out problems of entrepreneurship development, suggesting recommendations, outlining the  opportunities  for  the development of entrepreneurs in the area.

3) Mohiuddin (1998)[6] described in his work on woman entrepreneurs that the half of the whole population in Bangladesh is woman. The proper economic growth of the country is not possible without the involvement of the large portion. This work also added the expansion and management of rural sector of rural woman entrepreneurs.

4) Hena (2006)[7] proposes the role of women entrepreneurs of Grameen Bank of Bangladesh with special references to Bogra zone of the bank. The author highlights the nature of businesses the woman  entrepreneurs  normally engaged in, their character, their problems with doing so, and the possible way outs needed to adapt for further improvement of theirs.

5) Uddin (2012)[8] addressed the demographic characteristics of women entrepreneurs and problems of women entrepreneurship development in Bangladesh. In this paper the author showed various types of businesses handled by woman, the women's educational background, family size, age, occupation, prior experiences and other demographic matters and at length the paper provides some recommendations for the existing problems in the field.

6) Al-Hossienie (2011)[9] carried out a study on socio-economic impact of woman entrepreneurship in Sylhet city, Bangladesh. He represented in the paper that focused on exploring the socio-economic impact of women entrepreneurship in the concerned area. Based on primary and secondary sources, it is found that nearly three quarters of the women entrepreneurs in Sylhet city are married and that they are mainly involved in tailoring and beauty parlor businesses. About half of the women entrepreneurs use their income for family purposes and most of them do not need permission of their husbands in using their income. Women entrepreneurship typically brings a positive change in

[4] Mujeri, M K (2005), '**Small and Medium Enterprises Development and Poverty Reduction: Some Issues in Bangladesh**', Rajshahi University Economics Association, vol. 11, July 2005, pp. 10-27, Uttoran Offset Printing Press, Rajshahi-6205, Bangladesh

[5] Anjum, M N (1995), '**Entrepreneurship Development in the northern districts of Bangladesh**' October 1995, Rajshahi University, Rajshahi - 6205, Bangladesh

[6] Mohiuddin (1998), Dhaka University Journal of Business Studies, Vol. 19, No. 1, p. 46

[7] Hena, M H (2006) '**Role of Women Entrepreneurs of Grameen Bank of Bangladesh: An Evaluation of Bogra Zone**' (Thesis Report), November 2006, University of Rajshahi, Rajshahi - 6205, Bangladesh

[8] Uddin M S (2012), '**Demographic Characteristics of Women Entrepreneurs and Problems of Women Entrepreneurship Development in Bangladesh**', Journal of Business Studies, Vol. 3, pp. 128-144

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attitude and behavior of family members and society towards them. This paper also provides some recommendations for policy makers to undertake suitable and effective policies towards the development of women entrepreneurship in the area. But the research paper is prepared only on the basis of socio-economic factors, it did not take into account of other variables like demographic, cultural and other variables.

7)  Khan & Kraemer (2008)[10] indicated that a significantly higher percent of women living in slums came from country side, had a poorer status by household characteristics, had less access to mass media, and had less education than women not living in slums. Mean BMI, knowledge of AIDS indicated by ever heard about AIDS, knowledge of avoiding AIDS by condom use, receiving adequate antenatal visits (4 or more) during the last pregnancy, and safe delivery practices assisted by skilled sources were significantly lower among women living in slums than those women living in other areas. Likewise, all the unadjusted significant associations with the variable slum were greatly attenuated and became insignificant (expect safe delivery practices) when some socio-economic variables namely childhood place of residence, a composite variable of household characteristics, a composite variable of mass media access, and education were inserted into the multiple regression models. Taken together, childhood place of residence, the composite variable of mass media access, and education were the strongest predictors for the health related outcomes. The study is based on socio-economic factors of woman but it is ignored business side.

## VI.  EVOLUTION OF THE CONCEPT "WOMAN ENTREPRENEURS": A FEW WORDS

The term "women entrepreneurs", not employees, were used for the first time in USA at around late nineteenth century. In 1977 the percentage of women entrepreneurs was 7.1% and later in 1990 it was risen to 32% [11].The concept of women entrepreneurs in Bangladesh developed from the very outset of the country. But the perspective in Bangladesh is different. The term 'woman entrepreneur' is a concept in Bangladesh where there are some controversies of term's origin. Generally, it is considered that the concept of women entrepreneurs had rooted from the beginning of the country, that is, after the independence of Bangladesh in 1971.

Woman entrepreneur indicates a female who initiates or launches a new business by undertaking risk of economic uncertainty and who will coordinate, administrate and control the overall enterprise.

## VII. FINDINGS AND DISCUSSION.

This section of the study states the actual findings from the field survey (given in appendix) and desk research; however the study finds the following results.

### VII.I CHALLENGES FACING BY THE WOMAN ENTREPRENEURS OF SMALL AND MEDIUM ENTERPRISES IN RAJSHAHI AREA

They perform two jobs at a time, one at home and one at outside, is difficult for a woman, but it is doubly taxing for a woman in a developing or transitional economy where poverty and lack of infrastructure can make the most basic tasks harder and more time-consuming. Woman entrepreneurs in Rajshahi area face different difficult problems regarding entrepreneurship development, financing, procurement, and others. Based on the study some basic challenges facing by the woman entrepreneurs involve the subsequent.

1.  Minor Mentality
Minor mentality among women entrepreneurs reveals the major problem seen in Rajshahi area. In most of the areas, it is seen that women entrepreneurs believe that they are not fit for initiating some business ventures/enterprises with comparison to the men one.

2.  Shortage of Raw-Materials
In the northern districts there have manifold problems shortage in raw material is major among them. There have great shortage in mineral resources, adequate agricultural raw materials for women entrepreneurs for the purpose of setting up a new venture. Lack in transportation and communication system creates this problem acute.

3.  Problems of Access to Credit
Most women in northern district in Bangladesh have some barriers in the process of access to credit though capital is the main constituent to run a business properly and this credit may be a short-range or long-range credit.

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[10] Khan M M H & Kraemer A (2008) "Socio-economic factors explain differences in public health-related variables among women in Bangladesh: A cross-sectional study", BMC Public Health, Deutschland [http://www.biomedcentral.com/1471-2458/8/254]
[11] Source: Estes, 1999; NFWBO, 1998; Women in Business-Lesotho, 1998; Jalbert, 1999c; Carter & Cannon, 1992.(adapted from: www.cipe.org/programs/women/pdf/jalbert.pdf)

4.   Shortage of Skilled and Efficient Manpower

Most of the women entrepreneurs of the northern districts are uneducated and if they are educated, its ratio is so poor. If the women entrepreneurs in northern districts of the country were mainly educated, they could make some initiatives easily.

5.   Capital Deficiency

Inadequacy of capital among the women entrepreneurs is another barrier. Most women of the   districts claim that if they have adequate money they will increase the production capacity of their small ventures.

6.   Limited Micro-Credit Financial Supports

Most of the public sector banking companies of the country provides credit in non micro credit system. So, it creates obstacles in formation of capital or accumulation of capital.

7.   Complexity in the Credit System

Capital is the main stream of a business enterprise but in the northern districts of Bangladesh most women entrepreneurs face some complexities in the credit system which is providing by different financial institute of the country.

8.   Unavailable and Inadequate Fuel and No Gas Supply

Unavailable and inadequate fuel and gas supply, as a result the people of this area do not get proper utilities of their productive resources.

9.   Shortage of Water and Power Supply

Water crises in northern districts are a main problem. Most of the rivers have scarcity of water in dry seasons, especially, in summer seasons. In some factories e.g., rice mills (for boiling), jute factories, silk factories, and poultry farming water is so essential.

10.  Underprivileged and Inadequate Training Facilities

Women entrepreneurs face the problem of increasing their experiences skills because of underprivileged and inadequate training facilities in the northern districts of the country.

11.  Religious Misinterpretation and Misrepresentation

Religious misinterpretation and misrepresentation, sometimes, discourage the women entrepreneurs to set up small ventures. There have lacks of clear concept of religions among the mass. In most of the areas in the northern districts it is experienced that the women entrepreneurs face the problem of religious misinterpretation and misrepresentation by the religious leaders.

12.  Poor Educational and Practical Knowledge and Experience

Most of the women entrepreneurs of the northern districts have little educational knowledge of their own which hamper the smooth flow of increasing SMEs.

13.  Unavailable Socio-Economic Infrastructure

Unavailable socio-economic infrastructure that is, there has a lack of educational institutes like school, college, university, technical institute, road and highway and lack of other facilities for the purpose of generating women entrepreneurs.

14.  Transportation and Communication Gap

Transportation and communication gap to remote areas, mass-communication and well-designed transportation system is the precondition of developing a community but in these area there has a narrowness of this facility.

15.  Marketing Problem of the Products

The products which are produced by the women entrepreneurs are sometimes very poor in quality. So the products produced by the women entrepreneurs lose their market values.

16.  Lack of Public-Private Initiatives

Lack of public-private initiatives for accelerating women entrepreneurs in Rajshahi area is one of the major obstacles behind the emergence of the sector woman entrepreneurs. Here, in the northern districts of the country it is seen that there is acute scarcity of public-private initiatives for the purpose of fostering the women entrepreneurship.

VII.II OPPORTUNITIES FOR WOMAN ENTREPRENEURS OF SMALL AND MEDIUM ENTERPRISES IN RAJSHAHI AREA

With a view to reduce the severances of the barriers which obstacle to the development of women entrepreneurship in the area, there are some opportunities which might accelerate the triumph of women entrepreneurship development in this area.

1. Industrial sector affordable for women entrepreneurs in the area

There are some sectors which are easy to maintain by the women entrepreneurs in the northern districts. They can easily contribute in different private sectors. A list of easily maintainable sectors by women entrepreneurs is given below:

Exhibit: 1- A table showing the industrial sectors of SMEs easily affordable for woman entrepreneurs of SMEs in the area.

| Name of SMEs easily maintainable by women entrepreneurs | Name of SMEs easily maintainable by women entrepreneurs |
|---|---|
| Textile industries | Plastic factories |
| Silk enterprise | Auto flour mills |
| Leather factories | Cold-storage factories |
| Packaging and packing | Soap factories |
| Pulses mills | Poultry farming and |
| Rice mills | Cattle rearing etc. |

2. Organizations providing financial aids and other logistics supports to woman entrepreneurs in the area

There are considerable institutions which provide financial and logistic supports and also ensure easily affordable training facilities to the women entrepreneurs of the area concerned. Here, there is given a list of the names of such institutions [12], and some of them are pitching down below.

Exhibit: 2- A table showing the financial aid providing institutions to woman entrepreneurs of SMEs in the area.

| Name of financial aid providing institutions | Name of financial aid providing institutions |
|---|---|
| General Commercial Banks[13] | Specialized Banks |
| • AB Bank<br>• Janata Bank<br>• Agrani Bank<br>• BASIC Bank<br>• BRAC Bank<br>• Prime Bank<br>• Rupali Bank<br>• Dutch-Bangla Bank<br>• Sonali Bank-BD<br>• Exim Bank<br>• Islami Bank | • Bangladesh Rural Development Bank<br>• Grameen Bank<br>• Ansar-VDP Unnayan Bank<br>• Bangladesh Krishi Bank<br>• Rajshahi Krishi Unnayan Bank<br>• Bank of Small Industries and Commerce Bangladesh Limited<br>• Other specialized banks |
| Non-Bank Financial Institutions[14] | Other NGOs and Institutions |
| • Industrial Promotion and Development Company of Bangladesh Ltd (IPDC) 1981<br>• Saudi-Bangladesh Industrial and Agricultural Investment Company Ltd (SABINCO) 1984<br>• Industrial Development leasing Company of Bangladesh Ltd (IDLC) 1985<br>• The UAE Bangladesh Investment Company Ltd 1989<br>• United Leasing Company Ltd (ULCL) 1989<br>• Phoenix Leasing Company Ltd 1995<br>• Uttara Finance and Investment Ltd 1995 | • Bangladesh Rural Advancement Committee<br>• Thangamara Mohila Sobuj Songgho<br>• Bangladesh Small and Cottage Industries Corporation<br>• Association of Social Advancement<br>• SACHETAN |

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[12] *Banglapedia: National Encyclopedia of Bangladesh*, CD Edition, February 2008 by Asiatic Society of Bangladesh, Disk 1/Financial Institutions

[13] Bangladeshi Banks [http://bank-insurancebd.blogspot.com/]

[14] Non-Bank Financial Institutions in Bangladesh [http://www.somewhereinblog.net/blog/jdon/29609482]

| • International Leasing and Financial Services Ltd (ILFSL) 1996 | |
|---|---|

- Grameen Bank, A specialized Bank provides collateral-free credit facilities in cash or in kind to landless persons for various types of income-generating and livelihood activities and most of the members of the Bank are women. So it is an opportunities for enthusiastic women entrepreneurs.

- ASA, An NGO giving opportunities of financial support to the poor and underprivileged portion of the women entrepreneurs of the country through microcredit basis.

- BSCIC (Bangladesh Small and Cottage Industries Corporation), this institution provides financial aids to the woman entrepreneurs of SMEs in the Rajshahi area. The terms and conditions of the bank is more comfortable and the loan disbursement system is more favorable to the woman entrepreneurs of SMEs particularly.

- TMSS (Thengamara Mohila Sobuj Songhho), a leading NGO (Non-Government Organization) operating among women entrepreneurs and providing loans to women through micro-credit system.

- BRAC (Bangladesh Rural Advancement Committee), an NGO, promotes income generation for the poor, mostly landless rural people through microcredit and programmes on healthcare, literacy, and education and training.

- BRDB (Bangladesh Rural Development Board), an institute based on rural development which is contributing to the development of rural sectors.

- Ansar-VDP Unnayan Bank, The Bank provides financial support to the underdeveloped and poor section of people of the society through micro-credit system and also provides training facilities men and women both.

- BKB (Bangladesh Krishi Bank), The Bank also provides credit and agricultural facilities to the farmers of the country to develop the existing condition through various training and logistic supports.

- RAKUB (Rajshahi Krishi Unnayan Bank), The Bank is still financing for the development of agriculture and its backward and forward linkage industries in the Rajshahi division of the country.

- BASIC Bank (Bank of Small Industries and Commerce Bangladesh Limited): Activities of the bank are grouped into industrial credit, commercial credit, and microcredit. Its services are directed towards entrepreneurs in the small industry sectors.

- BSRS (Bangladesh Shilpa Rin Songstha), a financial institute providing loan to the entrepreneurs and different small and medium scale industries for the purpose of fostering the economic growth of the country.

- BSB (Bangladesh Shilpa Bank), a financial body, offering loans in different manners as microcredit system, small and medium scale commercial and industrial credit.

- SACHETAN, a local NGO (Non-Government Organization) working among women for promoting their entrepreneurial abilities and increasing their productivity capacity.

The mentioned financial institutions, NGOs, banks, and banking companies are offering different small and medium term loans to the woman entrepreneurs of the area. Most significant commercial banks in this purpose provide credit facilities to the woman entrepreneurs with special emphasis on the development of the entrepreneurs and enterprises.

## VIII. SWOT ANALYSIS

A SWOT analysis represents the Strengths, Weaknesses, Opportunities and Threats, an individual, firm or any other organization has, in conducting the regular activities of their own.

Exhibit: 3 - A SWOT matrix representing the strengths, weaknesses, opportunities and challenges

| | Strengths | Weaknesses |
|---|---|---|
| Internal Factors | ➢ Mentally well prepared <br> ➢ More patient and encouraged <br> ➢ Improved risk taking ability of woman | ➢ Ignorance and illiteracy <br> ➢ Lack of proper risk taking abilities <br> ➢ Unhealthy physical and unsound mental |

| | | |
|---|---|---|
| | entreprenuers<br>➤ Less likely to be apart from the business | condition<br>➤ Lack of own fund of the woman entrepreneurs to start the venture |
| External Factors | **Opportunities**<br>➤ Free entry into SMEs<br>➤ Governments withdrawn some restrictions<br>➤ Improved technology and financial aids<br>➤ Encouragement to innovations and inventions<br>➤ Promotion of healthy completions<br>➤ Consideration increase in government assistance for woman entrepreneurs of SMEs<br>➤ Establishment of other national and international institutes<br>➤ Benefits of specialization<br>➤ Social and cultural development | **Challenges / Threats**<br>➤ Problems of raising capital<br>➤ Difficulty in borrowing fund<br>➤ Thought-cut completions endangered existence of small companies<br>➤ Problems of availing raw-materials<br>➤ Problems of obsolescence of indigenous technology<br>➤ Increased pollutions<br>➤ Religious misinterpretation<br>➤ Problems of infrastructure |

## IX. SUGGESTIONS AND RECOMMENDATIONS

This section of the paper represents some suggestions pertaining to the removal of barriers behind the development of women entrepreneurs SMEs in Rajshahi area and fostering the way they play role through SMEs. These initiatives can be significant steps for improving the standard of SMEs in the area.

- Removal of lower mentality from woman entrepreneurs is a strategic mechanism whereby the lower mentality among women can be solved. Instead of lower mentality there should be provided some motivation training for encouraging the women concerned.

- Increasing micro-credit financing system among woman entrepreneurs depicts involvement in micro-credit financing of women entrepreneurs. By increasing the engagement of women entrepreneurs and increasing support from different financial institutes and banking company as well as banks can eradicate the backwardness from the area concerned.

- Simplifying the credit system of public banks and financial institutions means that the credit systems which are being offered by different financial institutes and banks must be free from any sort of complexity and the process must be easy to realize.

- Adequate power and water supply: it refers to eliminate the years of electricity, fuel, and water supply. In order to eliminate, there should increase new production of electricity and fuel as well as water supply.

- Designing and maintaining the training programs for the improvement of women entrepreneurs: most of the training programs regarding the improvement of women entrepreneurs must be so motivational and encouraging as well as these training programs must be observed and supervised as well as followed up by the appropriate human development officers.

- Development of transportation and communication system indicates facilitating and constructing new roads and highway to the remote areas of Rajshahi area, on the other hand, the development of communication system connotes affordable communication system.

- Long-term financial support: there has a scarcity of long term financial support among women entrepreneurs and most financial institutes offer the short and intermediate term loans to women entrepreneurs in the area.

- Removal of marketing problems: it connotes that the products made by the women entrepreneurs is intricate to market in the local and international markets because of the lower quality of products. But supplying quality raw-materials and supporting components for the purpose of quality production can be done.

- Technical and logistic support connotes the direct and substantial as well as objective supports to the woman entrepreneurs of Rajshahi area.

- Establishing board on women entrepreneurship development is another way of get rid of the problems revealing among them in the concerned area and which must be set up with the responsible representatives.

- National patronization can also be helpful in this purpose.

The aforementioned measures are the possible way-outs but these are not accurate and adequate. Self-encouragement and wake up of woman entrepreneurs is basically the key in this behalf.

## X. CONCLUSION

The problems and prospects found out in the study based on women entrepreneurs of SMEs of Rajshahi area of Bangladesh will be helpful for understanding the overall scenario of women entrepreneurs of SMEs and there will create the opportunities to the investors and promoters as well as to Government for the purpose of planning and decision making. The study suggests every public private efforts and non-government organizations to assist the women entrepreneurs of northern districts of Bangladesh because this can create larger women entrepreneur for SMEs.

## APPENDIX

Table -1 Classification of respondents based on demographic factors

| Serial No | Demographic Factors | No. of Respondents | Percentage [%] |
|-----------|---------------------|--------------------|----------------|
| 1 | Age | | |
| | Below 25 years | 15 | 10 |
| | 25-35 years | 25 | 16.6 |
| | 35-45 years | 52 | 34.6 |
| | 45-55 years | 43 | 28.6 |
| | Above 55 years | 15 | 10 |
| | Total | 150 | 100 |
| 2 | Marital Status | | |
| | Married | 95 | 63.3 |
| | Unmarried | 38 | 25.3 |
| | Divorce | 5 | 3.3 |
| | Widow | 12 | 8 |
| | Total | 150 | 100 |
| 3 | Size of family | | |
| | 2-3members | 35 | 23.3 |
| | 3-5members | 55 | 36.3 |
| | 5-7members | 31 | 20.6 |
| | Above 7 members | 29 | 19.3 |
| | Total | 150 | 100 |
| 4 | Educational qualification | | |
| | No formal schooling | 16 | 10.6 |
| | Incomplete Primary school | 23 | 15.3 |
| | Complete Primary school | 35 | 23.3 |
| | Incomplete Secondary school | 19 | 12.6 |
| | Complete Secondary school | 22 | 14.6 |

| | Post secondary, diploma, degree | 20 | 13.3 |
|---|---|---|---|
| | Degree and above | 15 | 10 |
| | Total | 150 | 100 |
| | **Work experience** | | |
| | Below 2 years | 17 | 11.3 |
| | 2-4 | 24 | 16 |
| | 4-6 | 51 | 34 |
| 5 | 6-8 | 31 | 20.6 |
| | Above 8 years | 27 | 18 |
| | Total | 150 | 100 |
| | **Monthly income** | | |
| 6 | Below 10000 | 17 | 11.3 |
| | 10000-20000 | 29 | 19.3 |
| | 20000-30000 | 40 | 26.6 |
| | 40000-50000 | 36 | 24 |
| | Above 50000 | 28 | 18.6 |
| | Total | 150 | 100 |

**I**nterpretation: Table-1 shows that 34.6 % of the respondents are between 35 to 45 years of age. 63.3% of them are married. It also shows that 36.3% of the respondents have a family size of 3 to 5 members and 23.3% of the respondents' complete primary school, 34% of the respondents total work experience in between 4 to 6 years and 26%of the respondents monthly income is between TK.20, 000 to 30,000.

Classification based on results and findings.

Table -2 Lack of  practical experience and knowledge

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 52 | 34.6 |
| Agree | 47 | 31.3 |
| Neither Agree or Nor Disagree | 27 | 18 |
| Disagree | 24 | 16 |
| Strongly Disagree | 0 | 0 |
| Total | 150 | 100 |

**I**nterpretation: Table-2 shows 34% respondents are strongly agreed that they have lack of practical experience and knowledge while 31.3% of respondents are agreed with the statements.

Table -3 Inadequate  training Facilities

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 57 | 38 |
| Agree | 44 | 29.3 |
| Neither Agree or Nor Disagree | 23 | 15.3 |
| Disagree | 21 | 14 |
| Strongly Disagree | 5 | 3.3 |
| Total | 150 | 100 |

**I**nterpretation: Table-3 shows that 38% of respondents are strongly agreed that training facilities are inadequate whereas 14% of respondents are strongly disagree with the statements because they believe training facilities are adequate enough.

Table -4 Religious misrepresentation

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 45 | 30 |
| Agree | 54 | 36 |
| Neither Agree or Nor Disagree | 26 | 17.3 |
| Disagree | 18 | 12 |
| Strongly Disagree | 7 | 4.6 |
| Total | 150 | 100 |

**I**nterpretation: Table-4 shows that 36 % of respondents agreed that they need to go under religious misrepresentation while 17.3% of respondents were neutral.

Table -5 Lack of family support

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 52 | 34.6 |
| Agree | 53 | 35.3 |
| Neither Agree or Nor Disagree | 23 | 15.3 |
| Disagree | 18 | 12 |
| Strongly Disagree | 4 | 2.6 |
| Total | 150 | 100 |

**I**nterpretation: Table-5 shows that 34.6% respondents are strongly agreed that family supports are not adequate enough whereas 2.6% are satisfied with existing family support.

Table -6 Capital deficiency

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 56 | 37.3 |
| Agree | 49 | 32.6 |
| Neither Agree or Nor Disagree | 27 | 18 |
| Disagree | 10 | 6.6 |
| Strongly Disagree | 8 | 5.3 |
| Total | 150 | 100 |

**I**nterpretation: Table- 6 shows that 37.3 % respondents are suffered from capital deficiencies, while 5.3% of respondents are strongly disagreed in this issue.

Table -7 Inadequate  credit facilities

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 44 | 29.3 |
| Agree | 62 | 41.3 |
| Neither Agree or Nor Disagree | 27 | 18 |
| Disagree | 17 | 11.3 |
| Strongly Disagree | 0 | 0 |
| Total | 150 | 100 |

**I**nterpretation: Table-7shows 41.3% of respondents are agreed that they have lack of credit facilities, whereas 1.3% of respondents are disagreed.

Table -8 Insufficient utilities support

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 53 | 35.3 |
| Agree | 48 | 32 |
| Neither Agree or Nor Disagree | 28 | 18.6 |
| Disagree | 20 | 13.3 |
| Strongly Disagree | 1 | .6 |
| Total | 150 | 100 |

**I**nterpretation: Table-8 shows that 35.3% of respondents are strongly agreed that they are suffered from insufficient utilities support while only .6% respondent is strongly disagreed.

Table -9 Scarcity of  raw materials

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 38 | 25.5 |
| Agree | 67 | 44.6 |
| Neither Agree or Nor Disagree | 26 | 17.3 |
| Disagree | 17 | 11.3 |
| Strongly Disagree | 2 | 1.3 |
| Total | 150 | 100 |

**I**nterpretation: Table-9 shows that 44.6% respondents are agreed that raw materials are scared where as 1.3% respondents are strongly disagreed in this issue.

Table -10 Insufficient government support

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 40 | 26.6 |
| Agree | 41 | 27.3 |

| Neither Agree or Nor Disagree | 35 | 23.3 |
| Disagree | 27 | 18 |
| Strongly Disagree | 7 | 4.6 |
| Total | 150 | 100 |

**I**nterpretation: Table-10 shows in this that 27.3% respondents are satisfied with existing government facilities and 23.3% respondents have neutral opinion in this statement.

### Table -11 Insufficient NGOs support

| Agreeable level of opinion | No. of Respondents | Percentage [%] |
|---|---|---|
| Strongly Agree | 30 | 20 |
| Agree | 25 | 16.6 |
| Neither Agree or Nor Disagree | 25 | 16.6 |
| Disagree | 50 | 33.3 |
| Strongly Disagree | 20 | 13.3 |
| Total | 150 | 100 |

**I**nterpretation: Table- 11 shows that 33.3% respondents are disagreed in insufficient Non Government Organization (NGO) support, because they are satisfied of existing NGO support. Whereas 20% respondents are strongly agreed that NGO support are insufficient.

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# The impact of physical training program to improve the capacity of some motor skills and heart rate in elderly person

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*Abstract-*The deterioration in health functions is characteristic in elderly person (EP) and may be associated with decline in daily living activities with consequent reduced quality of life. The aim of this study was to analyze training program effects on health functions in elderly with Subjects. 34 elderly mean took part in this study and were allocated into two separated groups: Training Group (TG) and Social Gathering Group (SGG). The global physical health cognitive status was determined using some tests. The protocols were performed three times a week, one hour per session. Physical training protocol consisted of three sets of 20 repetitions, with two minutes of rest between sets and exercises. The activities proposed for the SGG aimed at promoting social interaction among patients. The Results: showed a significant difference associated to the effects of the practice of physical training on health elderly person. In conclusion, the improvement in physical health functions was evident in elderly with EP who followed a low intensity exercise protocol.

*Index Terms:* Physical health, resistance, elderly person, social integration, skills

## I-INTRODUCTION

Hardly pass a short time until we find a scientific research came new in the benefits of exercise on human health (Shang, 2013). So we see when regularity rights to exercise some kind of orderly movement such as walking, swimming or running and the subsequent activity occurs in all organs of the body until it reaches this man after (Hajian-Tilaki KO, 2007).  A few months to the stage becomes the level of efficiency devices more body strength and vitality which gives him the ability and activity more than any other, where increasing has estimated kinetic shall be work performed or exercise habit for more affordable and easily, this evolution and differences disparate level between individuals.  However the number hours that used to exercise practiced as well as the number of years that have passed since he began sports (Sugiura, 2013; Hedman, 2013).  In the Western societies that share sport and physical activity significant in human life and necessities inevitable daily habit for rights, we find an hour of sports training is sacred in these communities because they realized it is one of the basics of a happy life that qualifies them to continue to live physical easier for them to practice their requirements daily (Hedman, 2013). Because researcher one immigrants moving to Sweden recently, along with large numbers of immigrants and the various nationalities who are not used to doing physical activity in their countries on an ongoing basis and to be defined "*Btabaa Swedish society*", as well as introduce them to the importance of practicing the exercise was a training curriculum for age group specific (50-65 years) makes them willing to abide by the physical activity in cooperation with municipality "*Norashwbenk*". Hence the importance of research in the introduction of older immigrants in a sports training session working to motivate them and make them more vigor and vitality than before and for them to develop their abilities physical ability and kinetic capacity  .

Immigration to Sweden from different communities have made Sweden a microcosm and different cultures, but the government remains working on the integration of new immigrants into the community and the original work on introducing them to their customs and traditions, and most important of these habits are practicing a sport that is characterized by the Swedish

people, so we see its personnel active and vital throughout today and see its opposite of immigrants (Gillespie, 2001). To address the problem of our research  that foreigners seem less movement and activity and almost their abilities kinetic be very limited, especially at older ages, so sought researcher and cooperation with the Municipality "*Norashwbenk*" in the implementation of training curriculum simplified set of older men (50-65 years) to motivate them to practice aerobics kinetic and activate their abilities and their computer physiological and this is in the best interest of the health and psychological and therefore in the interest of the new society in which they engaged. Thus, the objective of this work was to identify the impact of the training program on some physical kinetic characteristics and heart rate, indeed the hypotheses was the training program has a significant impact in the development of some kinetic characteristics under study and heart rate on a sample search.

## II-METHODOLOGY

*Experimental approach to the problem*

The researcher chose the experimental method style of one set of relevance in solving the problem of search, "where is the most adequate means to get to know the reliable. However the human sphere was the new immigrants to Sweden and men Reconstruction (50 – 65 years). The temporal research domain was for the period between 7/5/2008 and 7/7/2008. Spatial domain: folk Park, Forest Farnfei, the central pool.

The research sample consisted of 20 men out of 22 common man in sports Special Session of the elderly, has ruled out two of the lack of commitment in the audience, and the researcher used per experimental group system to identify research variables. And to identify the specifications sample in terms of good selection and the allocation of natural and homogeneity among the sample coefficient sprains to measure weight, height and age to a statement "*Tjanassehm*", the results were within normal limits for plants sprains (+3) as whenever the score resulting sandwiched between (+3) indicated that the grades are distributed naturally and homogeneous sample and the absence of defect in their choice (2), as shown in the table (1)

*Testing protocols*

- *Tested 50 m shuttle from a standing position*- to measuring the speed and agility and balance. The tools used: ran 25 and Hookahs number, placed first on the distance of 13 m from the starting line and put the rest behind pillars and a distance of 2 m from all, stopwatch and Makati and recorder. The Method performance: joint takes place behind the starting line and used to stand high as the beginning of the test mode, after hearing the reference laboratory running fast towards the first pillar then jogging shuttle between pillars back and forth. The Date: measured the time that interrupted the joint to the nearest 0.01 seconds (sec and pars thereof).

- *Test of Medicine ball throw-* the aim of the test: measuring muscle strength of the arms (explosive force).Tools used: Football medical weight of 2 kg and a tape measure and to perform the test. Method performance: joint carries the ball medical Baldhirain from the back of the head and then thrown and directed to forward to the farthest point. Date: joint lead two attempts recorded "Avdilhma" that does not exceed his feet selected firing line.

- *Bend the trunk test the bottom of the stand- The aim of the test* was to measuring flexibility- Tools used: Fund height of 50 cm and a tape measure in the form of a ruler graded numbers starting from scratch and up to 100 cm so that the zero point at the beginning of the front edge of the box and 50 cm for the top 50 cm of the bottom. Method performance: stand on the box and legs outstretched and Amadmomtan not be bending the two during bending the trunk forward and down to get to the nearest degree either positive or Negative, for example (+3) any exceeded zero down, either (-2) any negative for the top, and this process would be for a period of two seconds and each participant two attempts and calculates the best. Date: measurement Balsntmitr two attempts and recorded the best.

-*Test to measure pulse rate at rest- the* Goal of the test was to measuring heart rate at rest. The Tools used: my wrist device connects to the hand to measure heart rate. Test Method: The laboratory lying on the ground is linear for 10 minutes, and then pulse rate is measured by the device that connects the wrist to measure the pulse. Registration: Registration will be by reading the number of pulses recorded in the device per minute.

*-Tribal tests-* the tests were conducted tribal research sample by the working group included the physical tests and test measurement of pulse rate on 9/5/2008 four o'clock in the evening.

*-Implementation of the proposed training program:* The researcher implementation of the proposed training program for one hour a day, for three training modules in the week, eight weeks, the length of the training program starting from the day 12/5/2008 until 4/7/2008.

## Statistical Analyses

Standard statistical methods were used to calculate means and ± SD s. A oneway ANOVA was performed on the anthropometrics and different test performances  of the two groups at the pre-test. To compare the effects of the training protocol, a mixed design 2 (test occasion: pre-post: repeated measures) x 2 (group: experiment vs. control group) analysis of variance (ANOVA) was used. All variables were tested for normal distribution, and when a significant *F* value was observed, Sheffe´s post-hoc procedures were performed to locate the pairwise differences. The level of significance was set at $p \leq 0.05$. Statistical analysis was performed using SPSS 18.0 for Windows (SPSS, inc., Chicago, IL).

### III-RESULTS

The participant characteristics are summarized in Table.1. In the table 2 were shown the average differences and standard error and the significance of the differences between pre and post tests for the research sample.

Table 1: The characteristics of participant (n=34)

|  | Mean calculated | Mean | Degree of variation | Mean of regression |
|---|---|---|---|---|
| Age (years) | 54,98 | 56 | 6,12 | - 0,5 |
| Hight (cm) | 178,11 | 175 | 7,46 | 1,25 |
| Weight (kg) | 93,17 | 96 | 14,31 | -0,59 |

Table 2 : Mean difference between test and retest of the sample selected

| *Data* | Sample  n=20 | | worth | | difference |
|---|---|---|---|---|---|
| *Varation* | *a* | *B* | calculated | program | |
| *Tested 50 m shuttle* | 1.3 | 0.3 | 4.1 | 2.09 | *significant* |
| *Medicine ball throw* | 1.19 | 0.14 | 0.14 | 2.02 | *significant* |
| *Test of Bend the trunk* | 4.2 | 1.67 | 2.5 | 1.3 | *significant* |
| *Mean* | 2.3 | 0.28 | 8.21 | 1.6 | *significant* |

The results showed *the test of 50 m shuttle run*, the average founded a differences between the two tests p<0.05, and after using the t-test the samples corresponding to measure the difference between the two tests pre and post, the value of (v) Imputed 4.1 is greater than the value spreadsheet amounting 2.09 under an error level of P< 0.05 and the degree of freedom of 19 and this confirms the existence of significant difference between pre and post tests and in favor of the post test. The results of the test *of medical ball throwing* the ball the average differences between the two tests was 1.19 meters and the standard error was 0.14, and after using the t-test for analog samples to measure the difference between the pre and post tests, the value of (v) calculated 8.5 which is the largest of its tabular value of 2.09 under an error level of p<0.05 and the degree of freedom of 19 and this confirms the existence of significant difference between pre and post tests and in favor of the post test. The results of the *test bend the trunk* of the bottom showed that the average differences between the two tests 4.2 and standard error 1.67, and after using the t-test the samples corresponding to measure the difference between the two tests pre and post, the value of (v) Imputed 2.5 is greater than the value tabular of  2.09 below the level of error of p<0.05 and the degree of freedom of 19 and this confirms the existence of significant difference between pre and post tests and in favor of the post test. Finally, the test results measure of heart rate at rest was average differences between the two tests 2.3 and standard error of 0.28, and after using the t-test for analog samples to

measure the difference between the pre and post tests, the value of (v) Imputed 8.21 which is the largest of tabular value of 2.09 below the level of error of p< 0.05 and the degree of freedom of 19 and this confirms the existence of significant difference between pre and post tests and in favor of the post test.

<div align="center">IV-DISCUSSION</div>

The present study shows that a significant differences were founded between the pre and post for the all tests measurement, we see the evolution of speed and agility in the shuttle test 50 m, This is due to the irregular sample in training within the proposed training program, (where the speed and agility to evolve through the shuttle run and the like in various kinetic exercises). Reduced balance, muscle strength, and flexibility in the elderly predispose them to falls and impaired quality of life. (Gaudreault, 2013) This is accentuated in elderly person in whom joint instability and pain further limit functional capacity. Previous studies have shown that the elderly person have reduced muscle strength compared with normal. (Gillespie, 2001). Anwer (2013) found reduced quadriceps strength and increased postural sway in elderly person compared with controls, and Sugiura (2013) demonstrated considerably impaired functional capacity with a high frequency of self-reported muscle problems in elderly person of the knee or hip. The clinical study of exercise programs in elderly person of the knees is that improving muscle strength in particular, and also coordination and flexibility, will improve functional capacity and reduce pain without causing deterioration of the disease despite the increased mechanical loading of joint tissues (Wang, 2013). The present study shows that it is possible to undertake such an exercise program in a group elderly person so severe that under normal circumstances they would be referred to improve the heath capacity (Sugiura, 2013; Hedman, 2013). The exercise program has some clinical benefit, although the finding of an increased number of knees with effusions after intervention might indicate that the intervention leads to increased disease activity.

The results of medicine ball testing throw showed a significant development in the explosive power of the arms, and researcher attributes that impact of the proposed training program which included exercises to develop muscle strength codified fits the reconstruction of the trainees. The increase of speed and reduce the resistors will improve fast explosive power". The test bend the trunk down, the results showed that there is significant development for the benefit of post-test, and the researcher attributes this development is the result contain the proposed training program flexibility exercises that led to the development of achievement. Because flexibility exercises and lengthen the muscles leads to expand the range of motion of the joints of the body and therefore extra freedom in the performance of movements. The training sessions were not designed to improve compliance by attempting socialization or otherwise and no economic compensation was paid. The low drop-out frequency is very similar to earlier studies of the effect of training on elderly person (Tsuji, 2013). This might be because this group of patients normally is not seen on a regular basis, and the increased attention given during the study period in it could improve compliance. This could also explain why the control group had such a high compliance to the assessment sessions. The most pronounced effects were a 20% increase in muscle strength for extension and a 40% increase for flexion of the least affected knee at low angular velocities. In the most affected knee there was no clear effect (Tsuji, 2013. This is in contrast to the findings of Fisher and coworkers, 919 who found no differences between the two legs in the response to intervention. However, it may be speculated that a true measurement of strength is hampered by knee pain in elderly person with severe affections of the knees of upper limb , thus making the interpretation of the data for the most affected knee particularly difficultly changes in muscle strength was most pronounced under isometric circumstances and at low angular velocities.

The test results showed heart rate at rest sophisticated morally for the post test and that is in favor of the proposed approach, because practicing individuals for physical activity regularly works on the development of the work of the heart.  We think that the amount of blood paid per strike at the heart of the trainee is greater than the heart is the trainee and this is able to deliver the amount of blood required for the body at rest a number less than the heart beat is apprentice. The notion of a greater physical activity in the months following the intervention is supported by the finding of an increasing number of training effusions in the most affected during the study period. Although the number of studied in elderly person is low, we find that the data could

indicate an increased disease activity during and after the training program, which might be a result of an increased general physical activity.

<div align="center">V-Conclusion</div>

Data from an experimental a model shown that regular exercises have given no indication of increased physical activity, and moderate exercise has been deemed relatively safe in elderly person. The safety of exercise programs in elderly person as severe as in our study remains to be clarified, and the possibility for adverse effects underlines the need that caution be observed. Further studies of the safety of exercise in elderly person are called for, with careful monitoring of disease physical activity during the trials.

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# Autonomous Hospital Management System Using Bluetooth Technology Developed on Python

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*Abstract-* In this project a hospital management system is developed by using a Bluetooth connection .Usually in the hospitals and medical clinics Wireless LAN(WLAN) or Wi-Fi is used for data transfer and network connection. The Electro-Magnetic Frequency (EMF) generated from the WLAN ranges from 0 to 300 GHz. Such a high range of frequency is very harmful for the patients since the Wi-Fi has been anecdotally linked to electromagnetic hypersensitivity. However the Bluetooth uses the microwave spectrum in the range of 2.4 GHz and 2.4835 GHz.The radiated output power of the Bluetooth devices vary from 1 to 100 MW and can operate continuously or sporadically.So total exposure to the EMF radiation is quite variable. Thus the Bluetooth device has never been linked to any serious health hazard. Implementation of the project in reality will help to reduce the manpower and in the efficient management of the hospital. The patients can take appointment just by using an embedded Bluetooth device without standing in a queue or waiting at the Appointment Desk. The nurse updates each and every details of the patient regularly to the main server so that by the help of the Bluetooth connection both the doctor and the patient's relatives can fetch whichever documents or information they want regarding that patient. Additionally the hospital canteen,medicine store and the Global Positioning System (GPS) have been incorporated in the project.One can know the direction to reach the particular room number with the help of Bluetooth device.Nurse can order the medicine from medicine store through the Bluetooth device.If it is available it will be send to the patient and bill will get appended. Automated Alarm System for the visitor's entry and exit within a time is facilitated by tracking the visitor's Media Access Control (MAC) –ID.Ambulance and parking facility are also developed by using MAC-ID tracker.The whole algorithm is developed using the Python language.

*Index Terms*- Bluetooth, Hospital management, MAC-ID, Python, Health hazard

## I. INTRODUCTION

In hospitals we often face a lot of problem, .let us focus on the problems which are often faced by the common people.

In the help desk the patients often have to stand in the queue. For getting appointments from a doctor(OPD) or even for getting admitted in the hospital (IPD) and often standing in such a long queue may bring distress amongst the patients.

Within the premise of hospital usage of LAN or Wi-Fi must not be allowed .Since the usage of these can cause severe problem to the patient due to the waves generated. The high signal strength medium such as wi-fi etc can interfere with the delicate medical devices such as pacemakers etc. For maintaining a huge data… large database are to be created. And the doctor may not have such time to go all the data of the patients at a time. All the medical report, the medicine table, the diet charts and also the last updates given by the doctors and it will be updated in regular basis.If the patient's relatives have any enquiries about the patient and if the doctor is not available in that hour, there will be no one to answer their queries. The canteen of the hospital does not remain well organized. But the functionality of the canteen is also simultaneously important.During the Visiting hours the patients were given token cards generally but loosing the token cards are a very common incident.Proper care of the parking area of the hospital must be taken. As the cars of the doctors, staffs,visitors and also the ambulances must be parked in different section with proper identities.

## II. WHY PYTHON??

Python is a remarkably powerful dynamic programming language that is used in a wide variety of application domains. Python is often compared to Tcl, Perl, Ruby, Scheme or Java. Some of its key distinguishing features include:

- very clear, readable syntax
- strong introspection capabilities
- intuitive object orientation
- natural expression of procedural code
- full modularity, supporting hierarchical packages
- exception-based error handling
- very high level dynamic data types
- extensive standard libraries and third party modules for virtually every task
- extensions and modules easily written in C, C++ (or Java for Jython, or .NET languages for IronPython)
- embeddable within applications as a scripting interface.

Thus, Python is a programming language using which we can work more quickly and integrate our systems more effectively. We can use Python to obtain a gain in productivity and also lower maintenance costs.

Python supports multiple programming paradigms, primarily but not limited to object-oriented, imperative and, to a lesser extent, functional programming styles. It features a fully dynamic type system and automatic memory management, similar to that of Scheme, Ruby, Perl, and Tcl. Like

other dynamic languages, Python is often used as a scripting language, but is also used in a wide range of non-scripting contexts. Using third-party tools, Python code can be packaged into standalone executable programs. Python interpreters are available for many operating systems. Python runs on Windows, Linux/Unix, Mac OS X, and has been ported to the Java and .NET virtual machines. Python is free to use, even for commercial products, because of its OSI-approved open source license.

**Comparing Python to Other Languages:**

Java: Python programs are typically 3-5 times shorter(in terms of number of lines of code) than equivalent Java programs, thus they also take much less time to develop. This difference can be attributed to Python's built-in high-level data types and its

dynamic typing. A Python programmer does not have to waste any time declaring the types of arguments or variables, and Python's powerful polychromatic list and dictionary types, for which rich syntactic support is built straight into the language, find a use in almost every Python program.

Java Script: Python supports writing much larger programs and better code reuse through a true object-oriented programming style, where classes and inheritance play an important role, whereas JavaScript does not.

Smalltalk: Perhaps the biggest difference between Python and Smalltalk is Python's more mainstream syntax, which gives it a leg up on programming training.Likewise, Perl, C++ follows Python in many a respect.

## III.   ALGORITHMS

**#INHOUSE PATIENT DEPARTMENT ( entering the information)**
Step 1: Click on the insert patient details.
Step 2: Enter the details of the patient such as sex age  etc.
Step 3: The registration and the password of the patient is also given.
Step 5: click on "check availability of the bed".
Step 6: According to the choice of the ward please enter which ward you want to take.
Step 7: After entering the name of the ward the confirmation message is shown.
Step 8: Click on the "confirm" button.
Step 9: For taking the snapshot of the patient click on

```
CLICK ON THE INSERT PATIENT DETAILS
            |
            v
FILL ALL THE RESPECTIVE DETAILS OF THE PATIENT SUCH AS SEX , DOCTOR DETAIL
            |
            v
THE REGISTRATION ID AND PASSWORDS ARE GIVEN
            |
            v
CLICK FURTHER FOR CHECKING THE AVALIBILITY OF THE BED
            |
            v
ACCORDING TO THE CHOICE OF THE WARD ENTER THE WARD NAME SUCH AS W1,W2,W3,W4
            |
            v
AFTER ENTERING THE NAME OF THE WARD THE CONFIRMATION MESSAGE WILL BE SHOWN
            |
            v
CLICK ON THE CONFIRM BUTTON
            |
            v
FOR TAKING SNAPSHOT CLICK ON "TAKE PIC"
            |
            v
ALL THE DETAILS OF THE PATIENT ARE ENTERED
```

**#OPD:**

Step 1: Show the genre
Step 2: Show the doctor 's name
Step 3: Enter the doctor 's  name
Step 4: Show the days on which the doctor is available
Step 5: For taking appointment fill the respective fields
Step 6: Click on the submit button
Step 7: the appointment id and the time of the appointment will be shown
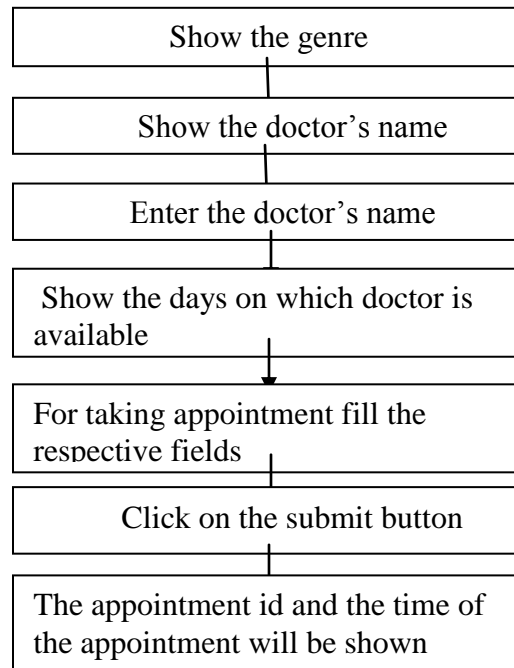


#### #MEDICINE STORE:

Step 1:Nurse can check whether the respective medicine is available in the medicine store or not.
Step 2:If medicines are available then nurse can order the medicines for the respective patient
Step 3:Add the price of the medicine to the patients bill
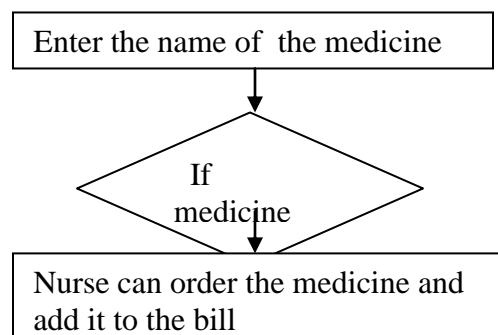


#### #NURSE ALGORITHM

Step 1. Click on the button "LOGIN".

Step 2. Enter the password and the nurse ID. The password and the nurse id will be matched with that from the database.

Step 3. If  the password is matched  then a new window  will open to you where you will get 5 options.

Step 3.a    .PATIENT DETAIL INFORMATION:
- Enter  all  the information  regarding the patient
- Click on the SUBMIT button.
- The data will be updated in the database.

Step 3.b.    PATHOLOGICAL LAB TEST:
- Fill the details of the patient diagnosis form.
- Click on the SUBMIT button.
- A message will be shown "The data s are submitted".
- Click on the "Pathological Test".
- Click on what type pathological test you want to enter the data.
- Fill the respective field and click on the SUBMIT button.
- A message will be shown "The values are updated".

Step 3.c.    PATIENT INJECTION DATE INFORMATION:
- Update, delete and submit the data regarding the patient injection information.

Step 3.d.    PATIENT MEDICINE INFORMATION:
- Update, delete or submit the data regarding the patient medicine information.
- Click on update, delete or submit.
- Check the availibility of a particular type of medicine

Step 4. If the password is not matched then an error message will be displayed   "you have entered a wrong password!!!!"
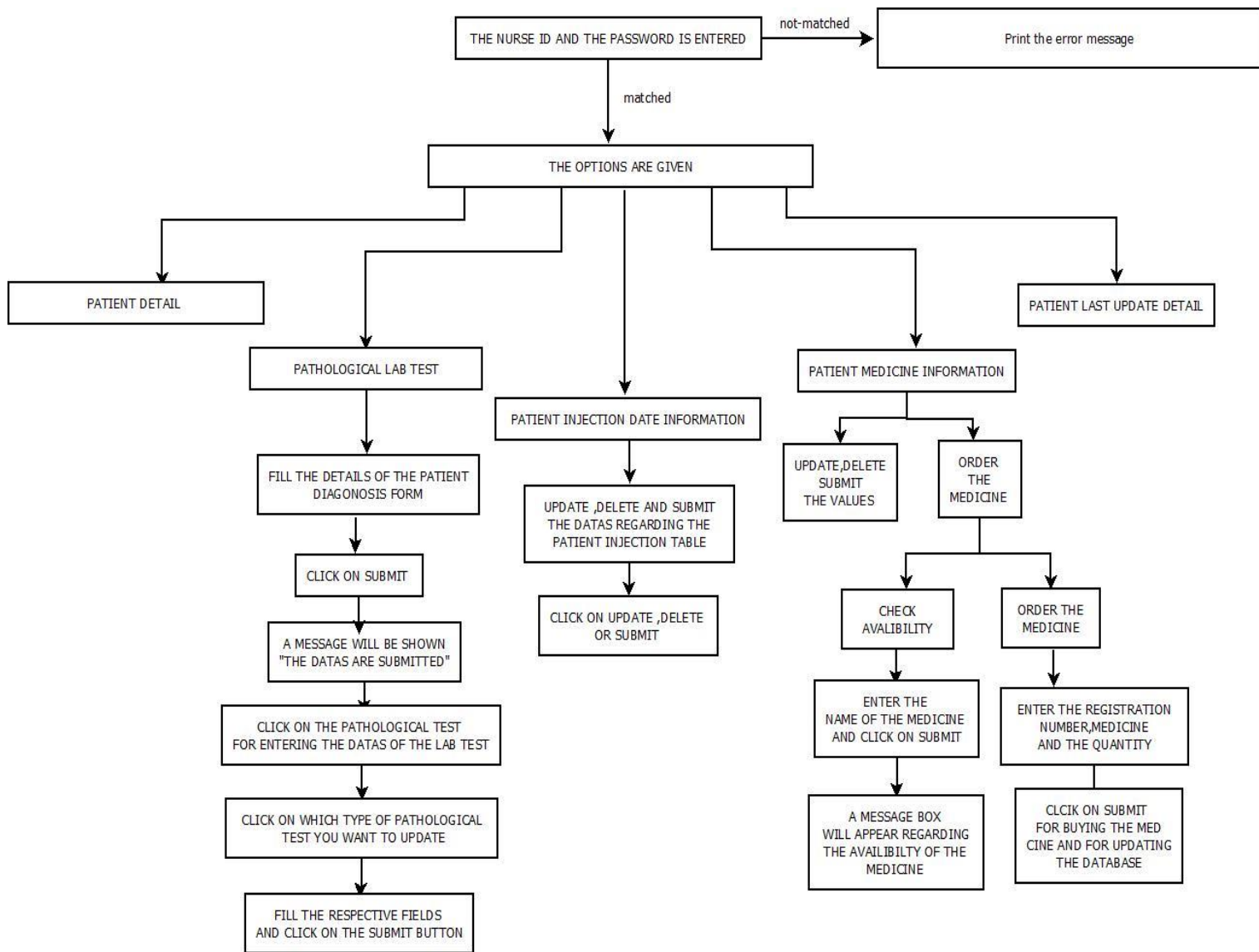
**#VISITOR INFORMATION DESK**

Step  1: Click on the button "Login as the visitor".

Step 2: Enter the password and the nurse ID. The password and the nurse id will be matched with that from the database.

Step 3:If the password is matched then a new window will open where there will be 4 options.

 The options are as follows :-

1. Check present update
2. Check the medicine updates of the patient
3. Check the total amount of bill
4. For further enquiry please click here..
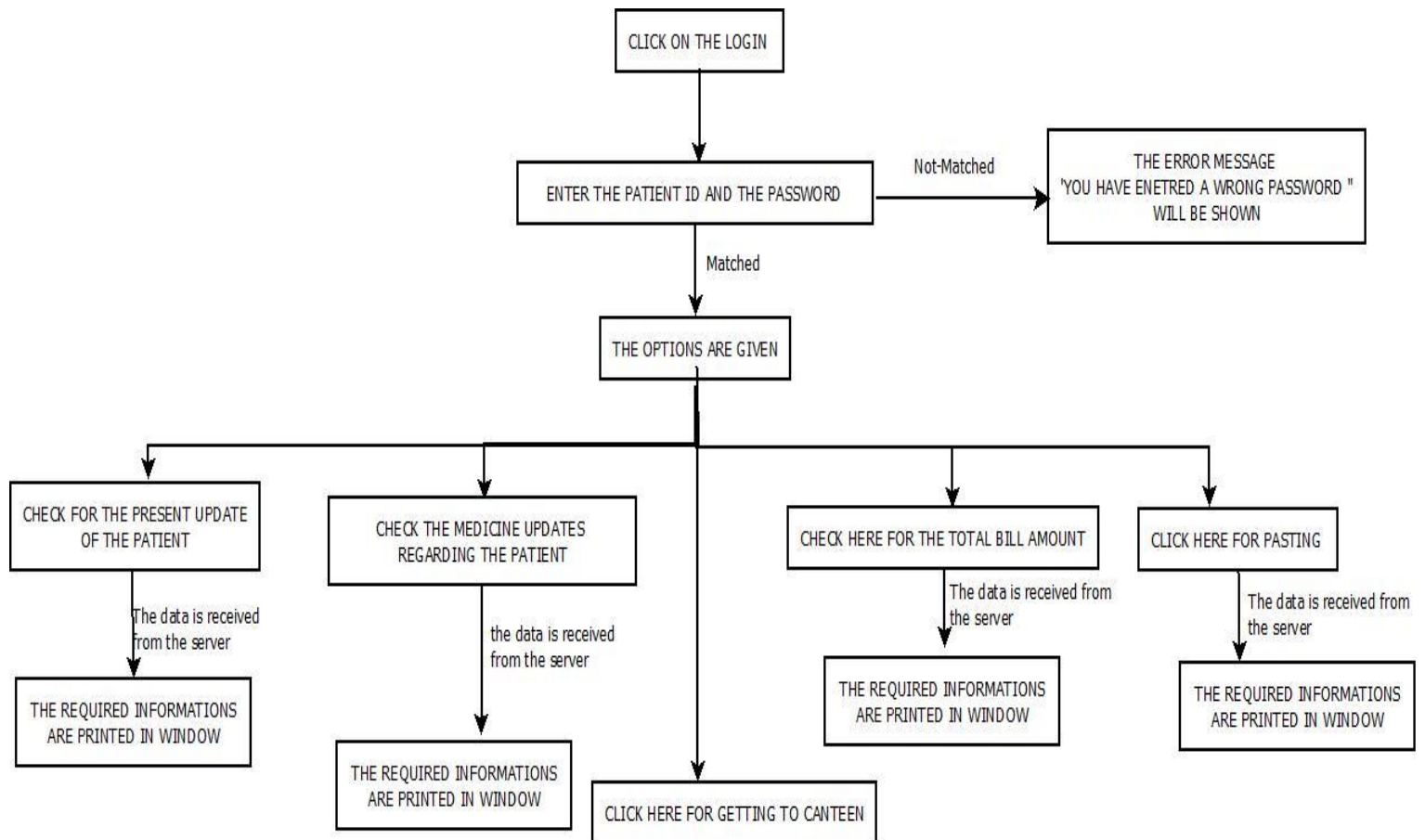
### #PARKING:

Step 1: Fetching of data from the database.

Step 2: Go for an infinite scan.

Step 3: Scanning of Bluetooth devices.

Step 4: If the mc id in database matches with mc id of scanned devices then go to the next step.

Step 5: If it does not belong to the staff zone.

Step 6: It will show the zone where the vehicle is supposed to go
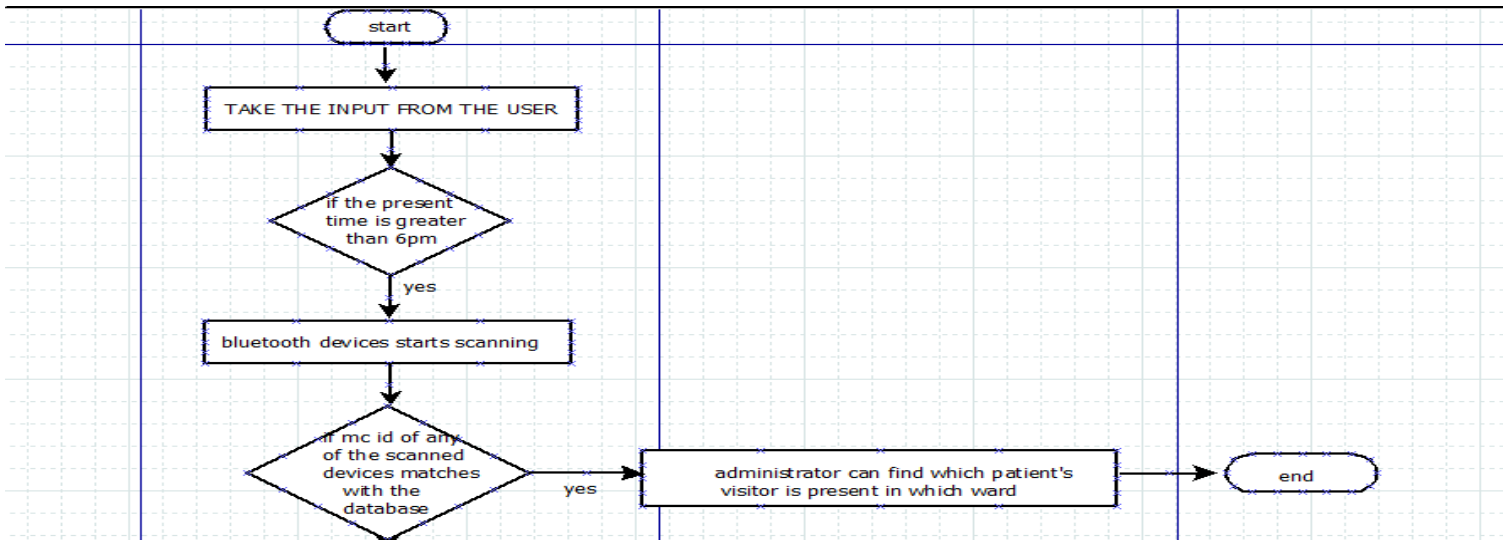


### #AMBULANCE:

Step 1: Scanning of Bluetooth devices

Step 2: Obtain the mc id and flag value from database

Step 3: If the mc id from the database matches with the scanned mc id then go to the next step.

Step 4: If the flag value is 1(i.e the ambulance is not empty) then go to next Step

Step 5: Message is shown to arrange for the ward boys and the doctor
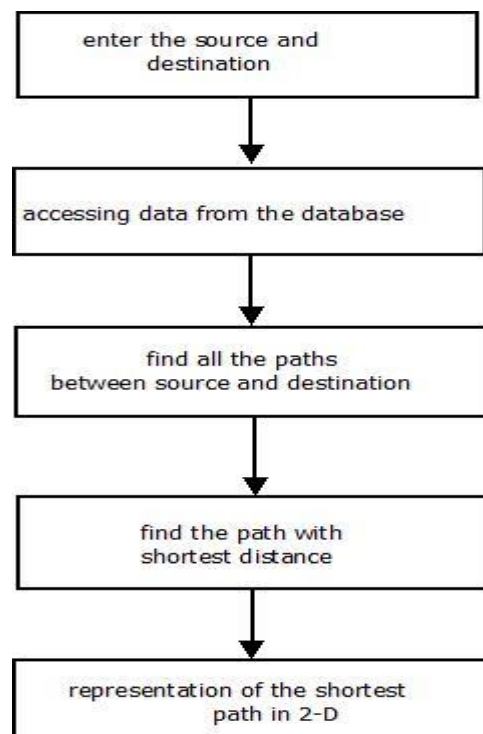
## IV.   METHODOLOGY

Relatives of each and every patient are given a Bluetooth device. Along with that nurse and the doctor are also given a Bluetooth device.

**OPD**: Doctor 's  name and their schedule are shown to the belongers of bluetooth device. People can fix their appointment with the Doctor through the Bluetooth device and a token no. and the appointment time will be given to them. If no more appointments can be fixed with that particular doctor for that day then it will show the message" please try for any other date" .

**IPD:** We take the details of the patient and a respective registration number and password is given. Availability of bed is checked and even patient detail can be updated.  The snapshot of the patient can also be taken and thus all the information's and the snapshot of the patient are also displayed.

**AMBULANCE:** If each of the ambulance is given a Bluetooth device and a Bluetooth scanner is installed at the gate. Whenever our ambulance is nearby and if  the ambulance  is not empty then person at the registration desk can arrange for the ward boys and doctors just before the ambulance arrives. Thus by the use of the Bluetooth application of python we are able to detect ambulances.

**VISITORS:** To each patient 's relatives two Bluetooth devices are given. If any  of the visitor is present in the patient's ward except the visitor 's time then the incharge receives a message "The visitor is present in this ward".

**CANTEEN:** Visitors can check out the menu available at the canteen via the Bluetooth device and thus can order  the menu via the device (which acts as a client) and thus all the order will be sent to the  manager  of the canteen.(which acts as a server). The whole procedure is implemented by the socket programming.

**PARKING:** The staff members of hospital (doctor,nurse) who have cars, their IDs are kept as record in the database. When the scanner finds a device whose ID is already there in the database then the security guard will ask to park the  Car in sec-'a' rest any other car will be in sec-'b'.

**NURSE**: This whole interface is database based. There is no server client programming in this nurse interface. Each and every nurses are given an embedded device where this whole application is installed. Thus by the help of this device the nurse can go through every details of the patient ..and also update ,delete the datas. Thus all the values gets automatically updated in the database.

**VISITOR INFORMATION DESK**: The patient's relatives are given a device,which is an embedded device where the whole application is being installed. Thus even if there is no doctor or nurse present one can get every information regarding that patient.

In the Bluetooth device ,if  the option  of mapping is entered and the source and destination is entered then the direction Is shown to the visitor.

## V.   RESULT

To enter the record ,nurse has to do it by entering her user name and password. After entering into its own account,she is able to update the details of the patient as:
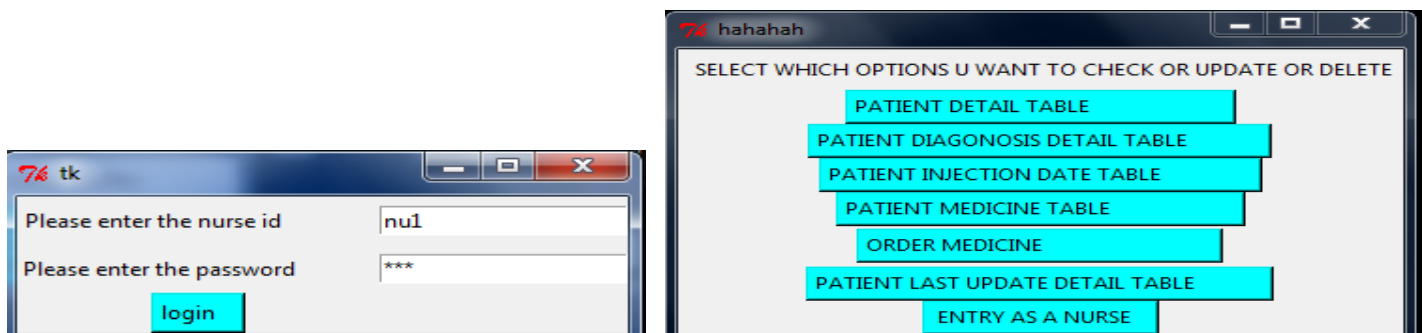


Data of  a  particular  inhouse patient  is  taken in the following pattern and the data gets updated in the database.

We get the report of test from the following interface.
By clicking on the buttons we get the report of that particular test.



MEDICINE ORDER BY BLUETOOTH TRANSACTION

Nurse can check the the availibilty of medicine.

Nurse can order for the particular patient as:



## VI. CONCLUSION

Despite some of the problems, Bluetooth remains a very promising technology, with plenty of medium and long term applications. But the real test will be whether it survives the hype. Promoters are laying on it, with their unrealistic claims. This technology is probably the only one which has a good chance to become widely available among PDAs and mobile devices. Bluetooth-equipped gadgets can connect to the LAN through the Access Protocols at once.50 kilobytes per second is about all you can expect from Bluetooth.

## RELATED WORKS

•Use e-mail while your portable PC is still in the briefcase! When your portable PC receives an e-mail, you'll get

an alert on your mobile phone.

•A travelling businessman could ask his laptop computer to locate a suitable printer as soon as he enters a hotel lobby, and send a printout to that printer when it has been found, and replied in a positive manner.

•Cable-less connection to printers and faxes, to digital cameras and video  projectors. Cordless connection from cell phone to handfree headset.

•Bluetooth interface to office PBX and Dial-up networking and automatic e-mail and use cell phone as office cordless phone. Use of PC or PDA as handfree  phone.

•Automatic exchange of files, electronic business cards, calendars etc.

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# Grid Computing and Security Issues

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*Abstract*— Grid is a utility or infra-structure for complex, enormous computations, where remote resources are accessible through the web (internet), from desktop, laptop, mobile phone. It is similar to power grid, where the user does not have to worry about the source of the computing power. Grid can be thought of as aggregation of millions of discrete computers owned by individuals, institutes from various countries across the world connected to form a single, huge, super-computer! Undoubtedly it is an evolution of internet facility, but such aggregation of networked computer resources in dynamic and multi-institutional environment demand for higher security. This paper deals with the challenging security issues that demand new technical approaches. We describe how these issues can be resolved.

*Index Terms*- **Control grid, Cryptography, Digital Certificate, Handshaking, Kerberos, Middleware**

## I.  GRID COMPUTING

At its most basic level, grid computing is a computer network in which each computer's resources are shared with every other computer in the system. Processing power, memory and storage devices are all community resources that authorized users can tap into and leverage for specific tasks.

More precisely a grid:

- integrates and coordinates resources that are not subject to centralized control (that live within different control domains)
- using standard, open, general-purpose protocols and interfaces (that address such fundamental issues such as authentication, authorization, resource discovery, and resource access.)
- to deliver significant qualities of service (with respect to response time, throughput, availability, and security, and/or co-allocation of multiple resource types to meet complex user demands, so that the utility of the combined system is significantly greater than that of the sum of its parts.)
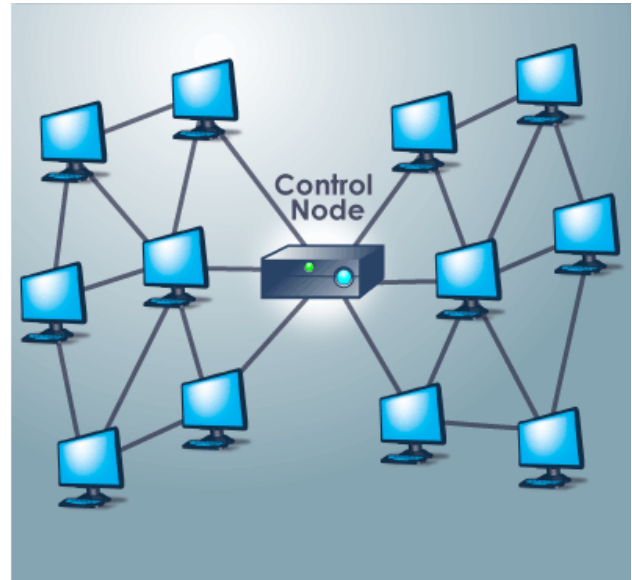


Fig. 1 Example of Grid Computing

A grid computing system can be as simple as a collection of similar computers running on the same operating system or as complex as inter-networked systems comprised of every computer platform you can think of.

This technology, developed since last only one decade, is being used presently, by high energy physicists to analyze data to be produced very soon in LHC (Large Hadron Collider) experiment where Indian scientists are taking part and by earth scientists to monitor Ozone layer activity (deals daily with Data whose volume is equivalent to 150 CDs).

## II.  REQUIREMENTS OF GRID COMPUTING SYSTEM

In general, a grid computing system requires:

- **At least one computer, usually a server, which handles all the administrative duties for the system** i.e. a control node. The control node must prioritize and schedule tasks across the network. It's the control node's job to determine what resources each task will be able to access. The control node must also monitor the system to make sure that it doesn't become overloaded. It's also important that each user connected to the network doesn't experience a drop in his or her computer's performance. A grid computing system should tap into unused computer resources without impacting everything else.
- **A network of computers running special grid computing network software.** These computers act both as a point of interface for the user and as the resources the system will tap into for different applications. Grid computing systems can either include several computers of

the same make running on the same operating system (called a homogeneous system) or a hodgepodge of different computers running on every operating system imaginable (a heterogeneous system). The network can be anything from a hardwired system where every computer connects to the system with physical wires to an open system where computers connect with each other over the Internet.

- **A collection of computer software called middleware.** Middleware is software that enables communication and management of data in distributed applications. In this more specific sense middleware can be described as "the dash in client-server". The purpose of middleware is to allow different computers to run a processor application across the entire network of machines. Middleware is the workhorse of the grid computing system. Without it, communication across the system would be impossible. Like software in general, there's no single format for middleware.

The middleware and control node of a grid computing system are responsible for keeping the system running smoothly. Together, they divide and farm out pieces of a program to as many as several thousand computers and control how much access each computer has to the network's resources and vice versa. While it's important not to let any one computer dominate the network, it's just as important not to let network applications take up all the resources of any one computer. If the system robs users of computing resources, it's not an efficient system.

## III.    SECURITY RISKS INVOLVED IN GRID COMPUTING

There are security risks in every application downloaded from the Internet. Whenever you link two or more computers together, you have to prepare yourself for certain questions. How do you keep personal information private? How do you protect the system from malicious hackers? How do you control who can access the system and use its resources? How do you make sure the user doesn't tie up all the system's resources? Thus Security requirements are fundamental to the grid design. The critical problems are resource discovery, authentication, authorization, and access mechanism. Without this functionality, the integrity and confidentiality of the data processed within the grid would be at risk. Let's discuss how authorization and authentication is done in grid system.

## IV.    SOLUTION TO SECURITY RISKS

### A.  Authentication

Authentication is the process of verifying identity of a participant to an operation or request. Authentication methods are Password-based, Kerberos authentication, SSL authentication, Certification authorities.

*1)   Password-based Authentication:*   Password-based Authentication is a simple function where one party presents a set of credentials (user ID and password combination) to a system. If the credentials match a given set on the system, the system returns a value that represents authorization; otherwise it does not. Some important issues in this are to send unencrypted

passwords only when messages can't be read by un-trusted processes while on network, otherwise instead of sending passwords over network one can use password as encryption key. They can encrypt a known but non-repeating value, Send encrypted value to party verifying authentication and both parties must know password or trust a third-party to distribute it.

*2)   Authentication Systems: Kerberos:*   Kerberos is a computer network authentication protocol which works on the basis of "tickets" to allow nodes communicating over a non-secure network to prove their identity to one another in a secure manner. Its designers aimed primarily at a client–server model, and it provides mutual authentication—both the user and the server verify each other's identity. Kerberos protocol messages are protected against eavesdropping and replay attacks. Kerberos builds on symmetric key cryptography and requires a trusted third party, and optionally may use public-key cryptography by utilizing asymmetric key cryptography during certain phases of authentication. It is well-suited to frequent authentication, centrally administered, requires trusted, on-line certification authority: Key Distribution Center (KDC)

Authentication process using Kerberos:
- Each client and server registers their keys in advance with Kerberos authentication server.
- Client wants to communicate with service provider: sends client and service provider names to Kerberos authentication server
- Kerberos server randomly generates a session key that will be used for symmetric encryption between client and server
- Kerberos server sends session key to client as well as a ticket that contains client's name and session  key, all encrypted with server's key
- Client caches encrypted session key and ticket, which are valid for some period that reduces number of authentication requests to server
- Client forwards ticket to service provider and sends server a timestamp encrypted using the session  key
- Server decrypts ticket and extracts session key
- Server uses session key to decrypt timestamp and checks that timestamp is recent
- If client needs to authenticate server, server encrypts the timestamp with the session key and sends it back to client.
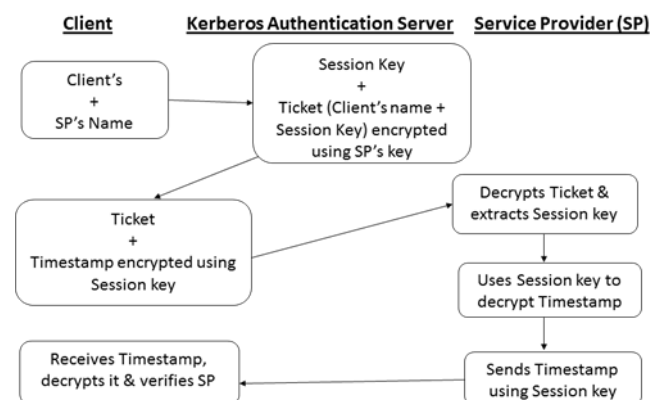


Fig. 2  Authentication process using Kerberos

*3)* *Authentication Systems:* Secure Sockets Layer (SSL): Transport Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL), are cryptographic protocols that provide communication security over the Internet.TLS and SSL encrypt the segments of network connections above the Transport Layer, using asymmetric cryptography for key exchange, symmetric encryption for privacy, and message authentication codes for message integrity.

Several versions of the protocols are in widespread use in applications such as web browsing, electronic mail, Internet faxing, instant messaging and voice-over-IP (VoIP). Every Client authenticates identity of the server by sending a session key from client to server to set up an encrypted communication. Server has a certificate that contains its public key. If client has a certificate, can authenticate itself to the server. The TLS protocol allows client-server applications to communicate across a network in a way designed to prevent eavesdropping and tampering.

Once the client and server have decided to use TLS they negotiate a stateful connection by using a handshaking procedure. During this handshake, the client and server agree on various parameters used to establish the connection's security.

Handshaking procedure between client and server using SSL is as follows:

- The handshake begins when a client connects to a TLS-enabled server requesting a secure connection and presents a list of supported cipher suites (ciphers and hash functions).
- From this list, the server picks the strongest cipher and hash function that it also supports and notifies the client of the decision.
- The server sends back its identification in the form of a digital certificate. The certificate usually contains the server name, the trusted certificate authority (CA) and the server's public encryption key.
- The client may contact the server that issued the certificate (the trusted CA as above) and confirm the validity of the certificate before proceeding.
- In order to generate the session keys used for the secure connection, the client encrypts a random number with the server's public key and sends the result to the server. Only the server should be able to decrypt it, with its private key. From the random number, both parties generate key material for encryption and decryption.
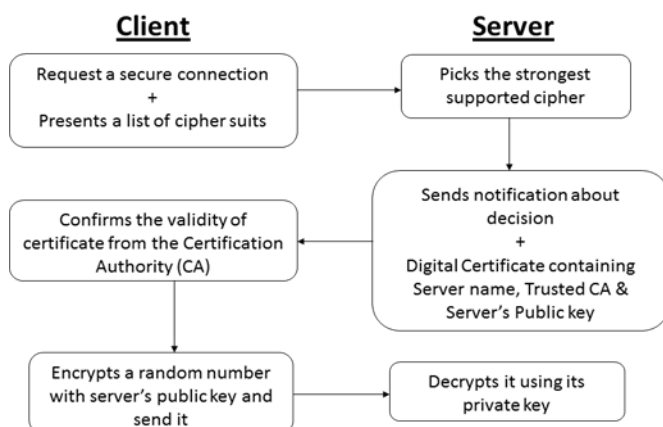


Fig. 3 Handshaking procedure between client and server using SSL

This concludes the handshake and begins the secured connection, which is encrypted and decrypted with the key material until the connection closes. If any one of the above steps fails, the TLS handshake fails and the connection is not created.

*4)* *Digital Certificates and Certification Authorities (CA):* If a grid resource needs to securely communicate with another grid resource, it needs a certificate signed by a CA. Digital certificates are digital documents that associate a grid resource with its specific public key. A certificate is a data structure containing public key and pertinent details about the key owner. A certificate is considered to be a tamper-proof electronic ID when it is signed by the Certification Authority for the grid environment. Certificates do not normally contain any confidential information, and their free distribution does not create a security risk. The technical implementation is such that it is considered extremely difficult to alter any part of a certificate without easy detection. The signature of the CA provides an integrity check for the digital certificate.

Obtaining a client or a server certificate from a CA involves the following steps:

- The grid user requiring certification generates a key pair (private key and certificate request containing the public key). When a grid client wants to start a session with a grid recipient, he or she does not attach the public key to the message, but the certificate instead
- The user signs its own public key and any other information required by the CA. Signing the public key demonstrates that the user does, in fact, hold the private key corresponding to the public key.
- The signed information is communicated to the CA. The private key remains with the client and should be stored securely. For instance, the private key could be stored in an encrypted form on a Smartcard, or on the user's computer.
- The CA verifies that the user owns the private key of the public key presented.
- The CA (or optionally an RA) needs to verify the user's identity. This can be done using out-of-band methods, for example, through the use of e-mail, telephone, or face-to-face communication. A CA (or RA) can use its own record system or another organization's record system to verify the user's identity.
- Upon a positive identity check, the CA creates a certificate by signing the public key of the user, thereby associating a user to a public key. The certificate will be forwarded to the RA for distribution to the user.
- The recipient receives the communication with the certificate and then checks the signature of the Certificate Authority within the certificate. If the signature was signed by a certifier that he or she trusts, the recipient can safely accept that the public key contained in the certificate is really from the sender. This prevents someone from using a fraudulent public key to impersonate the public key owner.
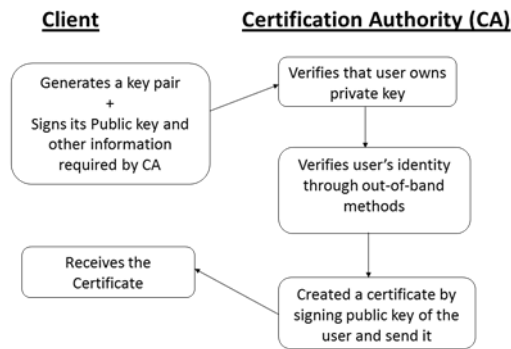
Fig. 5 Process of obtaining a certificate
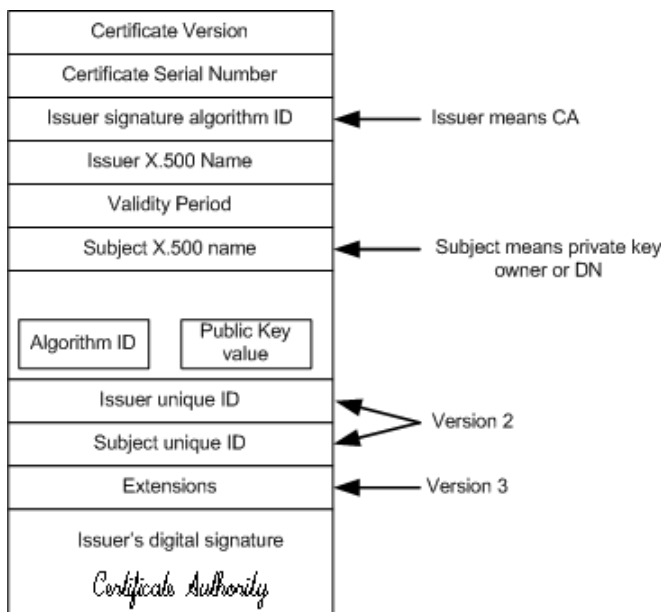


Fig. 4 Graphical depiction of the digital certificate

Certificate can be compared to the passport that serves as an authentication mechanism when this individual travels to foreign countries. Just like passports, digital certificates can subsequently be used for authenticating subjects to other parties that require authentication.

In the grid computing area, the researchers and practitioners have come together to create the Global Grid Forum (GGF) (now called OGF). They have released an open standard called Open Grid Standards Architecture (OGSA). There is a Grid Security Infrastructure (GSI) layer of OGSA which addresses most of the information security challenges mentioned above. A central concept in GSI authentication is the certificate. Every user and service on the grid is identified via a certificate, which contains information vital to identifying and authenticating the user or service.

### B.  Authorization

Another important security issue is that of authorization. Authorization is the process that determines whether a particular operation is allowed. Authorization is important to limit access

for security reasons and also to allow only certain users to access the full capabilities of the network to avoid deadlock by flooding control node with processing requests.  Like any resource sharing system, grid systems also require resource specific and system specific authorizations. That is why the authorization systems can be mainly divided into two categories: VO Level Systems and Resource Level Systems.

*1)  VO Level Systems:* A virtual organization (VO) is defined as a dynamic group of individuals, groups, or organizations who define the conditions and rules (business objectives and policies) for sharing resources.

VO level grid authorization systems are centralized authorization for an entire Virtual Organization (VO). These types of systems are necessitated by the presence of a VO which has a set of users, and several Resource Providers (RP) who own the resources to be used by the users of the VO. Whenever a user wants to access certain resources owned by a RP, he/she obtains a credential from the authorization system which allows certain rights to the users. The user presents the credentials to the resource to gain access to the resource. In this type of systems, the resources hold the final right in allowing or denying the access to the users. Examples of VO level grid authorization systems are Community Authorization Service (CAS) Virtual Organization Membership Service (VOMS), and Enterprise Authorization and Licensing System (EALS).

*2)  Resource Level Systems:* Unlike the VO level authorization systems, which provide a consolidated authorization service for the virtual organization, the resource level authorization systems implement the decision to authorize the access to a set of resources. Therefore, VO level and resource level authorization systems look at two different aspects of the grid authorization. Different resource level authorization Systems are Akenti, Privilege and Role Management Infrastructure Standards Validation (PERMIS), and the GridMap system.

### C.  Integrity and Confidentiality

There is a need to protect data during transmission on network because anyone connected to an open network may observe, insert or possibly remove message. In a grid computing environment where risk is high, one must ensure integrity and confidentiality of the data being transmitted.

Here are some techniques used for creating secure grids as follows:

*1)  Symmetric key encryption:* Symmetric key encryption is based on the use of one shared secret key to perform both the encryption and decryption of data. To ensure that the data is only read by the two parties (sender and receiver), the key has to be distributed securely between the two parties and no others. This form of encryption has performance benefits over asymmetric encryption, but requires additional care and administration in the handling of the shared key. Data Encryption Standard (DES), Advanced Encryption Standard (AES), Triple-DES, RC2 and RC4 are some examples of symmetric key cryptographies.
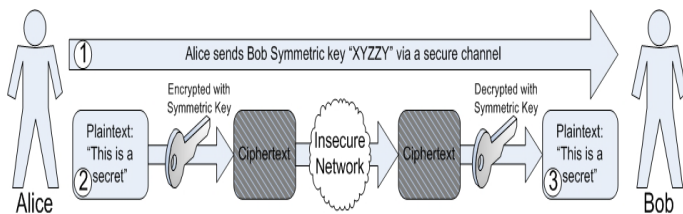
Figure 6 Symmetric key encryption using a shared secret key

The security of the exchange relies on the security of the symmetric key. If an attacker intercepts the symmetric key, the attacker can read the cipher text and he can create new cipher text.

*2)    Asymmetric key encryption:* In public key cryptography, the entities generate public/private key pairs based on some cryptographically secure mathematical function. A message when encrypted by the public key can only be decrypted by the private key corresponding to the public key. The public keys are known to everyone. The asymmetric key pair is generated by a computation that starts by finding two very large prime numbers. Even though the public key is widely distributed, it is practically impossible for computers to calculate the private key from the public key. The security is derived from the fact that it is very difficult to factor numbers exceeding hundreds of digits. This mathematical algorithm improves security, but requires a long encryption time, especially for large amounts of data. For this reason, public key encryption is often used to securely transmit a symmetric encryption key between the two parties, and all further encryption is performed using this symmetric key.
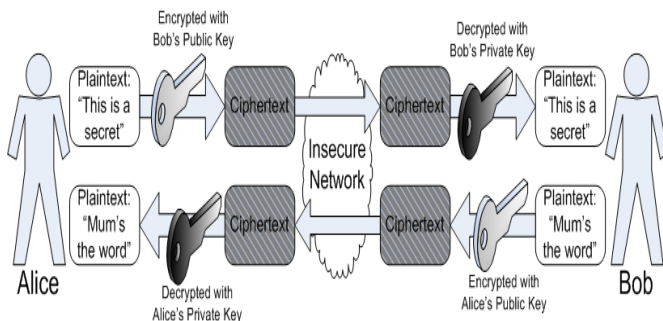


Figure 7 Asymmetric key encryption

Asymmetric key encryption also provides authentication. Only Alice has access to her secret key, so if Bob is able to decrypt a message with Alice's public key, he has assurance that Alice is the author.

## V.    CONCLUSION

Grid computing appears to be a promising trend for three reasons: (1) its ability to make more cost-effective use of a given amount of computer resources, (2) as a way to solve problems that can't be approached without an enormous amount of computing power, and (3) because it suggests that the resources of many computers can be cooperatively and perhaps synergistically harnessed and managed as a collaboration toward a common objective. When building any new environment or implementing a new software application. But while designing a grid, security checks should be performed. These checks will help determine how these new changes will affect the overall security of the environment and any other areas of change. Only effective security implementation in grid would ensure the reliability on grid computing.

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# Crosstalk Analysis between the bitlines of dualport SRAM

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*Abstract-* Crosstalk in VLSI interconnects is a major constraint in DSM and UDSM technology. Among various strategies followed for its minimization, shield insertion between aggressor and victim lines is one of the most prominent options. Placing shields around a victim signal line is a common way to enhance signal integrity while minimizing delay uncertainty. This paper analyzes the extent of crosstalk in capacitive coupled interconnects and minimizes the same through shield insertion. Also design guidelines for shielding in the presence of power/ground (P/G) noise are illustrated in this paper. The effects of P/G noise on crosstalk is analyzed for different line lengths, line widths, and interconnect driver resistances. Considering the P/G noise, a shield line can degrade the signal integrity due to increased P/G noise coupling on the victim line. A *RC* interconnect model is used to investigate the effects of coupling capacitance on the crosstalk noise. Physical spacing and shield insertion are compared in terms of the delay on the victim line for several technology parameters.

Dual port SRAM cells contain a second set of access transistors designed to allow a second read from the cell. As device sizes shrink, the spacing between conductors is reduced to the point where crosstalk between second pair of access runners within the same cell area of a dual port device becomes a significant design issue. Techniques for reducing capacitive coupling between these access lines are considered here. Additionally, the effects of technology scaling on P/G noise and shielding efficiency between bit lines are discussed, and related design tradeoffs are addressed. Design tools used to build circuit schematic is Cadence Virtuoso Design Platform, HSpice Simulator for simulation of schematics and CosmosScope (CScope) for observing the waveforms.

*Index Terms-* Capacitive coupling, Crosstalk, Interconnects, Power/Ground noise, SRAM.

## I. INTRODUCTION

In deep sub micrometer integrated circuits, crosstalk between adjacent interconnect lines has become a primary design issue. With aggressive technology scaling, the local interconnect has become more resistive and capacitive. Capacitive coupling has therefore become a significant design issue in local interconnect. As VLSI technologies scale down, interconnect performance is greatly affected by crosstalk noise due to the decreasing wire separation and increased wire aspect ratio, and P/G noise on crosstalk has become a major bottleneck for design closure.

Although P/G noise has received significant attention in the design of robust power distribution networks, the deleterious effects of P/G noise on shielding methodologies is usually neglected. Here, the effects of P/G noise on crosstalk is analyzed for different line lengths, line widths and interconnect driver resistance, to provide practical and more effective shielding methodologies. Comparisons between physical spacing and shield insertion techniques are provided. Boundary conditions are also identified to determine the efficacy regions of spacing and shield insertion.

## II. SRAM

SRAM is used in cache memory because it is fast to access and can be accessed in a dual ported manner. There are certain factors that have to be considered before selecting a RAM for system design. These design tradeoffs are density, speed, volatility, cost, and features.

The conventional six-transistor (6T) SRAM is built up of two cross-coupled inverters and two access transistors, connecting the cell to the bit lines. The inverters makeup the storage element and the access transistors are used to communicate with the outside. The cell is symmetrical and has a relatively large area. No special process steps are needed and it is fully compatible with standard CMOS processes.

### A. Dualport SRAM

Dual port SRAM cells are fundamentally different from conventional SRAM devices in that they contain a second set of access devices designed to allow a second read or write (or both) path into the cell. The cells are typically planar with all active devices located on the same level of the silicon substrate. This requires that at least a portion of all interconnections for each cell to occupy a common interconnection level. As device sizes shrink, the spacing between conductors is reduced to the point where crosstalk between runners becomes a significant design issue.

In the usual dual port SRAM, the second pair access lines are bit lines. The interconnection layout for this cell is asymmetric with essentially four bit lines per cell and two read lines. To maintain minimum cell size with a given design rule, the four bit lines will generally be the most closely spaced. The word lines are more widely spaced, usually sufficient to avoid undue capacitive interaction. However, from an electrical standpoint, this spacing is the opposite of that desired, since the word line voltage swings are both large, while the read bit lines voltages are relatively small. Thus the lines most susceptible to unwanted capacitive

coupling are read bit lines closely spaced to another line, usually a write bit line.
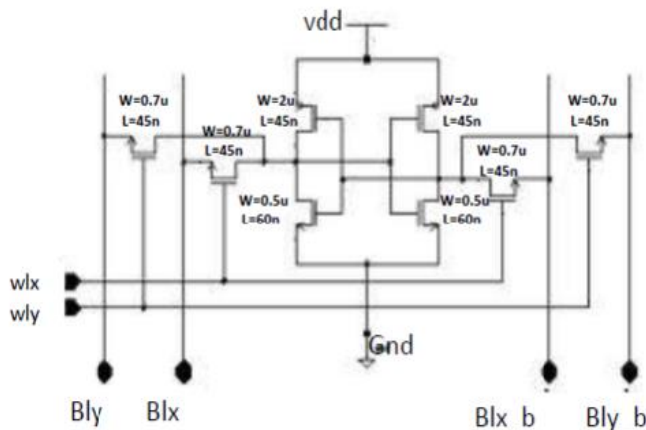


## B. Coupling noise in SRAM

Crosstalk is any phenomenon by which a signal transmitted on one circuit or channel of a transmission system creates an undesired effect in another circuit or channel.

The increased integration density raises the noise level due to inter-signal coupling (capacitive crosstalk) and it can be of two types.

➢   Bit line-to-bit line coupling
➢    P/G noise to bit line coupling

This problem is aggravated in dual port devices which have at least one second pair of access runners within the same cell area. The bit lines of dual port SRAM are modeled as a capacitive – resistive (RC) model. Bit line capacitive coupling causes small coupling voltages on adjacent bit lines, which influences proper sense amplifier operation.
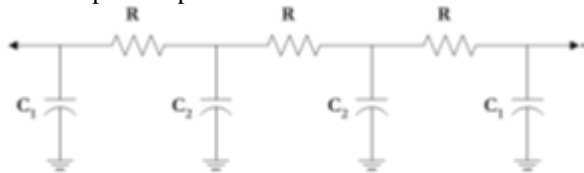


## C. Crosstalk noise reduction techniques

Several techniques can be used to mitigate the effects of crosstalk noise in high complexity integrated circuits. Increasing the physical distance between the aggressor and victim lines can reduce the coupling capacitance and resistance between adjacent lines. The reduction in crosstalk capacitance is approximately inversely proportional with the increase in spacing. The resistance, however, is not significantly reduced with increasing distance since the resistance is not a long range phenomenon. To reduce the resistance, additional return paths should be provided for the current to flow.

Inserting shield lines between the aggressor and victim lines reduces the capacitive and resistive coupling between adjacent blocks. Shield insertion significantly reduces capacitive coupling between the aggressor and victim lines because capacitive coupling is a short range phenomenon and is significantly reduced in non-adjacent lines. Shield insertion moderately reduces the resistance due to the current return path formed by

the inserted shield line for both the aggressor and victim lines. The difficulty in forcing the current return path complicates the inductive shielding process.

Active shielding is another shielding technique in which the shield line switches depending upon the switching pattern of the adjacent bus lines. Capacitive (inductive) coupling is reduced with active shielding when the shield line is switched in the same (opposite) direction as the signal line. The switching activity of the shield lines should therefore be tuned to the switching pattern which is different for non-dominated and dominated interconnects lines. The primary drawback of active shielding is increased power consumption and additional area of the logic circuitry controlling the active shield lines. Furthermore, process and environmental variations may unexpectedly affect the signal arrival times, degrading the efficiency of active shielding.

Sizing the buffer driving the aggressor and victim lines is another technique to reduce crosstalk noise. The effective conductance of the driver increases with larger drivers. For the victim line, a larger driver can be used to maintain the victim line at a constant voltage by increasing the driver conductance. For the aggressor line, using a smaller driver decreases the crosstalk noise since the signal transition is slower due to the increased time constant, decreasing the induced noise on the victim line. Proper sizing of the driver on the aggressor and victim lines can therefore produce lower crosstalk noise. This technique is however subject to delay constraints since a smaller driver increases the gate delay. Wire sizing can also be used to modify the line resistance, coupling capacitance, line-to-substrate capacitance, and self-inductance.

## III.   IMPLEMENTATION

The implementation was done for a dual-port 128X4 SRAM array. Each SRAM cell is a combination of precharge circuit, 8T-SRAM bitcell and a sense amplifier. This array is accessed with the help of a multiplexer.  The bit lines and the shield lines are modeled using RC-model considering the resistance of each line and the capacitance between the lines. Since the mutual inductance is almost nil for very small separation, RC model is considered instead of RLC. The measurements were taken for different widths, sizes and lengths of bitlines and shieldlines.
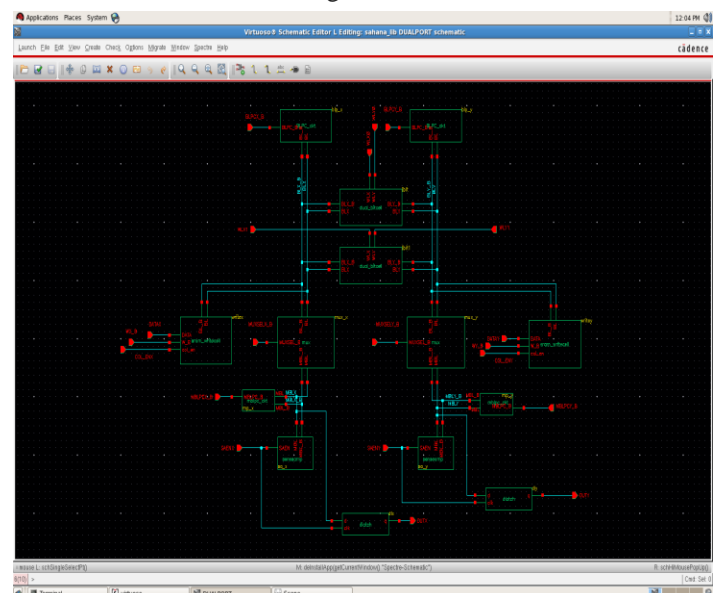
## IV. ANALYSIS

The resistance and capacitance (i.e. ground capacitance and bit line coupling capacitance) – RC parameters change for different

spacing between the bitlines and different widths of the bitlines is listed in the below table.

| Space (µm) | Width (µm) | Resistance (Ω) | c gnd (fF) | c bit (fF) |
|---|---|---|---|---|
| | 0.07 | 387.58 | 8.42 | 15.16 |
| 0.07 | 0.14 | 166.1 | 12.66 | 14.42 |
| | 0.21 | 154.93 | 17.04 | 14.58 |
| | 0.07 | 237.27 | 12.06 | 9.2 |
| 0.14 | 0.14 | 157.95 | 15.67 | 6.46 |
| | 0.21 | 100.78 | 20 | 6.44 |
| | 0.07 | 210.29 | 14.70 | 4.97 |
| 0.21 | 0.14 | 154.93 | 17.68 | 3.33 |
| | 0.21 | 100.78 | 22 | 3.31 |
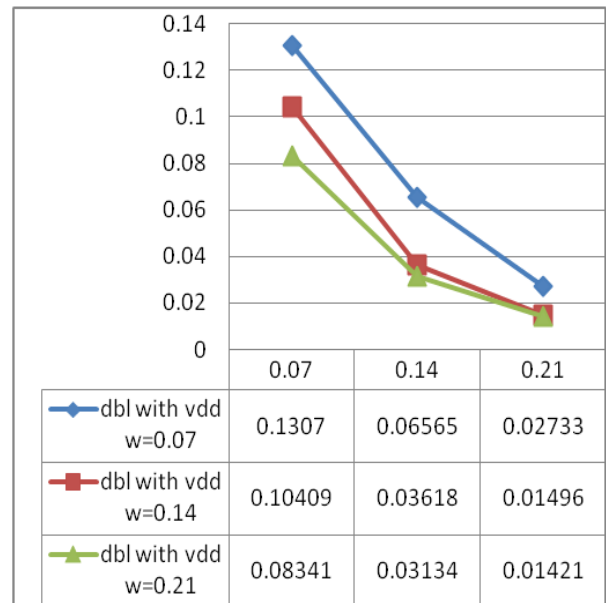
*A. Crosstalk noise comparison with and without shielding*

Shield insertion and physical spacing between adjacent interconnect are evaluated for several bit line widths and separation between the aggressor and victim. A comparison of shield insertion and physical spacing for different widths is illustrated in the figures below for a constant line length of 100um. Note that the distance between the aggressor and victim lines remains the same for both the physical spacing and shield insertion methods.



| | 0.07 | 0.14 | 0.21 |
|---|---|---|---|
| dbl with vdd w=0.07 | 0.1307 | 0.06565 | 0.02733 |
| dbl with vdd w=0.14 | 0.10409 | 0.03618 | 0.01496 |
| dbl with vdd w=0.21 | 0.08341 | 0.03134 | 0.01421 |

*B. Crosstalk noise comparison with and without p/g noise in $V_{DD}$ line*

For the 45nm technology that we are using, P/G noise becomes a significant design issue. The P/G network has become more resistive, increasing the noise within the P/G distribution network, with technology scaling. Additionally, with supply voltage scaling, the noise of the P/G network is more significant. P/G noise is the dominant source of crosstalk noise when the noise is greater than 10% of the supply voltage. Coupling from the aggressor to the victim is the dominant noise source when the P/G noise is less than 2% of the supply voltage. The P/G noise on the shield line reduces the efficiency of shielding because this noise also couples to the victim lines.

## Bit line Width = 0.07



| | 0.07 | 0.14 | 0.21 |
|---|---|---|---|
| dbl with vdd | 0.13076 | 0.10409 | 0.08341 |
| dbl with vdd spike | 0.4016 | 0.24412 | 0.1057 |
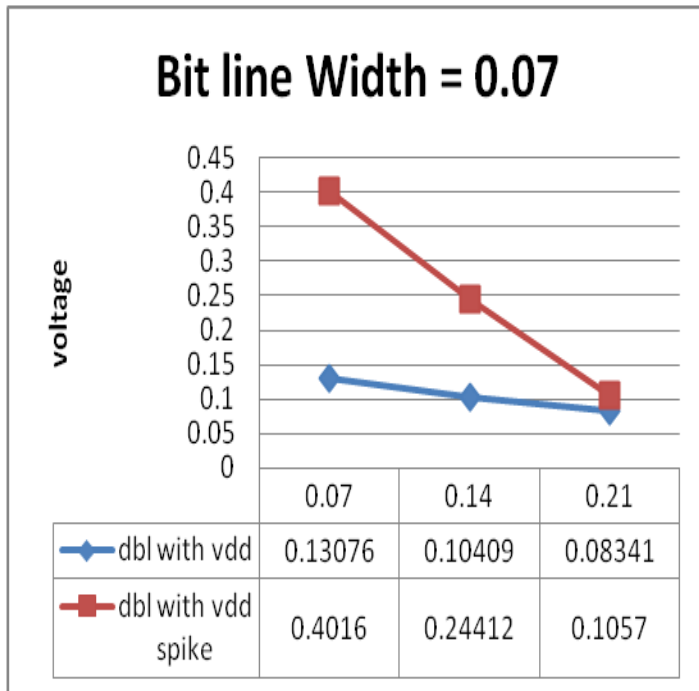
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## V. CONCLUSION

In this paper on *Crosstalk Analysis between the Bitlines of Dualport Sram*, we have given a comprehensive analysis of crosstalk noise with and without shielding and also the effect of shielding line noise have been studied. It can be inferred from the analysis that shielding is preferable for smaller driver resistance and physical spacing is preferable for higher driver resistance of the bit lines. Also shielding is more efficient when the coupling capacitance of the bit lines is higher and wider. We can also see that coupling from the aggressor to victim is dominant source of noise when the P/G noise is absent. The P/G noise is dominant source of crosstalk noise when the noise is greater than 10% of supply voltage. The analysis gives the comparisons for making a optimal trade-off between lower power and noise immunity by using a combination of spacing/shielding depending on the extent of coupling.

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# Condition Monitoring of Gear Box by Using Motor Current Signature Analysis

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*Abstract*- Even though there is a number of condition monitoring and analysis techniques, researchers are in search of a simple and easy way to monitor vibration of a gearbox, which is an important power transmission component in any machinery. In gearboxes, load fluctuations on the gearbox and gear defects are two major sources of vibration. Further, at times, measurement of vibration in the gearbox is not easy because of the inaccessibility in mounting the vibration transducers. Techniques such as wear and debris analysis, vibration monitoring and acoustic emissions require accessibility to the gearbox either to collect samples or to mount the transducers on or near the gearbox. But dusty environment, background noise, structural vibration etc. may hamper the quality and efficiency of these techniques. Hence, there is a need to monitor the gearbox away from its actual location, which can be achieved through Motor current signature analysis (MCSA). An efficient and new but non intrusive method to detect the fluctuation in gear load may be the motor current signature analysis (MCSA). Motor current signature analysis (MCSA) has been the most recent addition as a non-intrusive and easy to measure condition monitoring technique. This analysis system can be used for measuring the characteristics for a perfectly working gearbox and use the data as a standard for measuring faults and defects in other gearboxes.

*Index Terms*- Motor current signature analysis, Condition monitoring, load fluctuations, Gear defects.

## I. INTRODUCTION

GEARBOX are a critical component of all industrial processes and are frequently integrated in commercially available equipment and industrial processes.

The monitoring of a gearbox condition is a vital activity because of its importance in power transmission in any industry. Therefore, to improve upon the monitoring techniques and analysis tools for finding the gear ratios, gear faults, shaft misalignments in the gearbox and the current passing through the motor running the gearbox, there has been a constant improvement in these monitoring techniques. Techniques such as wear and debris analysis, vibration monitoring and acoustic emissions require accessibility to the gearbox either to collect samples or to mount the transducers on or near the gearbox. But dusty environment, background noise, structural vibration etc. may hamper the quality and efficiency of these techniques. Hence, there is a need to monitor the gearbox away from its actual location, which can be achieved through Motor current signature analysis (MCSA) which has already been successfully

applied to condition monitoring of induction motor. Gearbox is an important machinery component in any industry. Any defect in gears lead to machine downtime resulting in a loss of production. A number of techniques have been applied in order to diagnose faults in gears. Fast Fourier transform (FFT) is a versatile technique using which the frequency contents of a signal can be found out. Randal and Hee [1] have cited the efficiency of cepstrum analysis in detecting the small sidebands of the tooth mesh frequency. Bayder and Ball [2] have compared acoustic signature with vibration signature using pseudo-Wigner–Ville distribution (WVD), whereas Stander et al. The objective of this article is to establish motor current signature analysis as the basis of condition monitoring of a multi-stage gearbox. The condition monitoring includes two major sources of vibration: load fluctuation and defects in gears. FFT analysis is used to correlate the components of steady vibration and current signatures. The demerit of this technique lies in the fact that good time resolution will give rise to poor frequency resolution and vice versa, as per the uncertainty principle. Hence, two different sets of data have been acquired to analyse the low-frequency components and the high frequency-components of vibration and current signatures.

## II. BACKGROUND

THE Motor Current Signature Analysis (MCSA) is considered the most popular fault detection method now a day because it can easily detect the common machine fault such as turn to turn short ckt, cracked /broken rotor bars, bearing deterioration etc. The present paper discusses the fundamentals of Motor Current Signature Analysis (MCSA) plus condition monitoring of the induction motor using MCSA. In addition, this paper presents four case studies of induction motor fault diagnosis.[1] Modern rotating machinery often takes advantage of new designs of used gearwheels and rolling bearings. Usage of these new components enables machine to work quieter, increase its reliability, and lengthen working life. Machine vibration analysis belongs to important methods used for rotating machine conditions monitoring.[2] An automatic feature extraction system for gear and bearing fault diagnosis using wavelet-based signal processing. Vibration signals recorded from two experimental set-ups were processed for gears and bearing conditions. Four statistical features were selected: standard deviation, variance, kurtosis, and fourth central moment of continuous wavelet coefficients of synchronized vibration signals (CWC-SVS).[3] How current signature analysis can reliably diagnose rotor winding problems in induction motors. Traditional CSA

measurements can result in misdiagnosis and/or false alarms of healthy machines due to the presence of current frequency components in the stator current caused by non-rotor related conditions such -as mechanical load fluctuations, gearboxes, etc. Through theoretical advancements, it is now possible to predict many of these components, therefore making CSA testing a technology that is much more robust and less error prone[4]. The main components in gear vibration spectra are the tooth-meshing frequency and its harmonics, together with sideband structures due to modulation effects. Sideband structures can be used as an important diagnostic symptom for gear fault detection. The main objective of the present paper is to unravel amplitude modulation effects which are responsible for generating such sidebands.[5]

## III. MOTOR CURRENT SIGNATURE ANALYSES

A Common approach for monitoring mechanical failures is vibration monitoring. Due to the nature of mechanical faults, their effect is most straightforward on the vibrations of the affected component. Since vibrations lead to acoustic noise, noise monitoring is also a possible approach. However, these methods are expensive since they require costly additional transducers. Their use only makes sense in case of large machines or highly critical applications. A cost effective alternative is stator current based monitoring since a current measurement is easy to implement. Moreover, current measurements are already available in many drives for control or protection purposes. However, the effects of mechanical failures on the motor stator current are complex to analyze. Therefore, stator current based monitoring is undoubtedly more difficult than vibration monitoring. Another advantage of current based monitoring over vibration analysis is the limited number of necessary sensors. An electrical drive can be a complex and extended mechanical systems. For complete monitoring, a large number of vibration transducers must be placed on the different system components that are likely to fail e.g. bearings, gearboxes, stator frame, and load. However, a severe mechanical problem in any component influences necessarily the electric machine through load torque and shaft speed. This signifies that the motor can be considered as a type of intermediate transducer where various fault effects converge together. This strongly limits the number of necessary sensors. However, since numerous fault effects come together, fault diagnosis and discrimination becomes more difficult or is sometimes even impossible. A literature survey showed a lack of analytical models that account for the mechanical fault effect on the stator current. Most authors simply give expressions of additional frequencies but no precise stator current signal model. In various works, numerical machine models accounting for the fault are used. However, they do not provide analytical stator current expressions which are important for the choice of suitable signal analysis and detection strategies. The most widely used method for stator current processing in this context is spectrum estimation. In general, the stator current power spectral density is estimated using Fourier transform based techniques such as the periodogram. These methods require stationary signals i.e. they are inappropriate when frequencies vary with respect to time such as during speed transients. Advanced methods for non-stationary signal analysis are required.

## IV. GEAR BOX FAULT ANALYSIS USING FFT BASED POWER SPECTRUM

### A. Bearing fault analysis

THE bearing consists of mainly of the outer race and inner race way, the balls and cage which assures equidistance between the balls. The different faults that may occur in bearing can be classified according to the affected element are as follow,

1) Outer raceway defect.
2) Inner raceway defect.
3) Ball defect.

The relationship of bearing vibration to the stator current spectra can be determined by remembering that any air gap eccentricity produces anomalies in the air gap flux density. Since ball bearings support the rotors, any bearing defect will produce a radial motion between the rotor and stator of the machine. The mechanical displacement resulting from damaged bearing causes the machine air gap to vary in a manner that can be described by a combination of rotating eccentricities moving in both directions. Due to rotating eccentricities, the vibrations generate stator currents at frequencies given by

$$f_{bearing} = f_1 \pm m\, f_{io} \qquad (1)$$

where m=1,2,3,4…….and $f_{io}$ is one of the characteristic frequencies which are based upon the bearing dimension

$$f_{io} = \frac{N_b}{2} \times f_r \left(1 \pm \left(\frac{D_b}{D_c}\right) \times cos\beta\right) \qquad (2)$$

Where,
$N_b$ = number of bearing balls.
$f_r$ = mechanical rotor speed in hertz.
$D_b$ = Ball diameter.
$D_c$ = Bearing pitch diameter.
$\beta$ = Contact angle of the balls on the races.

It should be noted from 2 that specific information concerning the bearing construction is required to calculate the exact characteristic frequencies. However, these characteristics race frequencies can be approximated for most bearings with between six and twelve balls.

$f_o = 0.6\, N_b\, f_r \qquad (3)$
$f_i = 0.4\, N_b\, f_r \qquad (4)$

Thus from above equation we can calculate expected fault frequencies for inner race fault and outer race fault at various load condition.

In order to diagnose the bearing fault of gearbox, above experimental setup will be use. The bearing of gearbox is single row, deep groove ball bearing, type 6206. Each bearing has eight balls. Experiments will conduct on four bearings; two of these are undamaged while two bearing will damage as shown in fig. 5.3 and 5.4.

**Figure 1: Damage Bearing**



Figure 3: Gear tooth break

## B. Gear fault analysis

GEARS are used to transmit motion from one shaft to another or between the shafts. In most systems, the gear forms a part of the mechanical load that is coupled to an electrical device, which usually is an electric motor .Several faults can occur in the gear arrangement. A gear often consists of a pinion and a driven wheel. The motor is coupled to gear box. A gear defect such as a damaged tooth produces an abnormality in the load torque seen" by the motor. This abnormality is transferred to the motor current from the load. Depending on the abnormality, unique frequencies can be seen in the current frequency Spectrum. Mechanical oscillations in gear box changes the air-gap eccentricity results in changes in the air-gap flux waveform. Consequently this can induce stator current components given by

$$f_e = f_1 \pm m\,f_r \quad (5)$$

$f_1$ = supply frequency
$f_r$ = rotational speed frequency of the rotor
m = 1,2,3.............harmonic number
$f_e$ = current components due to airgap changes

As seen from above, mechanical oscillations will give rise to additional current components in the frequency spectrum. Gearboxes may also give rise to current components of frequencies close to or similar to those of broken bar components. Specifically, slow revolving shafts will give rise to current components around the main supply frequency components as prescribed by equation (5).

In order to diagnose the gear fault of gearbox, above experimental setup will be use. The gear of gearbox is spur gear. Experiments will conduct on two gears; one of these are undamaged while other will be were gear.
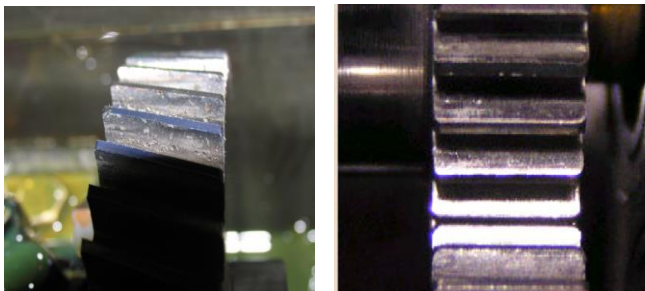


**Figure 2: Were gear.**

## V. EXPERIMENTAL SETUP

IN order to diagnosis the fault of gear box, motor current analysis method use. Block diagram of these two experimental setup as shown in figure. Experimental setup consists of single phase DC motor, single stage spur gear box, Resistance, data acquisition card, Pentium-4 computer with softwear Labview. LabVIEW 2010 software is used to analyze the signals. It is easy to take any measurement with NI LabVIEW. The measurements can be automated from several devices and data can be analyzed spontaneously with this software. Data acquisition card are used to acquire the current samples from the motor under load. NI M Series high-speed multifunction data acquisition (DAQ) device can measure the signal with superior accuracy at fast sampling rates. This device has NI-MCal calibration technology for improved measurement accuracy and six DMA channels for high-speed data throughput. It has an onboard NI-PGIA2 amplifier designed for fast settling times at high scanning rates, ensuring 16-bit accuracy even when measuring all channels at maximum speeds. This device has a minimum of 16 analog inputs, 24 digital I/O lines, seven programmable input ranges, analog and digital triggering and two counter/timers. The PCI-6251 data acquisition card which is used in experiment.
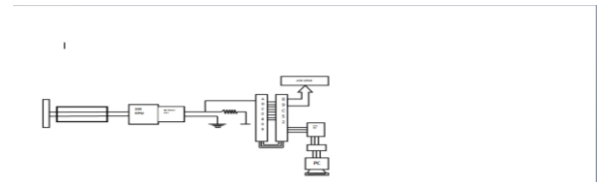


**Figure 4: Experimental Setup**

**Table I : Expected fault frequencies for input shaft Inner race Of bearing at various load conditions**

| load | speed | frequency(fr) | frequency(f$_i$) | fault frequency | |
|------|-------|---------------|------------------|-----------------|--------|
|      |       |               |                  | m =1            | m =2   |
| 0    | 1000  | 16.666        | 79.99            | 79.99           | 159.99 |
| 2    | 890   | 15.833        | 75.98            | 75.98           | 151.968 |
| 5    | 830   | 14.80         | 69.19            | 69.19           | 138.38 |
| 8    | 830   | 13.834        | 64.38            | 64.38           | 128.76 |
| 10   | 770   | 12.60         | 59.29            | 59.29           | 118.58 |

**Table II : Expected fault frequencies for input shaft outer race Of bearing at various load conditions**

| load | speed | frequency(fr) | frequency(f_i) | fault frequency | |
|---|---|---|---|---|---|
| | | | | m =1 | m =2 |
| 0 | 1000 | 16.6666 | 13.33 | 13.33 | 26.66 |
| 2 | 890 | 15.8333 | 11.46 | 11.46 | 22.93 |
| 5 | 830 | 14.80 | 9.8656 | 9.865 | 19.73 |
| 8 | 830 | 13.834 | 8 | 8 | 16 |
| 10 | 770 | 12.60 | 5.866 | 5.866 | 11.73 |

**Table III :Expected fault frequencies for Input shaft wear gear at various load conditions**

| load | speed | frequency(fr) | fault frequency | |
|---|---|---|---|---|
| | | | m =1 | m =2 |
| 0 | 1000 | 16.6666 | 16.6666 | 33.333 |
| 2 | 890 | 15.83333 | 15.83333 | 31.6667 |
| 5 | 830 | 14.80 | 14.80 | 29.66 |
| 8 | 830 | 13.834 | 13.834 | 27.66 |
| 10 | 770 | 12.60 | 12.60 | 25.66 |

**Table IV: Expected Fault Frequencies for input Shaft one broken teeth gear at Various Load Conditions**

| load | speed | frequency(fr) | fault frequency(mfr) | |
|---|---|---|---|---|
| | | | m =1 | m =2 |
| 0 | 980 | 16.33 | 16.33 | 32.66 |
| 2 | 820 | 13.66 | 13.66 | 27.33 |
| 5 | 740 | 12.33 | 12.33 | 24.66 |
| 8 | 700 | 11.66 | 11.66 | 23.33 |
| 10 | 660 | 11 | 11 | 22 |

**TableV: Expected Fault Frequencies for input Shaft two broken teeth gear at Various Load Conditions**

| load | speed | frequency(fr) | fault frequency(mfr) | |
|---|---|---|---|---|
| | | | m =1 | m =2 |
| 0 | 910 | 15.25 | 15.25 | 30.50 |
| 2.5 | 760 | 12.66 | 12.66 | 25.33 |
| 5 | 680 | 11.33 | 11.33 | 22.66 |
| 8 | 600 | 10 | 10 | 20 |

| 10 | 550 | 9.16 | 9.16 | 18.33 |

## VI. RESULTS AND DISCUSSION

The experiments have been performed to detect bearing fault, wear gear, broken teeth gear in gearbox using Lab VIEW software. Gearbox is tested with three different defective conditions. Defective condition generates eccentricity in the air gap with mechanical vibrations. The air gap eccentricity causes variation in the air gap flux density that produces visible changes in the stator current. These changes are determined in power spectrums of motor due to different fault. Bearing fault, wear gear, broken teeth gear in gearbox are diagnosed under no load and full load.
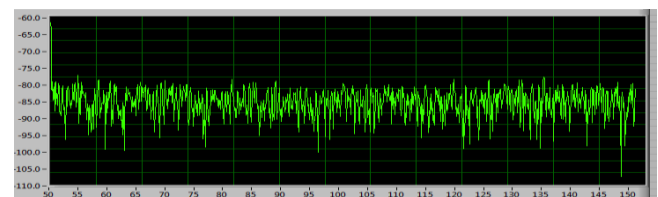


**Frequency [Hz]**
**Figure5: Power spectrum of healthy gearbox under no load condition**
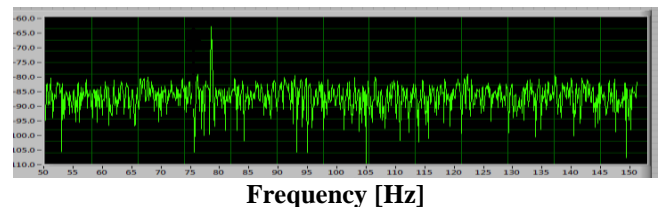


**Frequency [Hz]**
**Figure6: Power spectrum of faulty gearbox with inner race of bearing under no load condition (m=1)**
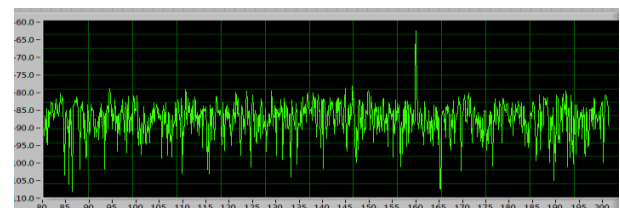


**Frequency [Hz]**
**Figure7: Power spectrum of faulty gearbox with inner race of bearing under no load condition (m=2)**
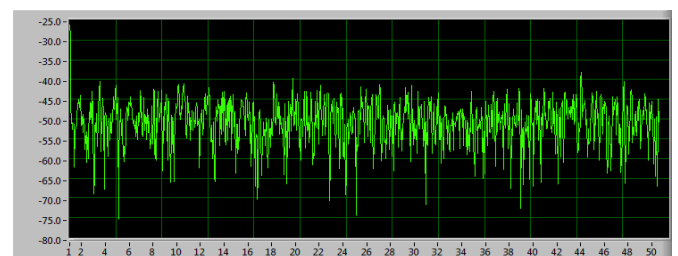


**Frequency [Hz]**
**Figure8: Power spectrum of healthy gearbox under no load condition**
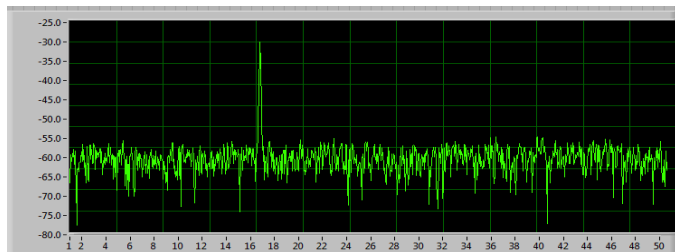
**Figure9: Power spectrum of faulty gearbox with input shaft wear gear under no load condition (m=1)**
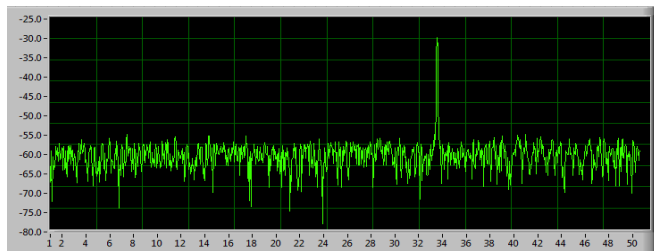


**Figure10: Power spectrum of faulty gearbox with input shaft wear gear under no load condition (m=2)**
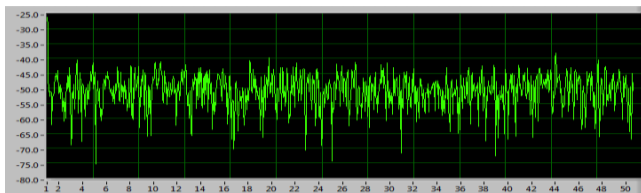


**Figure 11: Power spectrum of healthy gearbox under 10kg load condition**
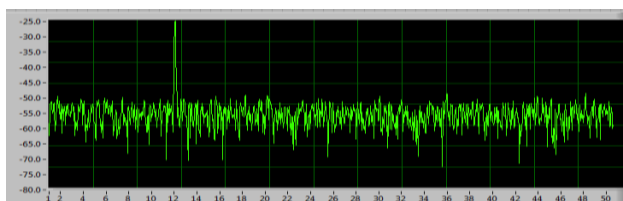


**Figure12: Power spectrum of faulty gearbox with input shaft wear gear under 10kg load condition (m=1)**
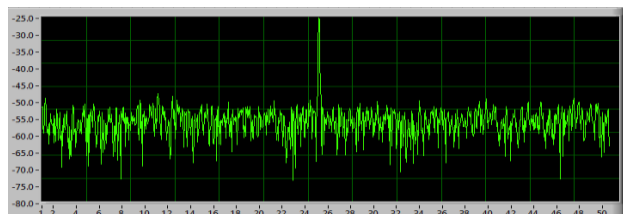


**Figure13: Power spectrum of faulty gearbox with input shaft wear gear under 10kg load condition (m=2)**
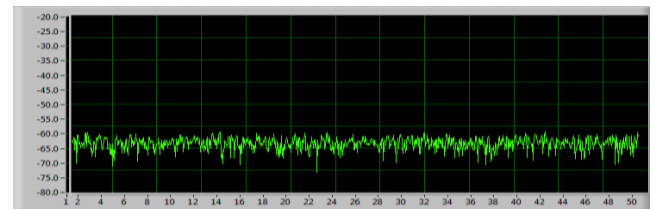


**Figure14: Power spectrum of healthy gearbox under no load condition**
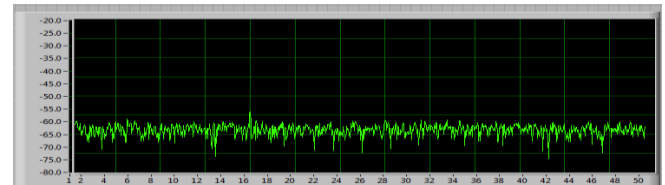


**Figure15: Power spectrum of faulty gearbox with fault gear under no load condition (m=1)**
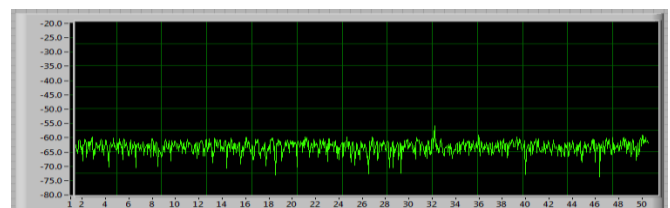


**Figure16: Power spectrum of faulty gearbox with fault gear under no load condition (m=2)**
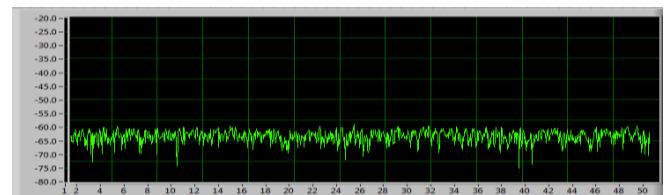


**Figure 17: Power spectrum of healthy gearbox under 10 load condition**
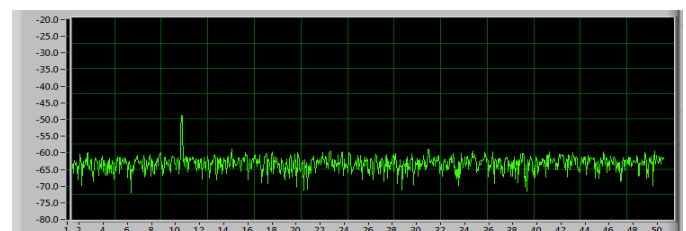


**Figure18: Power spectrum of faulty gearbox with fault gear under 10 load condition (m=1)**
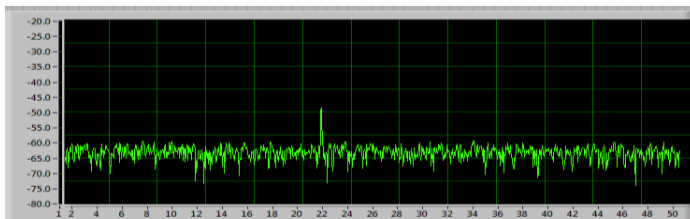
**Frequency [Hz]**
**Figure19 Power spectrum of faulty gearbox with fault gear under 10 load condition (m=2)**

## VII.   CONCLUSIONS

The aim of this research is to advance the field of condition monitoring and fault diagnosis in gearbox operating under different load conditions. The common types of faults in gearbox are studied in the project. The various types of current based condition monitoring and fault diagnosis techniques are reviewed. The main aim of the research work is to diagnose the common mechanical faults experimentally with help of suitable signal processing techniques. In order to perform accurate and reliable analysis on gearbox, an experimental set up is designed that can accurately repeat the measurements of signals and can introduce a particular fault of the gearbox faults. In the present research work, Lab VIEW environment is used to diagnose the faults with direct online condition monitoring.

This research work investigates the feasibility of detecting mechanical faults such as bearing failure and wear gear failure, gear tooth broken failure using the spectrum of current of a motor. Defective bearings, wear gear failure, gear tooth broken failure generate eccentricity in the air gap with mechanical vibrations. The air gap eccentricities cause vibrations in the air gap flux density that produces visible changes in the current spectrum. The signal processing techniques FFT are applied to detect the bearing fault and gear faults of gearbox. Experimental results show that the characteristic frequencies could not seen in the power spectrum if bearing fault and gear fault are small in size. As severity of fault increases, the characteristic frequencies become visible. In the research work, an experiment has also been conducted to detect the gear box fault.

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# Relationship between anthropometric parameters and physical self-esteem in overall motor disability among practitioners a physical activity

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*Abstract-*The aim of our research was to identify the importance of increasing self-esteem and overall physical satisfaction starting from a comparison between two engines disabled practitioners physical activity groups and not practitioners, with using of "self-esteem Rosenberg (1965) scale.".The results shows the existence of a significant difference between the scores of the rate of self-esteem of the disabled and non-practicing practitioners engines for those insertions within sports associations and engage in physical regular activities. The relationship between global self-esteem among the physically disabled practitioners and % body fat are strongly related (r = 0.7, p < 0.01). It has been proven that the sport positively affects the overall self-esteem and physical disability practitioners engine which is why we stress the importance of sport for people with physical disabilities, which will enable them to see themselves as useful and active members of society and thus to facilitate their reintegration.

*Index Terms:* self-esteem**,** motor disability, integration

## I-INTRODUCTION

The word "disability" comes from the word "Hand in cap" which means (hand in the hat).It is a disadvantage for the individual regardless of their physical or moral incapacity.There are several types of disabilities: physical (sensory, motor, chronic diseases, etc..), Mental (neuropsychological, dyslexia), primitive.  The motor disability is an individual with a limitation of action due to a significant impairment (Manga, 2009). According to the mechanisms of motor disability are: a motor impairment (nerves, muscles, bones), malformations (developmental disorders), diseases (congenital, hereditary or acquired), stroke (cardiovascular events), traumatic injuries (skull, skeleton, spinal, amputation) and aging. The motor disability caused by brain injury or neuromuscular. Roger (2006), this type of disability may affect a member or the entire body.Thus, people with this disability move either standing with the help of a cane or wheelchair. In practice, the motor impairments create a nuisance or hindrance to travel, gripping objects and sometimes speech

Being with disabilities can generate physical pain associated with a disease, trauma.But there is a more insidious suffering, which has little to do with the painful consequences of any disease. This suffering is moral and directly related to the image that people with disabilities have themselves. (FNSMR, 2008). But this self-perception is greatly influenced by the look that people called "valid" are on disability. Each culture generates a set of representations, beliefs and conventions, which are expressed through our attitudes, our language, our looks. Skin color, religious orientation. Disability, and are characteristic or stigma to "classify" our fellows in a particular category. Therefore any person, whether with disabilities or not, see "paste" a sensible attribute "summary" and identify the person as a member of a particular group, and in this case, the disabled. This attribute, which refers to any time a degraded self-image helps to change the behavior of people with disabilities in the context of others, and their relationship to their difference. The disabilities and generates emotional suffering can lead to different types of attitudes or behaviors that can manifest as a withdrawal up

to the marginalization or, conversely, a provocative statement itself leading to excessive risk-taking (especially in sports). Then it is a long way to go to accept the view of others (sometimes fleeting, sometimes benevolent see overprotective. (FNSMR, 2008).

According Ammar.A (1985), the problem of disability is that of social misfits, the elderly, in a word for the poor, a problem that begins to arise in our society that enriches and who wants an individualistic consumer society and competitive.  But this model of society leaves little for the poor and needy. We have seen that this problem arises in favor of domestic and external pressures. This writes a spastic in a section of the release entitled "Statute for the physically disabled": "In Tunisia, he writes, this category of people living away from social life, except for a few exceptional cases. they are hundreds to the margins of normal life, isolated and embittered at home or in the hospital. Idea of a possible social and professional integration would be foolish for them" (Ammar, 1985).

According Hamonet (1992), disability is a deep narcissistic reached. Body modifications will cause a readjustment of postural pattern adjustment is straight to the focus of the subject's attention on the affected area. The importance of motor impairment on the subject's personality and achievement, including body image depends on both the age of the patient at the onset of disability and On the other hand both reactions environment facing event that conditions of life of the individual. Indeed, seen in the mirror is not the same because of the physical alteration occurred. " People with disabilities are less considered devoid of physical possibilities. (Garel, 1996). They gradually access to sports and recreation and the legislature clearly stated today that handicapped students should benefit as other teaching in Physical Education (Garel, 1996). In this context, Garel in 1996 postulates that "the sport and physical activity can play a major role in the restoration of a sense of competence and self-esteem of people with disabilities. The practice of rewarding activities (in terms of success in practice) actually contributes to the enhancement of a sense of competence, including physical skills. If the sport is necessary to stay in shape on both the physical and moral practice this is more for the physically disabled who lack of movement can cause the deterioration of functions that have remained valid. " The objective of this study is to investigate the relationship between anthropometric parameters and physical self-esteem and overall motor disabilities in physically active. So the question that arises here is "the sport it is the notion of self-esteem and overall satisfaction with physical disabilities engines? Our hypothesis was that the overall self-esteem and physical self-esteem among people with physical disabilities develop through sport. Inded, the practitioners sport physically disabled have a degree of self-esteem and overall physical higher than non-disabled practitioners.

## II-METHODS

*1-Subjects:*

All procedures were approved by the Institutional Review Committee for the ethical use of human subjects, according to current national laws and regulations. Participants gave written informed consent after receiving both a verbal and a written explanation of the experimental protocol and its potential risks. Subjects were told that they could withdraw from the trial without penalty at any time. Our study population consisted of 24 healthy motor disabilities varied disabilities, which are divided into two groups: the average age and size of our subjects are $17.5 \pm 0.5$ years and $160 \pm 3$ 89. The first groupe N = 12, active drivers with disabilities (AD), various practitioners sporst (hammer throw, running on the treadmill ...) belonging to the sports association.  The second groupe N = 12, disabled inactive motors (DI), and are not included within sport associations (table 1).

Table 1. Anthropometric characteristics of the subjects

| Parameters | Group (AD) | Group (DI) |
|---|---|---|
| | Mean & SD | |
| Age (years) | $17,5 \pm 0,5$ | |
| Weight (Kg) | $57 \pm 0,5$ | |
| Height (cm) | $160 \pm 3,89$ | |

| % Body fat | 13,167 |
|---|---|

*2-Evaluation and procedures:*

*-Rosenberg's Self-Esteem Scale (RSE).*

To conduct our study we used the Rosenberg scale (1965) for the global self-esteem or Rosenberg's Self-Esteem Scale (RSE). The Rosenberg scale is composed of 10 questions covering the global self-esteem, its execution does not exceed 2 to 3 minutes where he asked subjects to respond if: (See.,e. Rosenberg 1965).    We used the 10-item Rosenberg in 1965 to measure global self-esteem and self-esteem of both physical disability groups (practicing and non-practicing). Completion of the questionnaire was accompanied by a profound explanation of the tests and an explanation of the questionnaire in Arabic.

*-Anthropometric Measures*

Anthropometric measurements were performed using a standard anthropometric kit (type Harpenden, Switzerland). Weight was measured using a calibrated weighing scale. Height was measured using a graduated measuring rod in (cm). Pliers skin folds was used for the measurement of skinfolds (biceps, triceps, subscapular and supra iliac). The estimation of fat is calculated from the formula of Claude Pineau (2009) for adolescents:

% BF = 0.783 * [triceps (mm) + subscapular (mm)] + 1.6

*3-Statistical Analyses:*

Means and SDs were calculated using standard statistical methods. The means is a dispersion index, which tells us about the importance of fluctuations of different values (x) at the turn of the mean (m) can be calculated by the following formula: $Sx = M / N$ .Where: M: Medium ; Sx: Sum of x ; N: Number ; X: Note to self-esteem. The variance of each sample is calculated separately calculation of the common variance and calculate the standard deviation. The  *t* student was calcluted.

### III-RESULTS

The chart above shows the existence of a significant difference between the scores of the rate of self-esteem of the disabled and non-practicing practitioners engines for those insertions within sports associations and engage in physical regular activities, this is justified by the value of Student's t (6.67, p <0.0001). The relationship between global self-esteem among the physically disabled practitioners and % body fat are strongly related this is reflected in the respective values of the regression coefficient r = 0.7 , p < 0.01. In this study group resulted in the appearance of the% body fat is 49% of the overall self-esteem, which is justified by the value of R ² is equal to 0.49. The relationship between the rate of the overall self-esteem and physical representation justified by the percentage of body fat (% BF) are not strongly linked. This is evidenced by the regression coefficient *r* = 0.43 and the value of $R^2 = 0.19$. In this population, the percentage of body fat is only 19% of the overall self-esteem.

### IV-DISCUSSION

There is evidence, then, according to the results, the sport has an influence on self-esteem and physical representation. We conclude then that the physically challenged practitioners in regular physical activity have a level of self-esteem and higher than non-practitioners overall physical satisfaction. The study show that our two hypotheses "the sport develops self-esteem and overall self-esteem in physical physically handicapped" and "disabled practitioners have a degree of self-esteem and overall physical higher than non disabled practitioners "are confirmed. The Self-esteem is defined as the feeling that everyone has its own value. It is the process by which an individual focuses on himself, on his performances and football skills, positive or negative judgments. At this level Coopersmith (1984) posits that self-esteem is an expression of approval or disapproval given to oneself, it indicates how an individual feels able, valuable, and important. Self-esteem is an inner attitude, it is important to know ourselves, to love ourselves as we are. So

must the physically disabled learn to accept, appreciate, know their tastes, their needs, their capabilities and their limitations. To increase their self, they need a change of attitude, a vision of life and of themselves that is positive and realistic.

The sport is one of the ways that we can achieve this by acting on certain psychological dimensions such as improving self-esteem. Because it involves the body, but also because it does not involve the body independent of other determinants of behavior, it also contributes to the cognitive, affective and relational abilities of the subject. A handicapped person can therefore expect a sports physical benefits, psychological and autonomy, thus improving the quality of reintegration. The physical benefits are the same as for valid: muscle strength, joint flexibility, hand coordination, fatigue. The exercise is also a way to avoid the evils of inactivity or immobility, stiffness, orthopedic deformities, cardiovascular mismatch . The psychological contribution of sport lies in the restructuring of body image and improved self-esteem, self-confidence, assertiveness, confirmation of self, self-acceptance, motivation ....

A study by Cazenave (2005), on the relationship between sport and physical activity and self-esteem in young people with congenital malformation of the foot idiopathic clubfoot shows that teens involved in physical activity have more self- esteem and a better self-perception that adolescents who did not practice any sport. In addition, it has shown that low self-esteem is associated with depressive disorders. These relationships are very important especially for people who suffer from physical disabilities. Thus, the practice of physical activity may be a means of enhancing self-esteem and self-perception, and can have a positive effect on depression. In this context, it was noted that research in Physical Education and sport psychology have confirmed the importance of the perception of the body in building self-esteem. This work has demonstrated that the development of physical perceived value contributes to strengthening self-esteem and a certain level of confidence was required to maintain the commitment of a subject in a physical practice.

This is the reason why the improvement of self-esteem has become a priority in some physical education programs. In the UK, for example, one of the eleven objectives of the physical education program is to strengthen the self-esteem of students. Similarly, one of the priorities of stakeholders in physical activity is to restore the self-image of mentally or physically handicapped subjects. Therefore, the perception of the body plays an important role in building self-esteem, especially among the physically disabled. Where a positive perception of the body involved in well-being and facilitate their relationships with others.

## V-CONCLUSION

The dimension of self-esteem occurs as a major psychological need in the composition of our personality. Self-esteem is not everything, but without it, there is nothing. This quality is the focus of all our sensations. " Self-esteem is thus part of a dynamic process that can change our attitudes and behavior. It affects self-confidence, assertiveness and self-image is the ability to manage the behavior and affects motivation. Therefore, in this study we tried to identify the importance of sport in increasing self-esteem and overall physical satisfaction starting from a comparison between two groups of disabled practitioners engines physical activity and non-practicing, and using as a yardstick the "self-esteem Rosenberg (1965) scale." It has been proven that the sport positively affects the overall self-esteem and physical disability practitioners engine which is why we stress the importance of sport for people with physical disabilities, which will enable them to see themselves as useful and active members of society and thus to facilitate their reintegration.

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# An evaluation of the performances of Global Climate Models (GCMs) for predicting temperature and rainfall in Zimbabwe

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**Abstract:** A global climate model (GCM) should be able to reproduce features of the distribution of the regional to local-scale climate in which it is applied. Such features include: the climatological mean, correlation, monthly or daily variance, thresholds, extremes etc, of the distribution of climate variables of interest. Most researchers need to know how GCM simulations vary depending on climatic variables, the choice of GCM and place. These variations can be understood by studying the descriptive statistics above, and inference can be made based on these sample statistics. However, there is no standard approach to test the features above in order to determine the skill of GCMs. In this paper, we focus on correlation and regression to evaluate the performances of five coupled global climate models for simulating monthly rainfall, minimum and maximum temperatures at five stations in northeastern Zimbabwe. We use observed historic climatic data (rainfall and air temperature) as well as downscaled model predictions of the same parameters. The global climate models used were the same as those used by the Intergovernmental Panel on Climate Change (IPCC) in formulating the IPCC Special Report on Emissions Scenarios (SRES). The GCMs were evaluated by comparing observed historic climatic data with hindcast downscaled model predictions. We use the error measures for correlation to assess model performance: coefficient of determination ($R^2$), root mean square error (RMSE) and model efficiency (ME). For each model, a $t$-test was performed at 5 % level of significance to assess the usefulness of the correlation between observed and simulated data. Comparison of the error measures reveals that the GCMs simulate temperature better than rainfall and therefore there is more confidence in predictions of temperature than rainfall. The performance of individual GCMs informs the research community of the need to select better GCMs for multi-model climate predictions. Global climate model performance varied from place to place i.e. the GCMs were site specific and therefore a GCM may need to be calibrated each time it is transferred to a different region.

**Index Terms:** *global climate model, correlation, error measures, inference*

## 1.0 Introduction

Despite limitations that lead to uncertainties, global climate models (GCMs) have consistently provided a robust and unambiguous picture of the climate system [1]. Currently, there is considerable confidence in global climate model simulations mainly because GCM principles are based on well established fundamental laws of physics such as conservation of mass, energy and momentum [2]. In addition, another source of confidence lies in the models' ability to simulate important aspects of the current and past climates as well as their changes [3]. Multi-model climate predictions have in recent years demonstrated that combining models generally increases the skill, reliability and consistency of model predictions [4]; [5]; *[6];* [7]; [8]; [9]. A wide range of measures of climate model skill have been developed over the past decade for example, [10]; [11]; [12]; [13]; [14]. All provided measures of model skill using monthly to annual time-scale data, sometimes over ensemble means of several climate models. However there

is no standard approach to determine the skill of GCMs. In this paper, we use a simple statistical approach, the correlation to study the skill of global climate models.  Many researchers have recently been able to quantify GCM performance in simulating various climate variables [15]; [16]; [17]; [18]; [19]; [20], but such work has not yet received well documentation in Zimbabwe. We evaluate five GCMs for simulating monthly rainfall, minimum and maximum temperatures at some selected sites in Zimbabwe. The global climate models used were the same as those used by the Intergovernmental Panel on Climate Change (IPCC) in formulating the IPCC Special Report on Emissions Scenarios (SRES).  Although more than five GCMs were available in the ensemble, our selection of the five was based on the following criteria: (i) only well established models were considered, those that are extensively described in peer-reviewed scientific literature [21]; [22]; [15] and  (ii) only models that perform adequately in inter-comparison studies [23]. The paper is organized as follows: Section 2 describes the materials and methods used in this study. Main results and discussion are presented in section 3. Finally, conclusions are summarized in section 4.

## 2.0      Materials and Methods

### 2.1     The study area

The study was carried out in an agro ecological zone known as Natural Region 2 which is located in the middle of the north of Zimbabwe, covering parts of Harare, Mashonaland East, Mashonaland West, Mashonaland Central and Manicaland provinces. The region has a total area of 58600 km$^2$ which is about 15 % of the total area of Zimbabwe [24]. Data from five climatic stations: Karoi, Mutoko, Mt Darwin, Rusape and Wedza were used in this research. Table 1 shows the characteristics of the stations used in the study, while Figure 1 is a map of Zimbabwe showing all the natural regions with locations of the climatological stations overlaid.

**Table 1** Characteristics of the stations used in the study

| Station | Region | Location | | Altitude (m) | Period for the observed data | |
|---------|--------|----------|---|--------------|------------------------------|---|
| | | | | | Minimum/Maximum Temperature | Rainfall |
| Karoi | 2a | 16° 50´S | 29° 37´E | 1343 | 1971-2000 | 1970-2000 |
| Wedza | 2b | 18° 37´S | 31° 34´E | 1384 | 1971-2000 | 1970-2007 |
| Rusape | 2b | 18° 32´S | 32° 08´E | 1430 | 1971-2000 | 1970-2007 |
| Mt Darwin | 2b | 16° 47´S | 31° 35´E | 965 | 1971-2000 | 1970-1999 |
| Mutoko | 2b | 17° 25´S | 32° 13´E | 1244 | 1971-2000 | 1970-2003 |
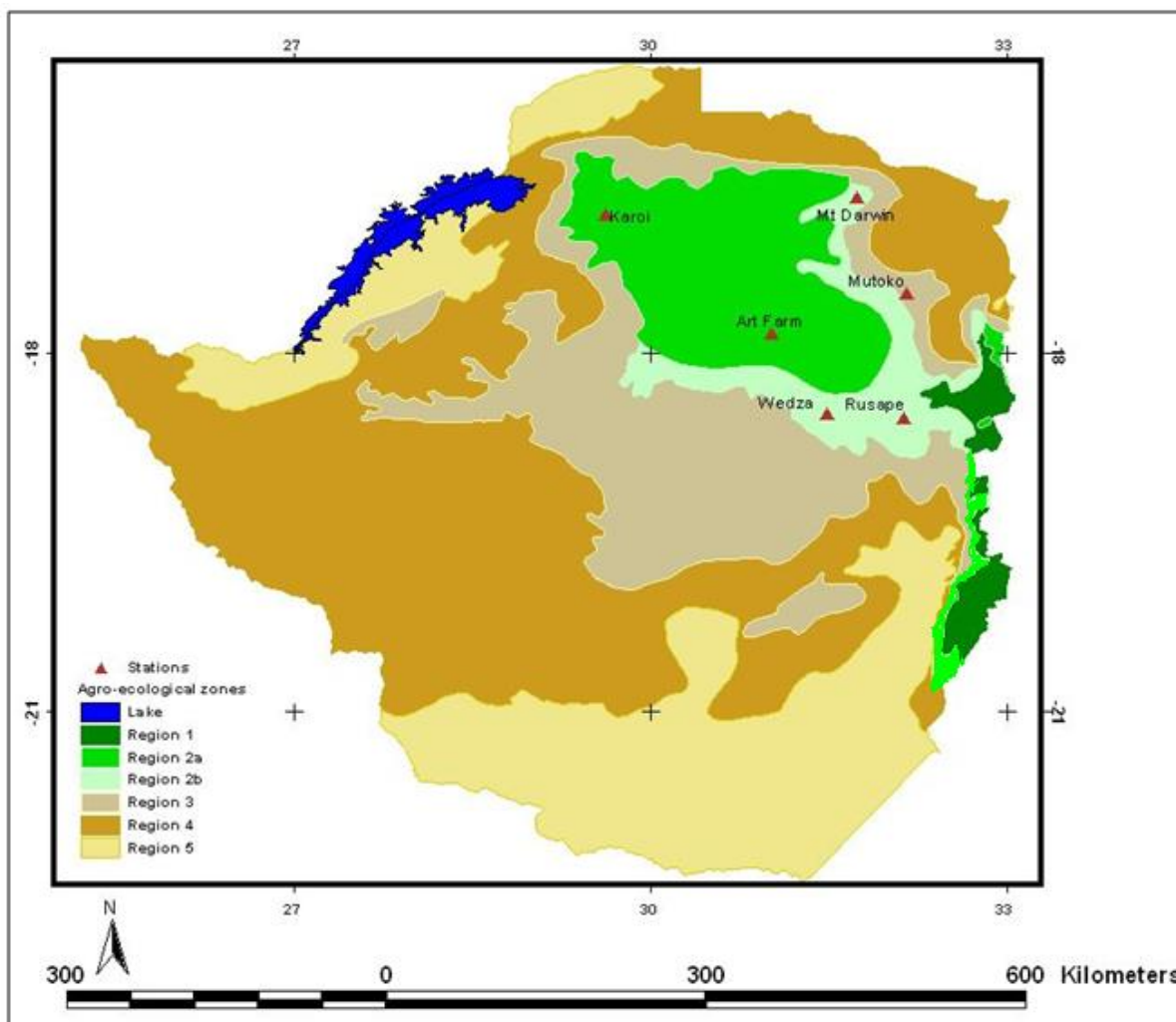
**Figure 1:** The study area, showing the locations of the climatological stations used in this study.

### 2.2    Sources and types of data

In this paper, we used observed as well as downscaled model data. Observed data was obtained from the Zimbabwe Meteorological Services Department (ZMSD). Downscaled data from five different global climate models from the Intergovernmental Panel on Climate Change Assessment Report (IPCC-AR4) was directly downloaded from the Earth System Grid (ESG) data portal (http://data.csag.uct.ac.za/) for the A2 socio-economic scenario.

Observed rainfall data were daily totals for the periods shown in Table 1. RAINBOW [25] was used to test the homogeneity of rainfall data for each station. RAINBOW is a software package for hydro meteorological frequency analysis and testing the homogeneity of historical data sets. All the stations confirmed homogeneity of rainfall data. The changes in rainfall for all stations were therefore assumed to have been caused by variations in climate only and not by factors such as changes in instruments, observation procedures, monitoring station relocations, changes of the surroundings, changes in calculation procedures, etc. Downscaled model data consisted of daily and monthly totals for the period 1961-2000. Observed temperature data were mean monthly minimum and maximum temperatures for the period shown in Table 1. Downscaled model data were average daily and monthly minimum and maximum temperatures over the same period.

### 2.3    Comparison of global climate model performances

*The five GCMs used are listed in Table 2.*

**Table 2** Global climate models used in the study

| Acronym | Name and Institute | Atmospheric resolution (latitude x longitude) |
|---|---|---|
| CCCMA_CGCM3_1 | The third generation coupled global climate model (CGCM3.1 Model, T47). Canadian Centre for Climate Modelling and Analysis, Canada. | 3.75 ° x 3.75 ° |
| CSIRO_MK3_5 | Mark 3.5 Model. Commonwealth Scientific and Industrial Research Organization, Australia. | 1.88 ° x 1.88 ° |
| GFDL_CM2_0 | CM2.0 coupled climate model. Geophysical Fluid Dynamics Laboratory, United States. | 2.0 ° x 2.5 ° |
| GISS_MODEL_E_R | ModelE20/Russell. Goddard Institute for Space Studies, United States. | 4.0 ° x 5.0 ° |
| MPI_ECHAM5 | European Centre Hamburg Model. Max Planck Institute for Meteorology, Germany. | 1.88 ° x 1.88 ° |

All the models listed in Table 2 are based on the A2 climate change scenario. According to [26], the A2 scenario is characterized by heterogeneity, self reliance, an emphasis on local identities and global population increases continuously, reaching over 10 billion by 2050. Economic development is regionally oriented and economic and technological development is relatively slow for the A2 scenario as compared to the other scenarios.

The performances of the models were evaluated by comparing hindcast model simulations with observed climatic data separately for rainfall, minimum and maximum temperature. It was then possible to determine the variation in prediction skill across models as well as variation in skill due to change of climatic variable. Each model data set was compared with observational data and the results statistically analyzed. We applied the error measures of correlation:

### 2.3.1 Coefficient of determination ($R^2$)

A scatter plot of observed against model data in EXCEL clearly demonstrated the relationship between the two variables. The closeness of the relationship was assessed by the coefficient of determination ($R^2$).

### 2.3.2 Model efficiency (ME)

The efficiency of each model to simulate the variables was calculated for each of the five models. The ME approach [27] is computed as:

$$ME = 1 - \frac{\sum_{i=1}^{n} (O_i - M_i)^2}{\sum_{i=1}^{n} (O_i - \bar{O}_i)^2} \qquad (1)$$

where ME is model efficiency, $O_i$ is an elementary observation in the observed data set (*n* observations), $\bar{O}_i$ is the mean of *i* observations and $M_i$ represents an elementary observation in the modelled dataset (*n* predictions).

### 2.3.3 Root mean square error (RMSE)

The RMSE for each model for simulating the variables was calculated. The RMSE approach is computed as:

$$\text{RMSE} = \sqrt{\frac{\sum_{i=1}^{n} (O_i - M_i)^2}{n}} \qquad (2)$$

A $t$-test was carried out at 5 % level of significance to assess the reliability of the null hypothesis (H$_\text{o}$) which was formulated as follows: observed and simulated data are not significantly different. A two tailed test was performed for each pair of data set. The null hypothesis was rejected when the $t$-value obtained ($t_{stat}$) was greater than $t$-critical ($t_\alpha$). That is, H$_\text{o}$ was rejected when $|t_{stat}| > t_\alpha$ otherwise it was not rejected. The value of $t_\alpha$ was 2.25. Model performance was judged by the magnitude of the coefficient of determination ($R^2$), root mean square error (RMSE), model efficiency (ME) and the $t$-value.

## 3.0      Results and discussion

### 3.1   Minimum air temperature

The statistics used to assess global climate model performance in simulating minimum temperature are shown in Table 3.

**Table 3:** Quantitative measures of the performance of the five global climate models for simulating minimum temperature at the 5 stations

| Statistic | Station | CCCMA_CGC M3_1 | CSIRO_MK3 _5 | MPI_ECHA M5 | GFDL_CM2 _0 | GISS_MODEL_ E_R |
|---|---|---|---|---|---|---|
| $R^2$ | Karoi | 0.92 | 0.89 | 0.88 | 0.82 | 0.69 |
| | Wedza | 0.89 | 0.85 | 0.79 | 0.76 | 0.73 |
| | Rusape | 0.87 | 0.84 | 0.84 | 0.81 | 0.69 |
| | Mt Darwin | * | * | * | * | * |
| | Mutoko | 0.86 | 0.81 | 0.77 | 0.69 | 0.67 |
| ME (%) | Karoi | 91.72 | 87.17 | 85.9 | 78.23 | 66.05 |
| | Wedza | 88.89 | 82.86 | 74.98 | 74.33 | 71.36 |
| | Rusape | 86.73 | 83.44 | 81.56 | 77.13 | 67.2 |
| | Mt Darwin | * | * | * | * | * |
| | Mutoko | 85.33 | 80.2 | 77.13 | 78.56 | 83.44 |

| | | | | | | |
|---|---|---|---|---|---|---|
| RMSE | Karoi | 3.21 | 3.08 | 2.88 | 2.58 | 2.32 |
| | Wedza | 2.88 | 2.66 | 2.46 | 2.48 | 2.36 |
| | Rusape | 3.81 | 3.47 | 3.3 | 3.19 | 2.89 |
| | Mt Darwin | * | * | * | * | * |
| | Mutoko | 3.81 | 3.49 | 3.19 | 3.66 | 3.47 |
| $t_{stat}$ | Karoi | -0.07 | 7.23 | -5.5 | -5.6 | -2.34 |
| | Wedza | -2.1 | -6.04 | -6.06 | -1.69 | -0.64 |
| | Rusape | -1.76 | 4.61 | -6.44 | -6.44 | -2.09 |
| | Mt Darwin | * | * | * | * | * |
| | Mutoko | -1.16 | -1.79 | -6.44 | -6.44 | 4.61 |

\*          Missing data

At Karoi, the CCCMA_CGCM3_1 model showed the greatest values of $R^2$, ME and RMSE as shown in Table 3. We failed to reject the null hypothesis at 5 % level of significance as $|t_{stat}| < t_{\alpha}$. The GISS_MODEL_E_R model showed the smallest values of $R^2$, ME, RMSE and $H_o$ was rejected. For the remaining models, $H_o$ was rejected ($|t_{stat}| > t_{\alpha}$) at Karoi indicating that they did not perform well in simulating minimum temperature at the station. The CCCMA_CGCM3_1 model therefore obtained the highest performance for simulating minimum temperatures at this station.

Values of $R^2$, ME and RMSE were greatest for the CCCMA_CGCM3_1 model at Wedza and we also failed to reject $H_o$ for this model. Although we failed to reject $H_o$ for the CSIRO_MK3_5 and the GISS_MODEL_E_R models; the coefficient of determination, model efficiency and root mean square error values were however smaller that those obtained for the CCCMA_CGCM3_1 model. The CCCMA_CGCM3_1 model showed the greatest skill for simulating minimum temperatures at Wedza.

Rusape minimum temperatures were best simulated by the CCCMA_CGCM3_1 model. Although $H_o$ was not rejected for the GISS_MODEL_E_R model at Rusape, the $R^2$, ME and RMSE values for this model are weaker than those of the former, thus making the CCCMA_CGCM3_1 model the best.

The statistical measures were greatest for the CCCMA_CGCM3_1 model at Mutoko and we failed to reject $H_o$ for this model. Although $H_o$ was also not rejected for the GISS_MODEL_E_R model; its statistical measures were smaller than those obtained for the CCCMA_CGCM3_1 model.

### 3.1.2 Maximum air temperature

The statistics used to assess global climate model performance in simulating maximum temperature are shown in Table 4.

**Table 4:** Quantitative measures of the performance of the five global climate models for simulating maximum temperature at the 5 stations

| Model Statistic | Station | CCCMA_CGC M3_1 | CSIRO_MK3 _5 | MPI_ECHA M5 | GFDL_CM2 _0 | GISS_MODEL_ E_R |
|---|---|---|---|---|---|---|
| $R^2$ | Karoi | 0.67 | 0.61 | 0.61 | 0.56 | 0.4 |
| | Wedza | 0.69 | 0.63 | 0.58 | 0.56 | 0.33 |
| | Rusape | 0.67 | 0.6 | 0.6 | 0.59 | 0.38 |
| | Mt Darwin | 0.68 | 0.62 | 0.6 | 0.54 | 0.42 |
| | Mutoko | 0.78 | 0.71 | 0.68 | 0.66 | 0.62 |
| ME (%) | Karoi | 64.6 | 60.24 | 49.15 | 54.68 | 37.33 |
| | Wedza | 60.78 | 60.45 | 57.82 | 54.57 | 28.48 |
| | Rusape | 62.36 | 59.9 | 55.28 | 58.24 | 36.66 |
| | Mt Darwin | 63.95 | 61.79 | 44.55 | 52.37 | 41.27 |
| | Mutoko | 68.2 | 65.11 | 57.83 | 64.35 | 50.24 |
| RMSE | Karoi | 2.31 | 1.91 | 1.58 | 1.49 | 1.77 |
| | Wedza | 2.74 | 2.19 | 2.09 | 2.18 | 1.98 |
| | Rusape | 2.74 | 1.97 | 1.92 | 2.16 | 1.93 |
| | Mt Darwin | 2.55 | 2.05 | 1.61 | 1.81 | 1.89 |
| | Mutoko | 2.41 | 1.99 | 1.71 | 1.83 | 1.75 |
| $t_{stat}$ | Karoi | -1.48 | -3.23 | 9.73 | 0.81 | -3.24 |
| | Wedza | -2.22 | -4.54 | -0.86 | -3.53 | -3.58 |
| | Rusape | -0.91 | 0.17 | 6.38 | -2.66 | -3.08 |
| | Mt Darwin | 2.21 | -0.05 | 10.9 | 3.6 | -0.63 |
| | Mutoko | 2.11 | 3.62 | -4.95 | -0.31 | 3.91 |

At Karoi, the CCCMA_CGCM3_1 model best resembled observations. $H_o$ was not rejected for the GISS_MODEL_E_R model; however the weaker statistics showed a lesser skill as compared to the CCCMA_CGCM3_1 model.

The greatest values of $R^2$, ME and RMSE for the CCCMA_CGCM3_1 model that are shown in Table 4 indicate the highest skill in simulating maximum temperatures at Wedza.

At Rusape, all other models did not perform well in simulating maximum temperatures at the station and the CCCMA_CGCM3_1 model showed the highest skill. Although the null hypothesis was not rejected for the GISS_MODEL_E_R model, its statistical measures were weaker than those of the CCCMA_CGCM3_1 model.

Maximum temperatures at Mt Darwin were best simulated by the CCCMA_CGCM3_1 model as shown by the statistics in Table 4. All other models performed poorly in simulating temperatures at Mt Darwin. The CCCMA_CGCM3_1 model however showed weaker values of $R^2$, ME and RMSE in simulating maximum temperature as compared to the same statistical quantities for simulating minimum temperature. This indicates that its skill in simulating minimum temperatures in higher than the skill for simulating maximum temperatures

The CCCMA_CGCM3_1 model showed the greatest skill for simulating maximum temperatures at Mutoko as shown by the statistical measures in Table 4.

We failed to reject the null hypothesis at all stations for the CCCMA_CGCM3_1 model.  This is confirmed by the $t$-values obtained in the significance tests. The CCCMA_CGCM3_1 model therefore obtained the highest performance for simulating both minimum and maximum temperature at all stations.  The GISS_MODEL_E_R model showed weaker values of $R^2$, ME and RMSE; however for this model, $H_o$ was not rejected at Wedza, Rusape and Mutoko for simulating minimum temperature and was also not rejected at Wedza, Rusape, Mutoko and Karoi for simulating maximum temperature. This model was second in simulating both minimum and maximum temperature.  For the MPI_ECHAM5 model, $H_o$ was not rejected only at Mt Darwin for simulating maximum temperature. For the CSIRO_MK3_5 model, $H_o$ was not rejected only at Wedza. The GFDL_CM2_0 model performed well in simulating maximum temperature at Mt Darwin only and it performed poorly for all other stations.

### 3.1.3 Rainfall

Summary statistics used to assess global climate models' performances in simulating rainfall are shown in Table 5.

**Table 5:** Quantitative measures of the performance of the five global climate models for simulating rainfall at the 5 stations

| Statistic | Model Station | CCCMA_CGCM3_1 | CSIRO_MK3_5 | MPI_ECHAM5 | GFDL_CM2_0 | GISS_MODEL_E_R |
|---|---|---|---|---|---|---|
| $R^2$ | Karoi | * | * | * | * | * |
| | Wedza | 0.33 | 0.22 | 0.39 | 0.18 | 0.32 |
| | Rusape | 0.33 | 0.37 | 0.42 | 0.21 | 0.31 |
| | Mt Darwin | 0.33 | 0.41 | 0.42 | 0.41 | 0.35 |
| | Mutoko | 0.36 | 0.43 | 0.35 | 0.3 | 0.39 |
| ME (%) | Karoi | * | * | * | * | * |
| | Wedza | 33.97 | 10.93 | 18.33 | 39.92 | 49.21 |
| | Rusape | 15.73 | 29.11 | 51.45 | 24.3 | 17.22 |
| | Mt Darwin | 26.63 | 23.01 | 32.13 | 46.51 | 20.08 |
| | Mutoko | 30.06 | 22.25 | 10.38 | 38.62 | 13.14 |
| RMSE | Karoi | * | * | * | * | * |
| | Wedza | 72.9 | 66.4 | 89.4 | 65.3 | 73.2 |
| | Rusape | 52.7 | 64.5 | 64.6 | 40 | 51.9 |
| | Mt Darwin | 55.8 | 76.8 | 73.2 | 66.6 | 55.3 |
| | Mutoko | 53 | 71.4 | 72.6 | 46 | 53.2 |
| $t_{stat}$ | Karoi | * | * | * | * | * |
| | Wedza | 3.69 | 2.67 | -0.59 | 1.51 | 0.04 |
| | Rusape | 6.54 | 3.28 | 3.16 | 6.04 | 3.94 |
| | Mt Darwin | -7.25 | -11.01 | -10.54 | -2.19 | -10.98 |
| | Mutoko | -7.28 | 3.66 | 4.82 | -10.12 | 4.61 |

\*        Missing data

The statistical measures are very low for all the models at Wedza; however the null hypothesis was not rejected for the GFDL_CM2_0, GISS_MODEL_E_R and the MPI_ECHAM5 models. The statistical indicators show that the null hypothesis was rejected for all the models at Rusape thus the models performed poorly in simulating rainfall at this station.

All models performed poorly in simulating rainfall at Mt Darwin. This is shown by the weak values of $R^2$ and low values of ME and RMSE for each model in Table 5. The null hypothesis was not rejected only for the GISS_MODEL_E_R model thus making it a better GCM amongst the five models. It is interesting to note that the CCCMA_CGCM3_1 model which best simulated temperature at Mt Darwin was found to be the worst for simulating rainfall at the same station. Table 5 shows inaccuracy of all climate models in simulating rainfall at Mutoko. Results of the analysis showed that all the models are poor in predicting rainfall for all the stations. Inaccuracy of global climate models to predict precipitation was reported by many researchers. [28] point out that that the space-time correlation between models and observations is small, only about 50 to 60 %, particularly in the tropics where the spatial variation of precipitation is great. According to [29], strong horizontal gradients in the field lead to a significant drop in correlations between model output and observations. Another discrepancy between models and observations is that when precipitation is categorised into light, moderate and heavy, models reproduce the observed extent of moderate precipitation (10 to 20 mmday$^{-1}$) but underestimate that of heavy precipitation and overestimate the extent of light precipitation [30]. [31] report that for precipitation, the Geophysical Fluid Dynamics Laboratory (GFDL) model reveals significant widespread errors in the tropics, mostly in the Intertropical Convergence Zone (ITCZ) where precipitation is underestimated by several millimetres per day. However, despite these shortcomings, the GISS_MODEL_E_R showed relatively better skill for predicting rainfall at Mt Darwin, Karoi and Mutoko, while the MPI_ECHAM5 and the GFDL_CM2_0 models were skilful at Wedza and Rusape, respectively.

## 4.0      Conclusions

We evaluated the performances of five global climate models for simulating rainfall, minimum and maximum temperature. The three main questions were centred on the variation of GCM skill with climatic variable, choice of GCM and place. The results indicate that most GCMs can reproduce the observed temperature better than rainfall and that the difference between the rainfall predictions from the different GCMs can be significant. The CCCMA_CGCM3_1 model was shown to be a better performing GCM amongst the five. Global climate models are place sensitive; a GCM that performs well in one region may not do the same when transferred to a different region.

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# A Convenient Method of Synthesis of 2-(Substituted Phenyl)-4-(4-Dimethylaminophenyl)-5-Phenyl-1H-imidazoles from4-Dimethylaminobenzil in the Absence of Catalyst

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*Abstract -* In this study new imidazoles derivatives were synthesized.The first stage involved preparation of 2-hydroxy-1-(4-dimethylaminophenyl)-ethan-1-one ( $F_1$) by reacting 4-dimethylaminobenzaldehyde with benzaldehyde in presence of sodium cyanide catalyst .The second stage involved the synthesis of 1-(4-dimethylaminophenyl)-2-phenylethan-1,2-dione($f_2$) using nitric acid in glacial acetic acid. Finally the compound (5a-5l) were synthesized using the three component system ( Compound $F_2$ , Substituted benzaldehyde and ammonium acetate ) .The structure of all compounds were confirmed by elemental analysis ,NMR and IR data and by melting point .In conclusion this method give some advantages such as good yield ,simple procedure , low cost of chemicals and easy work up .

*Index Terms –* 4-dimethylaminobenzil, ammonium acetate, substituted benzaldehyde, imidazole derivatives.

## I. INTRODUCTION

Substituted imidazoles, many of which play important roles in the biologically significant processes have been prepared by a variety of synthetic methods [1.] Imidazoles and their derivatives play important role as versatile building blocks for the synthesis of natural products and as therapeutic agents [2].Compounds with imidazole moiety have also been found to process many pharmacological properties and are widely implicated in biochemical processes [3] .The study of triphenyl imidazole derivatives has been a developing field within the realm of heterocyclic chemistry for the post several decades because of their ready accessibility through synthesis , wide range of chemical reactivity and manifold biological activities .The compounds with imidazole ring system have many pharmacological properties and play an important role in biochemical process .The structures of trisubstitued imidazoles are prevalent in natural products and pharmacologically active compounds ,such as p38 kinase inhibitors I (SB 203580) [4] and cyclooxygenase-2( Cox-2) inhibitor II [5] ,fungicides and herbicides [6].Recent advances in green chemistry and organ metallic chemistry have extended the boundary of imidazoles to the synthesis and application of a large class of imidazoles as ionic liquid and imidazole related N-heterocyclic Carbenes ( NHC ) [7,8] .Several routes have been developed for the synthesis of substituted imidazoles, such as hetero-cope rearrangement [9].The synthesis of imidazoles from1,2-diketone and aldehyde in presence of variety of catalysts by using microwave ( MW ) irradiation have been reported including MW / Silica-gel

[10] , MW / Silica –gel H-Y [11], MW / Al$_2$O$_3$ [12] ,NiCl$_2$.6H$_2$O [13] ,Iodine [14], acetic acid [15] , sodium disulphide [16], ammonium acetate [17] .

However these methods require exotic reaction condition and high cost of catalyst.

**Keeping in view of their biological activity , synthesis of some new 2-(Substituted phenyl) -4-(4-dimethylaminophenyl)-5-phenyl-1H-imidazole derivatives has been carried out without using a catalyst** .The 4-dimethylaminobenzoin was synthesized by benzoin condensation using benzaldehyde and  and 4-dimethylaminobenzaldehyde in presence of sodium cyanide as a catalyst .The 4-dimethylaminobenzoin was oxidized using Conc. Nitric acid in presence of glacial acetic acid to obtained 4-dimethylaminobenzil.The 4-dimethylaminobenzil was reacted with substituted aromatic aldehyde ,ammonium acetate in glacial acetic acid to obtained the 2-(Substitutedphenyl)-4-(4-dimethyaminopenyl)-5-phenyl-1H-imidazoles.

## II. EXPERIMENTAL SECTION

**Materials -**  Substituted benzaldehyde, 4-dimethylaminobenzadehyde, sodium cyanide, ethanol, Conc. Nitric acid, ammonium acetate, glacial acetic acid is required chemicals. All the reported melting points were taken in open capillaries and are uncorrected. Infrared spectra were measured by using Perkin Elmer model 2000 spectrophotometer and are given in cm-1 using KBR disc, $^1$HNMR spectra were measured by Bruckner Avance 400 MHz spectrophotometer using TMS as an internal standard .The purity of all the synthesized compounds was tested by TLC on silica gel plate using ethyl acetate and petroleum ether (80:20) and iodine was used as a visualizing agent.

**\*General procedure for the synthesis of 1-(4-dimethylaminophenyl)-2-hydroxy-2-phenylethan-1-one (F$_1$) -**To the mixture of 4-dimethylaminobenzaldehyde (0.15mol) in 65 ml ethylalcohol, added benzaldehyde (0.15mol) and aq. solution of sodium cyanide (0.1 mol) .It was reflux for 3 hour. The reaction mixture was cooled under the tap water with continuous shaking for 10 min and poured into ice-cold water, kept it long time on table obtained the crude product, Filter it, wash by water, dried and recrystallized from mixture of ethanol and water.   Colour - Yellow   ,   Yield – 78 %          , M.Pt- 158 $^O$C      Formula – C$_{16}$H$_{17}$O$_2$N   , M.Wt – 255.31.

IR ( KBr cm-1 )        3368.40 ( O - H ) , 3010 ( Ar C-H ) , 2870 ( Ali C-H ) , 1610.40 ( C=O )

1552.05 (C= C), 1234 .80 (C – O), 751.32 ( p- substituted –CH$_3$) .

1HNMR ( 400 MHz  , DMSO ) – 2.98 ( S , 3H ,- CH$_3$ ) , 3.05 ( S , 3H , -CH$_3$ ) , 5.89 ( S , 1H , C-H )

6.00 ( S , 1H , O-H) , 6.55 to 7.96 ( m , 9H ,aromatic ) .

Anal.Calcd for C$_{16}$H$_{17}$O$_2$ N     1) Found - C: 75.35, H: 6.72, O: 12.65, N: 5.55

2) Calcd  - C :75.29 ,   H : 6.66 , O : 12.54 ,  N :5.49 .

**\*General procedure for the synthesis of 1-(4-dimethylaminophenyl) -2- phenylethan-1,2-dione ( F$_2$) –**

Took 12.3 gm of 2-hydroxy-1-(4-dimethylaminophenyl)-ethan-1-one ( F$_1$) dissolved it in 25 ml glacial acetic acid ,then added 36 ml Conc. Nitric acid slowly to the reaction mixture ( Kept in an ice-bath ),Refluxed the reaction mixture for 2 hour ,

until the complete evolution of brown gas. Stopped reaction, cooled and poured it to ice-cold water, obtained a solid product, to

neutralized the excess acid add small amount of dil. sodium hydroxide. Filter the solid product and recrystallized from ethanol.

Colour – Greenish      Yield- 60%   Formula – $C_{16}H_{15}O_2N$ , M.Wt – 253.29 , M.Pt -  112 $^O$C .

IR( KBr cm$^{-1}$ )  -        3092 (aro C-H ) ,  2929( ali C-H ) , 1620 ( C=O), 1586 ( C=C )  .

1HNMR ( 400 MHz ,DMSO )     - 3.08 ( S ,6H ,CH$_3$) ,6.90( S ,2H ,C-H) , 7.5( d , 2H C-H) ,7.72(d ,2H,C-H)

               7.90 ( d ,H , CH ) , 8.9 ( d , 2H , C-H ) .

**\*Procedure for the synthesis of 2-(Substituted phenyl)-4-(4-dimethylaminophenyl) -5-phenyl-1H- imidazole        (5a – 5**

**l):-** A mixture containing 1-(4-dimethylaminophenyl) -2-phenylethan-1,2-dione ( 0.01 mol) , benzaldehyde ( 0.01 mol )

,ammonium acetate ( 0.07 mol ) was taken in a 100 ml round bottom flask .It was dissolved in 25 ml glacial acetic acid and

refluxed for 6 hour .Check the progress of reaction by TLC plate .Cooled the reaction mixture  and poured to ice cold water, kept

for 10 minutes ,obtained a solid product . Filtered it and wash with cold water .Recrystallized   it from ethanol.

Reaction:-

1)   Step – 1



2)   Step -2



3)   Step-3
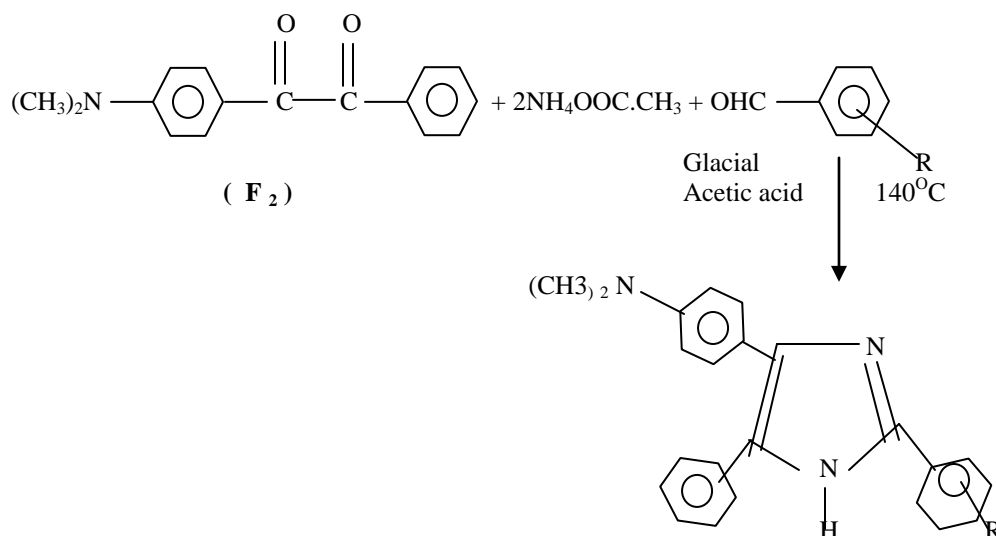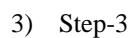
**(5a – 5l)**

R =H , 4-Cl , 4-OCH$_3$ , 4-NO$_2$ , 4-N(CH$_3$)$_2$ , 2-OH , 4-OH , 3-(OCH$_3$) , 3,4,5-(OCH$_3$) , 2Cl , 4-OH .

**Spectral Data** – **1) 2-Phenyl-4-(4-dimethylaminophenyl)-5-phenyl-1H-imidazole (5a) –**

5

Colourless solid,        M.Pt – 243 $^O$C,    Formula –C$_{24}$H$_{21}$N$_3$ ,        M.Wt – 351.

**IR ( KBr cm$^{-1}$)** – 3468 (N-H) , 3092 ( Aro ,C-H ) , 2927 (C-H alip) , 1621 ( C=N ) , 1408 ( C= C aro ).

**$^1$HNMR**      - 3.10 (d ,6H –CH$_3$) ,7.0(d , 2H ) ,8.0(S 1H) , 8.2( d,2H) ,8.2 to 8.8 ( m ,9H) ,8.9 (S , N-H )

Anal.Calcd for C$_{24}$H$_{21}$N$_3$ :      Calcd –   C:82.05          H:5.98          N: 11.96 .

                                  Found – C: 82.17         H: 5.92          N: 11.98.

**Spectral Data - 2) 2-(4-Chlorophenyl)-4-(4-dimethylaminophenyl)-5-phenyl-1H-imidazole (5b) –**

Colourless solid,   M.Pt -275$^O$C,         Formula – C$_{24}$H$_{20}$N$_3$Cl             M.Wt- 385.5

**IR ( KBr cm$^{-1}$)**   3353 ( N-H ) , 3093 ( C-H aro ) , 2927 ( C-H aliph ) , 1683 ( C= N ) , 1408 ( C=C aro ) ,

        745 (C-Cl).

**$^1$HNMR -**      3.0 ( S , 3H , -CH$_3$ ) , 7.0 ( d , 2H ) , 7.2 ( d , 2H ) ,7.4 ( d, 2H ) , 7.5 to 8.9 (m ,7H)

9.7 (S, 1H, N-H) .

Anal . Calcd for  - C$_{24}$H$_{20}$N$_3$Cl ,Found    C:74.65,          H:5.20,          N:10.81 ,        Cl:9.28,

              Calcd   C: 74.70         H: 5.18,          N: 10.89,         Cl:9.20

The other compounds of this series (5a – 5l) were prepared similarly and are recorded in table- 1

**Table -1 Chemical Data of the synthesized compounds**

| S.No | Code | R | Formula | M.Wt | %of Yield | M.Pt ( $^O$C ) |
|------|------|---|---------|------|-----------|----------------|
| 1 | 5a | -H | C$_{24}$H$_{21}$N$_3$ | 351 | 79 | 243 |
| 2 | 5b | -4Cl | C$_{24}$H$_{20}$N$_3$Cl | 385.5 | 82 | 275 |
| 3 | 5c | -4OCH$_3$ | C$_{25}$H$_{23}$N$_3$O | 369 | 65 | 236 |
| 4 | 5d | -4NO$_2$ | C$_{24}$H$_{20}$N$_4$O$_2$ | 368 | 85 | 242 |
| 5 | 5e | -2NO$_2$ | C$_{24}$H$_{20}$N$_4$O$_2$ | 368 | 83 | 265 |
| 6 | 5f | -4N(CH$_3$)$_2$ | C$_{26}$H$_{26}$N$_4$ | 394 | 68 | 209 |
| 7 | 5g | -2( OH) | C$_{24}$H$_{21}$N$_3$O | 354 | 86 | 227 |
| 8 | 5h | -4(OH)-3-(OCH$_3$) | C$_{25}$H$_{23}$N$_3$O$_2$ | 404 | 59 | 190 |
| 9 | 5i | -3,4,5-(OCH$_3$)$_3$ | C$_{27}$H$_{27}$N$_3$O$_3$ | 425 | 78 | 211 |
| 10 | 5j | -2Cl | C$_{24}$H$_{20}$N$_3$.Cl | 373.5 | 80 | 249 |
| 11 | 5k | -4 OH | C$_{24}$H$_{21}$.N$_3$.O | 354 | 63 | 237 |
| 12 | 5l | -3NO$_2$ | C$_{24}$H$_{20}$N$_4$.O$_2$ | 368 | 81 | 240 |

III. RESULT AND DISCUSSION.

2-Substituted -4-(4-dimethylaminophenyl)-5-phenyl-1H-imidazole ( 5a- 5l ) were synthesized by condensation reaction involving reactant such as 4-dimethylaminobenzil ,substituted benzaldehyde ,ammonium acetate in glacial acetic acid .The sodium cyanide is a best catalyst which gives the cross benzoin condensation between benzaldehyde and 4-dimethylaminobenzaldehyde to form 4-dimethylaminobenzoin  . Nitric acid with glacial acetic acid is an oxidizing agent which oxidized 4-dimethylaminobenzoin into 4-dimethylaminobenzil. The physical data of compound were collected and presented under compound name and spectral data. The yield of the compound was in the range of 59-86 %. Most of them are colorless crystalline solid .The IR spectrum of compound shows N-H band  at 3468 to 3350 cm-1.The characteristic band at 1500-1650cm-1 due to  C=N group  .The 1HNMR spectrum of compound ( 5a- 5l ) shows signal of N-H at 9.8 ,8.9 ppm which confirm the presence of N-H band of imidazole .

The synthesis of 2-Substitutedphenyl-4-(4-dimethylaminophenyl )-5-phenyl-1H-imidazole from mixed benzil is very difficult .**We have reported the efficient method of synthesis of  2-Substitutedphenyl-4-(4-dimethylaminophenyl )-5-phenyl-1H-imidazole in the absence of catalyst for synthesis required  less compound which gives high yield of product by avoiding the excess used of catalyst .In using of  ethanol as a solvent give less product, but in glacial acetic acid occurred increased the yield of product .This synthesis is easy to follow and required low cost reactant .The reaction has advantages such as excellent yield, simple procedure .**

## IV. CONCLUSION.

In Conclusion ,we have developed an efficient and convenient method for the synthesis of 2-(Substituted phenyl )-4-(4-dimethylaminophenyl)-5-phenyl-1H-imidazole derivatives using mixed benzil in absence of catalyst .**The notable merits offered by this methodology are mild reaction condition , simple procedure, required less reactant and gives excellent yield of products .**

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# EFFECTS OF EXERCISE ON INFANT BIRTH WEIGHT AND GESTATIONAL AGE IN PREGNANT WOMEN

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   **Objective:** When a lady becomes pregnant she surely must be anxious and excited on when is she is going to embark on a journey full of mysteries, surprises and revelations. Birth weight plays an important role in infant mortality and morbidity, childhood development, and adult health low birth weight babies are at an increased risk for mortality short terms and long terms morbidities. The Aim of the study is to find out whether a supervised exercise programme is effective on infant birth weight, gestational age at delivery in pregnant women.

   **Design and setting**: A Experimental study design done with 5 subjects who underwent interventional training of aerobic and strength training for a period of 12 weeks were given .

   **Subjects:** Five subjects of nulliparous woman, subjects within their 24weeks of pregnancy who didn't participate in walking exercise for the last 6 months were included. The procedure was done in Physiotherapy Department at Masterkill College of Nursing and health.

   **Outcome Measurement**: The outcome measurement based on Infant birth weight measured in grams and Gestational age at delivery.

   **Results:** The birth weight of new born infant is noted in gms and gestational age is noted at the time of delivery concludes adherence to exercise protocols among previous sedentary pregnant women are warranted.

   **Conclusion:** Aerobic-dance exercise for sedentary pregnant women appeared to be safe and was not associated with any reduction in newborn birth weight, preterm birth rate (or) neonatal well-being.

   **Key words:** Gestational Age, Birth weight, Aerobic exercise.

## I. INTRODUCTION

When a lady becomes pregnant she surely must be anxious and excited on when is she is going to embark. She is on a journey full of mysteries, surprises and revelations too. Therefore it is crucial to arm yourself with proper knowledge about the whole thing including pregnancy symptoms complications, fetus development, diet, checkup tips for healthy, pregnancy and almost every other thing about each stage of pregnancy [2,]

More information makes the mother to enjoy her pregnancy is a period of expectant waiting and one that all of us aspire to experience eat least once in our life time. As we set food on the path that transmutes one from a woman into a mother, several responsibilities and concerns become ours alone[4]. Among these is our duty to the life the is yet to be and how we can give of ourselves in body and spirit to form and nurture the new life that we seek to bring into existence.

Giving life is powerful. It is vital, therefore that we prepare our body to become a suitable environment for the baby to grow in while staying happy and healthy emotionally and mentally as well. Each week of pregnancy brings with it new changes and feelings that may require some explanation is and support [5].

This section touches on those aspects you held to be aware of in the time before,

during and after your pregnancy. There are massive hormonal changes for a bit we'll begin with the physical changes that occur after pregnancy[6]. Think of your uterus. It went from the size of your first to large enough to wrap around a baby now going to shrink and going to bleeding the day you give birth will likely be one of the most physically, mentally and emotionally challenging days you'll ever experience.

Historically, and largely based on socio-cultural reasons more than on scientific evidence, pregnant women have been encouraged to reduce Physical Activity[7] (PA) and stop working during pregnancy because of perceived increased risk of problems, e.g., such of early pregnancy, loss or reduced placental circulation.

A potential source of controversy on the issue arises from the fact that more "active" or energy-consuming occupational professional activities that require prolonged standing (>3h/day) and/or carrying loads >10kg, such as in industrial work or as cleaning staff and shopkeepers, might increase the risk of preterm birth and low birth weight in comparison with a more sedentary type of activity, for example in executive staff, teachers or office staff indeed while the results of most studies show PA during pregnancy to be beneficial overall to the maternal-fetal unit and to prevent the occurrence of maternal disorders such as hypertension[8] . There is no definitive, complete answer regarding the effect of exercise during the total duration of pregnancy on the pregnancy.

Birth weight is affected by gestational age at delivery and several maternal characteristics, including racial origin, age body mass index, parity, and cigarette smoking [11].

Placental function in early pregnancy, reflected in the maternal serum concerntration of the pregnancy-associated plasma protein-A (PAPP-A) at 11-13 weeks of gestation.

Birth weight plays an important role in infant mortality and morbidity, childhood development, and adult health low birth weight babies are at an increased risk for mortality short terms and long terms morbidities[12,13] .

American college of obstetrics and Gynecology (ACOG) guidelines promote continuation of pre-pregnancy exercise activities and recommend that sedentary women start exercising during pregnancy[14]. According to the present guidelines, all pregnant women are encouraged to be physically active for at least 30 minutes on most days of the week, in the absence of medical or obstetrical contraindications.

A Cochrane review from 2009, found no effects of maternal exercise on infant birth weight and Gestational age.
However, the optimal dose for recreational physical activity during pregnancy remains to be determined, and the impact of prolonged and repeated aerobic exercise on clinical outcomes for mother and infant are still unclear [15].

The purpose of the present study was to examine the effects of aerobic dance exercise twice a week, in addition to 30 minutes of moderate self imposed physical activity on the remaining week-days, on birth weight and gestational age in new-born of nulliparous previously inactive pregnant women[16].

## II. METHODOLOGY

All the eligible subjects were explained about the procedure and written informed concert was obtained before starting the exercise training.

The base line interview cornered demographic information (e.g. Age, Pregnancy week, smoking habit, education, Occupation) assessment of daily life physical activity and sedentary behavior (at work, transportation and household).

The subjects were asked to include 30 minutes of moderate self-imposed physical activity like walking, during their pregnancy.

Participants at the gestational age of 24-36 weeks are taken as study period. They were encouraged to participate in at least 2 out of 3 possible one hour aerobic dance classes per week for a minimum of 12 weeks according to ACOG exercise prescription guideline each session started with 5 minutes of warm up followed by 35 minutes of aerobic dance which included low impact exercises, [Kicks, Grape vines, Marches and Lunges.

Step training [Stepping on and off the stepper] Followed with this they underwent 15 minutes of strength training like light wt dumbbells, for Iron strengthening, squatting for pelvic floor muscles strengthening, pressing towel to the wall for back muscle strengthening and 5 minutes of cool

down, both the warm-up and cool down included stretches.

All aerobic activities were performed at moderate intensity measured by ratings of perceived rate of exertion at 12-14 on the 6-20 Borg's rating scale.

## III. DATA ANALYSIS

The birth weight of new born infant is noted in grams and gestational age is noted at the time of delivery that was as follows.

| S.No. | Subject | Birth Weight of New born infant | Gestational age at the time of delivery. |
|-------|---------|--------------------------------|------------------------------------------|
| 1. | Subject-1 | 2,900 gms | 37 weeks |
| 2. | Subject-2 | 4,000 gms | 40 weeks |
| 3. | Subject-3 | 3,500 gms | 39 weeks |
| 4. | Subject-4 | 4,300 gms | 41 weeks |
| 5. | Subject-5 | 33,200 gms | 38 weeks |

## IV. RESULTS

There was no statistically significant reduction in birth weight and gestational age at delivery in pregnant women.

## V. CONCLUSION

Pregnancy fitness is not only important for the fetus as well. Evidence is clear that aerobic fitness improves brain, heart, immune and metabolic function at all ages, including in uterus.

If continued early in life, healthy physical adaptations that occur in the uterus become reinforced behavior, preparing a good foundation for a healthy lifestyle. Babies are acute observes of movement and activity, and learn from each other.

A Key component of a good mom-baby programme is the interaction of the babies themselves. A good teacher will facilitate healthy activity among our smallest class members.

The AHA/ACSM guidelines to the amount of aerobic exercise needed to improve cardiovascular status hold true for pregnant women just as they do for the rest of the population – a minimum of 150 minutes of moderate, or 75 minutes of vigorous, or a combination of these levels of intensity, per week. If you are not getting this level of activity, you are putting your health and that of your offspring at risk.

By this study it is concluded that, Aerobic-Dance exercise for sedentary pregnant women appeared to be safe and was not associated with any reduction in new born birth weight, gestational age at delivery and neonatal well being.

Further studies on strategies to achieve adherence to exercise protocols among previous sedentary pregnant women are warranted.

## VI. DISCUSSION

This is one of very few RCTs investigating the effect of a supervised structured exercise programme on birth weight. No negative effects of a twice a week 12 week aerobic dance programme in $2^{nd}$ and $3^{rd}$ trimester of pregnancy in previously sedentary women were found, and there was no statistically significant difference between groups in mean birth weight, low birth weight ($<2500$g) (or) macrosomia ($\geq 4000$g). Regular exercise during pregnancy did not affect gestational age (or) prematurity.

The strengths of the present study were use of an assessor blinded RCT design, few losses to follow-up and implementation of an exercise programme following ACOG recommendation, conducted by certified personnel in a supervised stetting. In addition, we aimed at Integration of exercises into daily life activities, a focus not reported in other studies.

Adherence to the training protocol was registered, and all follow-up procedures were done by the same investigator. A limitation was the adherence to the training program and that variation in nutritional intake was not assessed. However, EG subjects have similar gestational weight gain.

Clapp reported that previously physically inactive women, who were assigned at gestation week 8 to exercise for 20 minutes 3-5 times per week for the remainder of pregnancy, gave birth to significantly heavier newborns than the control women. A meta-analysis based on both experimental, quasi-experimental and cohort studies,

concluded that exercise in pregnancy generally does not affect birth weight. Our results support this conclusion.

Another interesting finding in the other study was that mean apgar score of the newborns was higher in the EG compared to the CG at immunity. However, by 5-minutes these were no difference. Clinically the 5 – minutes score may be more relevant as this score assesses how well the newborn is adapting to the new environment, compared to how well the baby has tolerated the birthing process (1-minute score).

The pregnant women in this study were healthy nulliparous with a high educational level, and are therefore not representative for all eligible women.

Study has established a reference range of birth weight for gestation in a large heterogeneous inner-city population of singleton pregnancies in which gestational age was determined by an ultrasound scan in early pregnancy.

Birth weight is significantly influenced by maternal characteristics such as racial origin, weight, height, parity, cigarette smoking, and medical history of chronic hypertension and pre-pregnancy diabetes mellitus.

Birth weight increased with maternal weight and height. It was higher in parous than in nulliparous women and in those with a medical history of pre pregnancy diabetes mellitus and it was lower in cigarette smokers, in all racial groups other than in Caucasian women, and in those with a medical history of chronic hypertension.

Irrespective of age, weight and height of mother and race. Women who eat well and gain the appropriate amount of weight are more likely to have healthy babies. So if you are eating fresh, whole some foods and adding pounds, relax.

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# Genetic Studies of Association and Path Coefficient Analysis of Yield and its Component Traits in Pigeon Pea ( *Cajanus Cajan* L. Millsp.)

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*Abstract-* 50 pigeonpea genotypes were evaluated to study the nature and magnitude of relationship of important agronomic traits with seed yield along with their direct and indirect effects. Days to maturity, number of primary branches per plant, number of pods per plant, and harvest index had significant positive association with seed yield, also showed direct positive effect in determining yield in pigeonpea. Hence due emphasis should be given to number of pods per plant, number of primary branches and harvest index for improvement of seed yield in pigeonpea.

*Index Terms*- Correlation, path analysis, pigeonpea, yield , harvest index

## I. INTRODUCTION

Pigeonpea is an important rainy season pulse crop of subsistence agriculture. Despite of research efforts the productivity of pigeonpea is very low. Yield is a complex trait controlled by polygenes and highly influenced by environment. Selection based on yield itself only is not effective. The information on nature and magnitude of correlation coefficient help the breeders to decide the traits to be given importance in selection and also the selection criteria for simultaneous improvement of various characters along with the seed yield. when more characters are involved in the association analysis it becomes difficult to ascertain which really contributes towards yield. Thus correlation analysis is not enough to give an exact picture of relative importance of direct and indirect influence of each of the component characters on seed yield. Path coefficient analysis is an important tool for plant breeders helps in partitioning the correlation coefficient into components of direct and indirect influences and provide better insight on character and their relationship with yield. The objective of this study was too estimate the association of yield contributing characters their direct contribution to yield and indirect effects through other characters on pigeonpea yields under rainfed situations.

## II. MATERIAL AND METHODS

In the present study, investigation was carried on 40 genotypes/germplasm lines received from NBPGR, New Delhi and 10 locally maintained germplasm/advanced lines. The genotypes were evaluated in randomized complete block design with two replication during *kharif* 2010-11 at D' block farm of Regional Agricultural Research Station, Warangal. Each experimental plot consisted of two rows of 4 meter length with row to row and plant to plant spacing of 120 cm and 20 cm respectively. All the recommended agronomic practices were followed for optimum crop growth. Five competitive plants in each plot were selected randomly in each genotype per replication for recording observations on plant height (cm), number of primary branches per plant, number of pods per plant, pod length (cm), number of seeds per pod, 100 seed weight (g), seed yield per plant(g) and Harvest Index (%). Days to flowering and days to maturity were recorded on plot basis. The data were statistically analysed to estimate the genotypic correlation coefficients between seed yield and other yield component traits as well as among the components traits as per the method suggested by Falconer (1964) Path coefficient analysis was done for yield components to find out the direct and indirect effects of different characters on seed yield. (Dewey and Lu, 1959).

## III. RESULTS AND DISCUSSION

The analysis of variance indicated significant differences among genotypes for all the characters. The correlation coefficients between seed yield and yield attributing traits are presented in Table-1. In the present study days to maturity, primary branches per plant, number of pods per plant, harvest index and plant height showed highly significant positive correlation with seed yield per plant. Similar results were also reported by Vasantha Rao *et al*.(2010b), Badru (2010) and Sawargoankar (2011) for number of pods per plant; Badru (2010) for primary branches, Vasantha Rao (2010b) and Badru (2010) for days to maturity , plant height and harvest index. Days to flowering and test weight were also had positive but non significant association with seed yield. Anuradha *et al* (2007) also reported positive association of days to flowering with seed yield. Vasantha Rao *et al*. (2010b) reported non significant but positive association of test weight with seed yield. Days to flowering showed significant positive association with days to maturity, number of primary branches and number of pods per plant but negatively associated with pod length and number of seeds per pod. The association between days to flowering and days to maturity is significantly positive. Plant height exhibited significant and positive association with number of primary branches per plant, number of pods per plant and harvest index. Number of primary branches per plant recorded positive and significant association with number of pods per plant and

negatively associated with test weight. Harvest index showed positive association with plant height, number of primary branches, number of pods per plant but significantly negatively associated with seed per pod. The association of number of pods with pod length , seeds per pod and test weight was negative revealing that plants with more number of pods produced smaller seeds .   A significant and positive genotypic association among number of pods per plant, number of primary branches per plant, plant height, days to flowering and days to maturity and their positive association with seed yield indicated that these are major yield contributing traits in pigeonpea. Therefore, selection for any of these traits would offer the scope for simultaneous improvement of contributing characters in addition would be helpful in improving the yield potential in pigeonpea.

Path analysis results are presented in Table-2a & 2b. Genotypic path anlysis revealed that number of pods per plant had the high positive direct effect (0.901) on seed yield followed by harvest index (0.651), 100 seed weight (0.498), Primary branches (0.412) and days to maturity (0.322). Remaining traits recorded low direct effect on seed yield. Days to flowering recorded negative direct effect on seed yield but indirect effects through plant height, number of pods per plant and  test weight are positive. Plant height and seed per pod had negligible positive direct effect on seed yield. The indirect effects of all the characters under study via number of pods were observed to be high. Similar results were reported by Vasantha Rao *et al.* (2010b),   Badru (2010) for number of pods per plant and test weight and days to maturity. Vasantha Rao *et al*. (2010b) for harvest   index. The component of residual effect was 0.402 indicating the adequacy and appropriateness of characters studied. However, there is scope for inclusion of some more traits of physiological and quality nature.

## IV.   CONCLUSION

The present study revealed that for obtaining higher seed in pigeonpea due emphasis should be given for higher number of pods per plant, more primary branches, more plant height and reasonable good test weight along with better harvest index, since all these characters are positively correlated with seed yield, also had high positive direct and indirect influence on seed yield. Based on these traits and cluster pattern 12 best genotypes were selected for future breeding programmes.

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**Table 1: Phenotypic (above diagonal) and genotypic (below diagonal) correlations for 10 characters in 50 pigeonpea [*Cajanus cajan* (L.) Millsp.] genotypes**

| Character | Days to 50% flowering | Days to maturity | Plant height (cm) | Primary branches/ plant | Pods / plant | Pod length (cm) | Seeds/ pod | 100- seed weight (g) | Harvest index (%) | Seed yield / plant (g) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Days to 50% flowering** | - | 0.6232** | 0.314 | 0.4281** | 0.4220** | -0.3221** | -0.4426** | -0.1687 | 0.1699 | 0.1912 |
| **Days to maturity** | 0.7105** | - | 0.1814 | -0.4162** | 0.4021** | -0.1525 | -0.1812 | -0.1134 | 0.1269 | 0.2822** |
| **Plant height (cm)** | 0.0471 | 0.1136 | - | 0.4224** | 0.5862** | -0.0221 | 0.1012 | 0.1922 | 0.2261* | 0.2544* |
| **Primary branches/ plant** | 0.5611** | -0.4615** | 0.5016** | - | 0.6102** | -0.0921 | -0.0822 | -0.3255** | 0.1138 | 0.4926** |
| **Pods/ plant** | 0.5261** | 0.4811** | 0.6052** | 0.6651** | - | -0.3022** | -0.2280** | -0.3116** | 0.2120* | 0.6722** |
| **Pod length (cm)** | 0.2620* | 0.0513 | 0.2152* | 0.1871 | -0.5112** | - | 0.3431** | 0.2814** | -0.0221 | -0.0111 |
| **Seeds/ pod** | -0.5166** | -0.2204* | -0.1021 | -0.1211 | -0.4617** | 0.4212** | - | 0.4156** | -0.0022 | -0.0211 |
| **100-seed weight (g)** | -0.1115 | -0.1276 | 0.2881** | -0.4116** | -0.4601** | 0.5144** | 0.5811** | - | -0.0121 | 0.0331 |
| **Harvest index (%)** | 0.1922 | 0.1586 | 0.2811** | 0.3641** | 0.3211** | -01717 | -0.2521* | -0.0222 | - | 0.3211** |
| **Seed Yield/ Plant (g)** | 0.1991 | 0.2752** | 0.6771** | 0.5122** | 0.7211** | -0.0221 | -0.1712 | 0.0581 | 0.5811** | - |

**\*\* = Significance at 1% level, \* = Significance at 5% level.**

**Table 2a: Estimates of direct and indirect effects (genotypic) between yield and yield components in pigeonpea**

| Character | Days to 50% flowering | Days to maturity | Plant height (cm) | Primary branches/ plant | Pods/ plant | Pod length (cm) | Seeds/ pod | 100 seed weight (g) | Harvest Index (%) | rg Seed yield per plant |
|---|---|---|---|---|---|---|---|---|---|---|
| Days to 50% flowering | **-0.257** | -0.221 | 0.261 | -0.029 | 0.110 | 0.012 | -0.009 | 0.216 | -0.128 | **0.1991** |
| Days to maturity | 0.018 | **0.322** | 0.273 | -0.170 | 0.207 | 0.002 | 0.000 | -0.228 | 0.028 | **0.2822\*\*** |
| Plant height (cm) | -0.022 | +0.005 | **0.091** | 0.025 | 0.324 | -0.051 | 0.001 | 0.027 | 0.001 | **0.6771\*\*** |
| Primary branches/ plant | 0.002 | 0.020 | 0.312 | **0.412** | 0.102 | 0.012 | -0.021 | 0.000 | 0.019 | **0.5122\*\*** |
| Pods/ plant | 0.001 | 0.021 | 0.311 | 0.009 | **0.901** | -0.119 | -0.018 | -0.300 | 0.276 | **0.7211\*\*** |
| Pod length (cm) | 0.015 | 0.014 | 0.091 | 0.201 | 0.091 | **0.148** | 0.025 | 0.014 | 0.041 | **-0.0211** |
| Seeds/ pod | 0.000 | 0.000 | -0.182 | 0.022 | -0.341 | 0.188 | **0.052** | 0.281 | 0.001 | **-0.1712** |
| 100 seed weight (g) | -0.003 | -0.004 | 0.032 | 0.201 | -0.103 | 0.117 | 0.173 | **0.498** | 0.001 | **0.0581** |
| Harvest Index (%) | 0.029 | 0.092 | 0.098 | 0.196 | 0.202 | -0.009 | -0.092 | 0.015 | **0.521** | **0.5811\*\*** |

**\*\* = Significance at 1% level, \* = Significance at 5% level.          Residual effect= 0.402**

Diagonal values are direct effects, other values are indirect effects: rg= Genotypic correlation

*Table 2b: Estimates of direct and indirect effects (phenotypic) between yield and yield components in pigeonpea*

| Character | Days to 50% flowering | Days to maturity | Plant height (cm) | Primary branches/ plant | Pods/ plant | Pod length (cm) | Seeds/ pod | 100 seed weight (g) | Harvest Index (%) | rp Seed yield per plant |
|---|---|---|---|---|---|---|---|---|---|---|
| Days to 50% flowering | **-0.182** | -0.102 | 0.128 | -0.086 | 0.098 | 0.008 | -0.001 | 0.195 | -0.098 | **0.1912** |
| Days to maturity | 0.014 | **0.296** | 0.121 | 0.091 | 0.198 | 0.001 | 0.000 | -0.148 | 0.019 | **0.2822**** |
| Plant height (cm) | -0.028 | -0.008 | **0.076** | 0.018 | 0.286 | -0.051 | 0.000 | 0.022 | 0.001 | **0.2544*** |
| Primary branches/ plant | 0.001 | 0.019 | 0.189 | **0.261** | 0.100 | 0.011 | -0.022 | 0.000 | 0.001 | **0.4926**** |
| Pods/ plant | 0.006 | 0.002 | 0.198 | 0.001 | **0.768** | -0.086 | -0.012 | -0.192 | 0.232 | **0.6722**** |
| Pod length (cm) | 0.001 | 0.002 | 0.066 | 0.110 | 0.078 | **0.129** | 0.018 | 0.007 | 0.040 | **-0.0111** |
| Seeds/ pod | 0.000 | 0.000 | -0.098 | 0.002 | -0.189 | 0.122 | **0.033** | 0.199 | 0.000 | **-0.0215** |
| 100 seed weight (g) | -0.001 | -0.001 | 0.033 | 0.181 | -0.092 | 0.079 | 0.099 | **0.412** | 0.001 | **0.0334** |
| Harvest Index (%) | 0.029 | 0.092 | 0.098 | 0.196 | 0.202 | -0.009 | -0.092 | 0.015 | **0.521** | **0.3211**** |

**\*\* = Significance at 1% level, \* = Significance at 5% level.          Residual effect= 0.482**

Diagonal values are direct effects, other values are indirect effects: rp= Phenotypic correlation

# Early Adolescents Perception of Personal, Parents Related, School Related and Teacher Related Stress

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*Abstract-* The present study aims to determine "Early Adolescents Perception of Personal, Parents related, School related and Teacher related Stress". The findings in response to personal stress indicated that homework is the greatest stressor and participation in extra-curricular activity is the least stressor according to adolescents. The adolescents perceived that comparison by parents with peers in academics is stressful and comparison with peers in extracurricular activities is the least stressful. The adolescents also perceived that when they do not get appropriate feedback on school work, is a source of stress to them and participation in extracurricular activities is least stressful. When the teacher does not listen to them is the greatest stress and are least stressed when teacher expresses concern about their future goals. There is significant difference in the mean stress of grade VIII and IX adolescents. There is no significant difference in the mean stress between boys and girls.

*Index Terms*- Early Adolescents, Perception, Stress

## I. INTRODUCTION

Adolescent period can be a stressful time for children, parents and adults who work with adolescents. Children are dealing with the challenges of going through puberty, meeting changing expectations and coping with new feelings. Many also worry about moving from an elementary to a middle high school. And some children may have to deal with things that their peers don't have to face such as the death of a family member or moving to a new town. Most children meet these challenges successfully and grow into healthy adults while others have a harder time coping with their problems. Adolescent stresses are from within and from the various social spheres in which the adolescent operates. The early years of adolescence, between 12 and 15, is often accompanied by short-term emotional instability or low self-esteem.

Stress results from the tension between an individual's reaction to difficulties or challenges and his or her ability to handle and resolve the stressful situation. How people cope with stress depends on the resources that are available to them and whether they have the skills to utilize these resources. The term stressor relates to a challenging occurrence that may produce stress.

A major stressor that some students are faced with on a daily basis is completing schooling task. Adolescents are faced with multiple stressors in their lives on a daily basis. These can range from relationship issues, academics, sex, and money related problems. The negative way that some adolescents cope with these stressors include substance abuse, self-harm or suicide, isolation, which may result in mental health problems including depression or anxiety. Research has shown an increase in resilience and coping skills when managing stress after participating in trainings and other educational school-based programs that focus on stress management and positive coping strategies. Recent research by Byrne, Davenport, and Masanov (2007) yielded ten dimensions (categories) of stressors that were derived from factor analysis of 58 distinct stressors (items) identified by Australian youth ages 13-18. Four of the categories related to schooling; other categories reflected stressors associated with interpersonal relationships, home life, financial pressures, uncertainty about the future, and the presence of emerging adult responsibility.

## II. EDUCATIONAL IMPLICATIONS OF STRESS

Stressful life circumstances may influence school adjustment in many ways. First, dealing with stress in other areas of their lives may interfere directly with children's performance at school by depleting the amount of time, energy, and focused attention available for academic tasks and school involvement, such as completing homework or engaging in after-school activities. Second, exposure to high levels of stress may divert coping resources away from efforts to deal with the challenges of school. This lack of resources may lead adolescents to feel overwhelmed, and create a sense of helplessness that results in disengagement from school. Third, stressful circumstances outside of school may lead children to place less of a priority on educational goals, thereby undermining school investment. Finally, if stress originates within the family setting, it is likely that family members have less availability and lower levels of school involvement, which would diminish emotional and instrumental support necessary for educational success.

With the exception of a few research studies (Verma & Gupta, 1990; Verma, Sharma & Larson, 2002), academic stress and adolescent distress has not been explored in great detail in India. Mental health professionals in India, however, have identified academic pressure as an acute stress factor that leads to mental distress, and in extreme cases, to suicide.

## III. AIM

To study Early Adolescents Perception of Personal, Parents related, School related and Teacher related Stress.

## IV.  OBJECTIVES

1. To identify the level of stress among the students of VIII and IX grades.
2. To compare stress among adolescent boys and girls
3. To analyze and compare stress among adolescent in relation to
   - Personal stress
   - Parent related stress
   - School related stress
   - Teacher related stress

**Hypothesis**

Ho1: Grade IX students are more stressed than grade VIII students.

Ho2: Girls are more stressed than boys.

## V.  METHODOLOGY

**Sampling method**

The sampling method used was convenient sampling and purposive sampling.  The samples were taken from English medium formal secondary grade school from the western suburbs of Mumbai, India. The total sample size for the study was 335 adolescent students from school of Mumbai city (western suburbs). 4 schools were selected for data collection. The data collected were on the basis of grades i.e. VIII and IX English medium schools.

**Tools for data collection**

The tools used for data collection was a self-made questionnaire to find out the stress level among the VIII and IX grades. The questionnaire had 2 categories: General information and Levels of stress – 5 point rating scale.

**Scoring of the tool**

Scores are derived for all the five categories by assigning a score from 1 to 5 to the responses given for each statement. For a positive statement, a response of "Not at all Stressful/Irrelevant to me" earned a score of 5, a response of "Little Stressful " earned of 4, a response of "Moderately Stressful" earned as 3, a response of "Quite Stressful"  earned as 2 , while "Very Stressful"  earned as score of 1.

**Tool Reliability**

**Table 1.  Tool Reliability**

| Cronbach's Alpha | Cronbach's Alpha Based on Standardized Items | N of Items |
|---|---|---|
| .773 | .773 | 21 |

The scale has a good reliability. A coefficient of >= 0.70.

**Procedure for data collection**

The procedure of the data collection began with the identification of formal English medium secondary schools. The researcher requested appointment to meet the principle of the school. In all, 10 English formal medium secondary schools were approached. Out of this, 4 English medium secondary schools gave permission to conduct the research study. Meetings were fixed with the principle of the school to explain the importance and objectives of the study. The data was collected after the permission was given by the schools.

**Data analysis**

The data collected from VIII and IX grade student's questionnaire was qualitatively analyzed. T-test was used to analyze the data quantitatively. Standard deviation and mean analysis was also used for this quantitative data.

## VI.  RESULTS AND DISCUSSIONS

The total sample constituted of 335 students from VIII and IX grades. 60.3% of the students were from Grade VIII and 39.7% of the students were from grade IX. The sample had 54% boys and 46% girls. In the sample 4.2% students were 12 years of age, 50.7% students were 13 years of age and 45.1% students were 14 years of age.
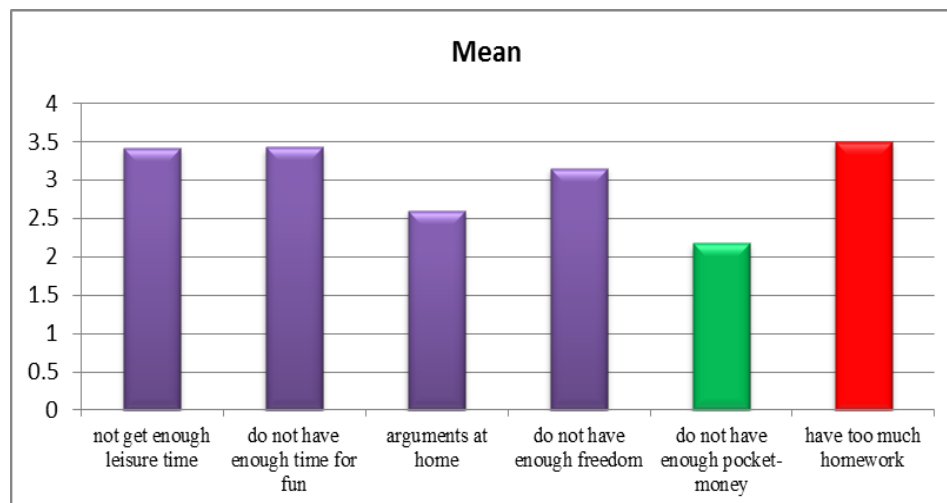
**Figure. 1.  Response to personal stress.**

The above figure shows responses towards personal stress. The adolescents feel that when they have too much homework it is the greatest stress and when they do not have enough pocket money is the least stress for them. However the research finding was in congruence with a finding of an empirical study done by Galloway & Pope, (2007) which stated that extensive homework in high school is associated with physical symptoms, academic worries, and mental health problems.
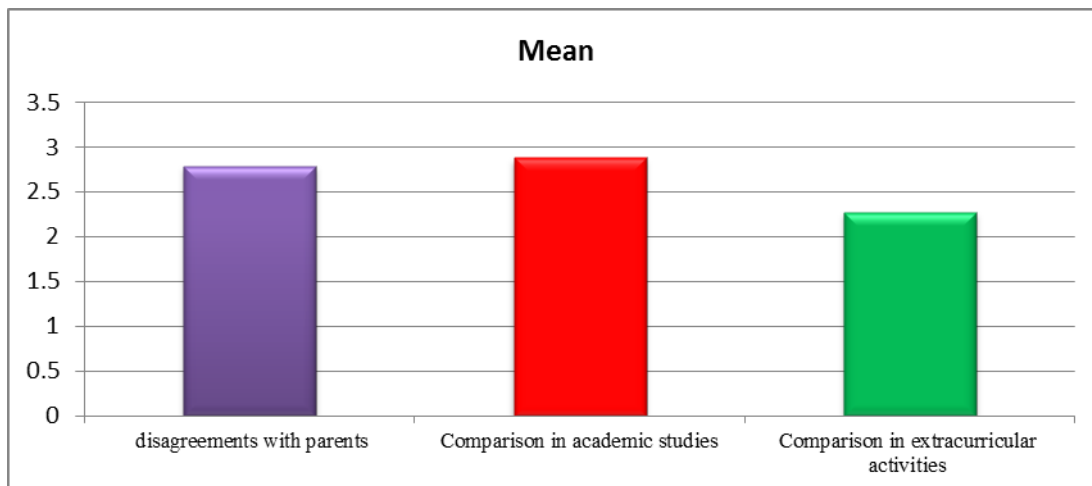


**Figure.2. Response to parents' related stress.**

The above figure shows responses towards parents' related stress. The adolescents feel that comparison by parents with peers in academics is the greatest stress and comparison by parents with peers in extracurricular activities is the least stress among adolescent students. The research finding was supported with finding of the study by Putnick, et al (2008)  which stated that mothers' and fathers' parenting stress was related to children's perceptions of acceptance and psychologically controlling behavior, and psychologically controlling behavior was related to adolescent self-concept. Parenting stress was related to specific parenting behaviors, which were, in turn, related to specific domains of self-concept in adolescence. Parenting stress appears to exert its effects on early adolescent self-concept indirectly through perceived parenting behavior.
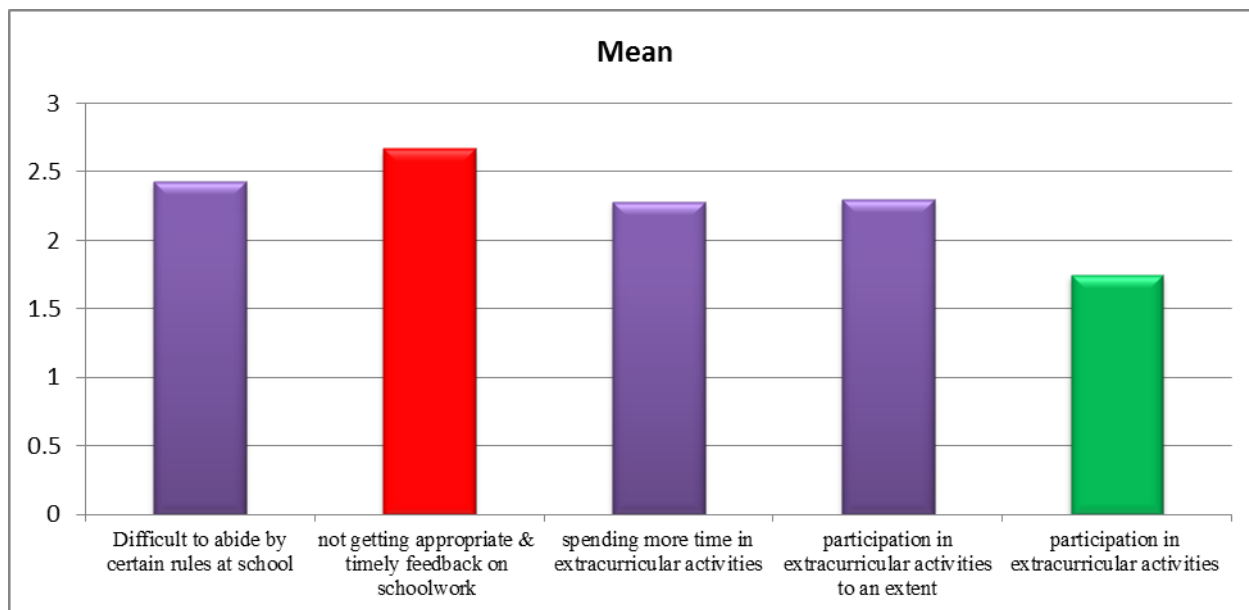


**Figure 3. Response to school related stress.**

The above figure shows the response to school related stress. The adolescents feel that when they do not get appropriate and timely feedback on school work is a great source of stress to them and participation in extracurricular activities is least stressful.
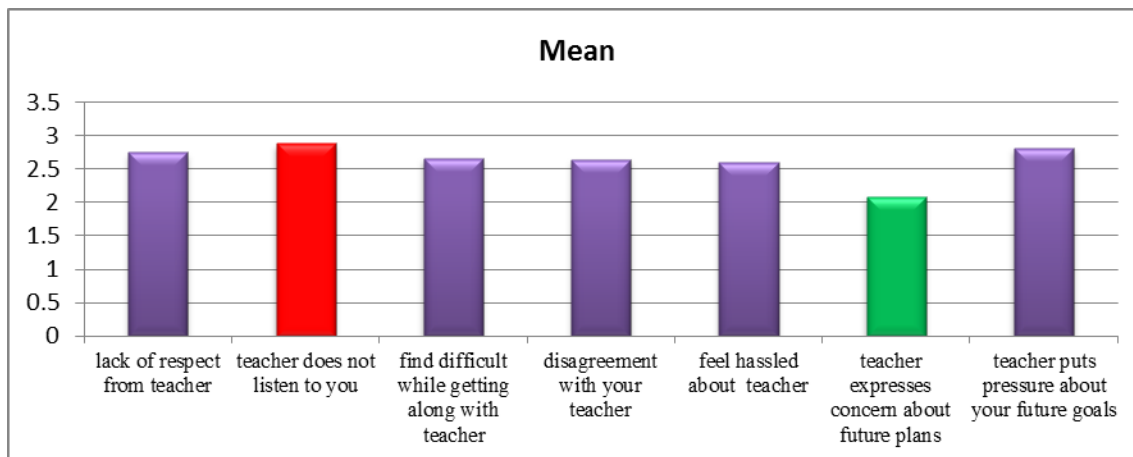


**Figure. 4. Response to teacher related stress.**

The above figure shows response to teacher related stress. When their teacher does not listen to them is one of the greatest stressors in adolescent students. The students are least stressed when teacher expresses concern about their future goals.

**Table 2. Mean difference between stress level among VIII and IX grade.**

| | Class | N | Mean % | S. D | SD Error Mean | t-test for Equality of Means | | |
| | | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| Stress | VIII | 202 | 43.08 | 14.08 | .99 | 2.18 | 333 | .029 |
| | IX | 133 | 39.77 | 12.62 | 1.09 | | | |

The above table shows the mean difference between stressors level among VIII and IX grade students. The p value is 0.029 which is < 0.05 hence there is a significant difference in the mean stress of grade VIII and IX adolescent students. The results indicate that Grade VIII students have more stress than grade IX Students. Therefore the hypothesis Grade IX students are more stressed than grade VIII students is rejected.

**Table 3. Mean difference between stress level among boys and girls.**

| | Gender | N | Mean % | S.D | S.D. Error Mean | t-test for Equality of Means | | |
| | | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|
| Stress | Boy | 181 | 41.31 | 13.73 | 1.02 | -.66 | 33 | .505 |
| | Girl | 154 | 42.30 | 13.47 | 1.08 | | | |

The above table shows the mean difference between stress level among boys and girls. The p value is 0.505 which is > 0.05 hence there is no significant difference in the mean stress between boys and girls. Therefore the hypothesis girls are more stressed than boys is rejected.

## VII. CONCLUSION

The present study was conducted to examine the levels of stress among adolescent students of VIII and IX grade. Adolescence is a period in which parents and teachers role is important in it. This is said to be life formation period. Therefore it has been considered necessary to study stress of adolescents with a view to have scientific understanding of the problem.

The findings in response to personal stress indicated that homework is the greatest stressor and participation in extra-curricular activity is the least stressor according to adolescents. The adolescents perceived that comparison by parents with peers in academics is stressful and comparison with peers in extracurricular activities is the least stressful in response to parents' related stress. The adolescents also perceived that when they do not get appropriate and timely feedback on school work from the teacher, is a great source of stress to them and participation in extracurricular activities is least stressful in response to school related stress. When the teacher does not listen to them is the greatest stress and are least stressed when teacher expresses concern about their future goals in response to teacher related stress. There is a significant difference in the mean stress of grade VIII and IX adolescent students. The results indicate that Grade VIII students have more stress than grade IX Students. The p value is 0.029 which is < 0.05 hence there is a significant difference in the mean stress of grade VIII and IX adolescent students. Therefore the hypothesis Grade IX students are more stressed than grade VIII students is rejected. There is no significant difference in the mean stress between boys and girls hence the hypothesis girls are more stressed than boys is rejected. The p value is 0.505 which is > 0.05 hence there is no significant difference in the mean stress between boys and girls.

Based on the findings of the present study, the following recommendations are made:

**Recommendations for teachers**:
- Training sessions on "Identify Stress and Help children cope with stress" should be conducted for teachers in schools in order to enhance their skills in dealing with stress issues of adolescent children.
- It is advisable for teachers to practice and implement the coping skills to help children cope with stress.

**Recommendations for parents**:
- Parents should make it a habit to open up lines of communications towards their children and discuss issues that their adolescent child would like to talk about.
- Parents need to acquire knowledge and skills to help their adolescent child deal with life situations in the right manner.

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# ARC LENGTH of an ELLIPTICAL CURVE

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**Abstract:** In this paper, I have introduced a new patent rule for computing ARC LENGTH of an ELLIPTICAL CURVE. It is based on Geometrical Theorems. The method is fast and simplest of all other methods meant for Elliptical Arc Length. The earlier methods existing for computing Elliptical Arc Length like Riemann sum (by integration), Numerical Integration, Bernoulli's method, Euler's method, and other methods in this sequence till now, recently by Arvind Narayan(September-2012)  provide approximate value and have more variables and involve more steps to  compute.. The peculiarity of this method is that no smoothness (differentiability) of the curve is required, just the extremities of arc is enough to determine the exact arc length of the elliptical curve. The present method not only provides a formula, but also, it will serve as the precious tool for the subjects relevant to the Elliptical Arc Length.
**Index Terms:** patent rule, exact, geometrical theorems, peculiarity, approximate

## I. INTRODUCTION

Earlier attempts to compute arc length of ellipse by antiderivative give rise to elliptical integrals (Riemann integrals) which is equally useful for calculating arc length of elliptical curves; though the latter is degree 3 or more, and the former is a degree 2 curves. Perhaps elliptical integrals are valuable tool, but for some curves it is difficult to evaluate and for some elliptical curves evaluation of elliptical integrals becomes impossible. Other methods like Riemann sum, and numerical integration after a long process gives an approximation, recently in 2012, Arvind narayan used geometry and trigonometry to find approximate elliptical arc length which requires end points of arc as well as their parametric equations.

The method which I am submitting is a simple solution for above problems, which just need the extremities of the elliptical arc. This method also establishes a valuable relation between elliptical arc length and its corresponding intercepted chord. To justify the significance of this method, it is necessary to explain it in two stages: Derivation of the formula, verification and its comparison.

## II. DERIVATION OF THE FORMULA(GEOMETRICALLY IN THE FORM OF THEOREM)

**[Farooque's Theorem]**

**Statement:** The arc length $(L)$ of an elliptical curve is equal to $\frac{\pi}{2\sqrt{2}}$ times of the intercepted chord length.

**Given:** An elliptical arc with extremities $A\,(x_1, y_1)$  and   $B\,(x_2, y_2)$

**To Prove:** $L = \frac{\pi}{2\sqrt{2}}\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
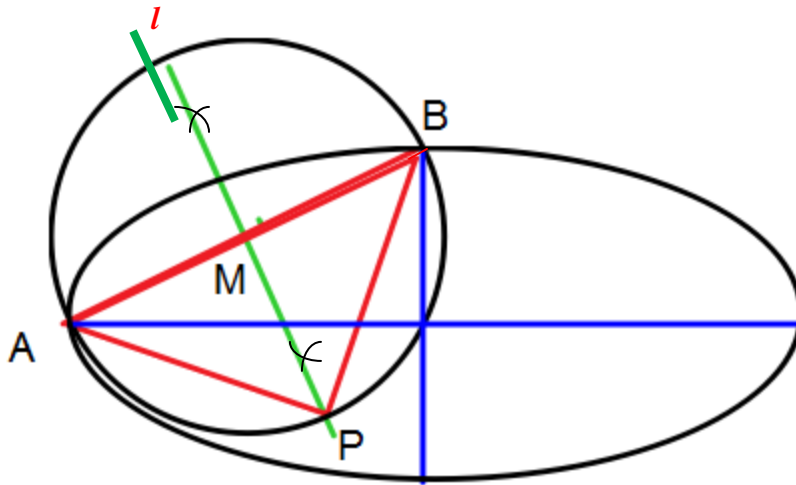
**Construction:**

$(i)$ Joining extremities A & B of given elliptical arc to make chord AB.

$(ii)$ Draw perpendicular bisector $(l)$ of the chord AB.

$(iii)$ With mid- point M of chord AB, as center and AM as radius, draw a circle, which cuts the produced $(l)$ at point P and Q.

$(iv)$ Joining AP and BP.

**Proof:**

(A)   In $\triangle$APM and $\triangle$BPM,

PM=PM (Common side to both triangles)

AM=BM (Since M is the mid-point of AB)

$\angle$ AMP $=$ $\angle$ BMP (Each is $90^c$ (as PM $\perp$ AB))

By SAS Congruency,

$\triangle$APM$\cong$ $\triangle$BPM

$\therefore$ AP=BP      (By cpct)

$\angle$ APM $=$ $\angle$ BPM   (By cpct)

Also $\angle$APB=$90°$ [ (As it is an angle in a semicircle (Appendix-A)]

$\therefore \angle$ APM $= \dfrac{APB}{2} = \dfrac{90°}{2} = 45^c$

(B)   **Relation of chord AP and radius AM of the circle**

In $\triangle$APM,        $\sin 45° = \dfrac{AM}{AP}$

$\dfrac{1}{\sqrt{2}} = \dfrac{AM}{AP}$

$AP = \sqrt{2}\ AM$

(C )   **Finding exact length of arc AB  of Ellipse**

Now consider sector APB

Since, $\text{Angle} = \dfrac{Arc}{Radius}$

$\therefore\ \theta = \dfrac{L}{AP}$

$\dfrac{\pi}{2} = \dfrac{L}{\sqrt{2}\ AM}$

$L = \dfrac{\pi}{2} \times \sqrt{2}AM = \dfrac{\pi}{2} \times \sqrt{2} \times \dfrac{AB}{2} = \dfrac{\pi}{4} \times \sqrt{2}AB$

$$L = \frac{\pi}{2\sqrt{2}} \times AB$$

HERE, (Distance), $AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$$L = \frac{\pi}{2\sqrt{2}} \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

**NOTE:**

**The factor** $\frac{\pi}{2\sqrt{2}} = $ **1.110720735** $\approx$ **1.111 [which I must write F (farooque) factor], which when multiplied to the chord length between any two points on curve gives the length of corresponding arc.)**

**VERIFICATION:** For example of an ellipse, $\frac{x^2}{16} + \frac{y^2}{9} = 1$



(0, 3)

(-4, 0)     (4, 0)
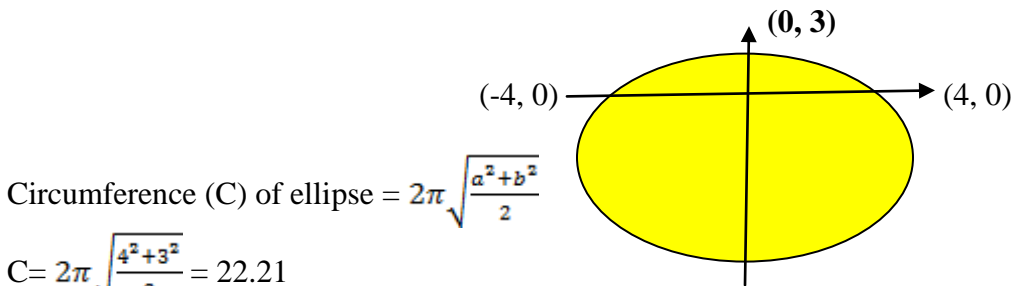
Circumference (C) of ellipse $= 2\pi \sqrt{\frac{a^2 + b^2}{2}}$

$C = 2\pi \sqrt{\frac{4^2 + 3^2}{2}} = 22.21$

By our recent formula,

AB= 5.55, which is the quarter of Circumference.

Now, C = 4×AB = 4×5.55 = 22.20

### III.    CONCLUSION

Therefore, above theorem gives a simple formula to determine the ''**arc length of** given **Elliptical arc segment lying within a quadrant of the ellipse''**, in the same manner, it is meant for other elliptical functions.

### IV.   PROSPECTS

Due to the simplicity and the degree of accuracy, this geometrical fact can be a step towards solving the problems related to elliptical Integrals, consequently a tool for all types of elliptic function. I hope that the method would find extensive applications where we require arc length of elliptical curves like cryptography and other applied engineering fields.

References:-

(1) *Wikipedia Article: Ellipse.*
(2)        *Wikipedia Article: Elliptical Integral*
(3)        *Wikipedia Article: Elliptical Curves*
(4)        *Perimeter of Ellipse by Arvind Narayan (2012).*

### APPENDIX-A

**STATEMENT:** "Angle subtended at the centre of the circle by its arc is twice the angle which the same arc subtends at the remaining part of the circle."

**GIVEN:**   A circle with centre O and radius r, AB is the arc and P is the point on the circle in its alternate segment.

**TO PROVE:** $\angle$ AOB = 2 $\angle$APB

**CONSTRUCTION:** Draw a circle with centre O, AB is arc and joining OA, OB, also PO produced up to C and joining PA and PB.
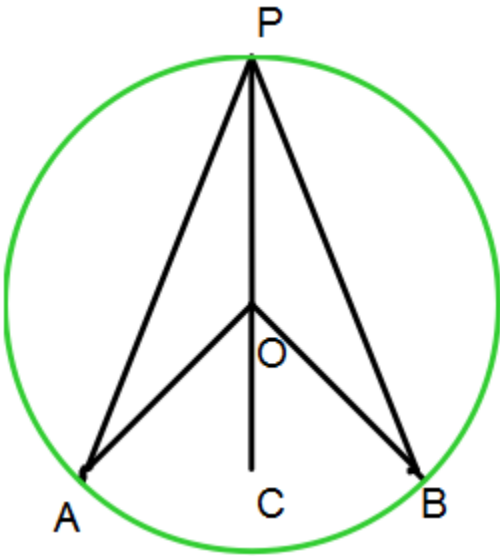


PROOF: In $\triangle$ AOP

OA = OP (being radius of same circle)

$\angle$OAP = $\angle$OPA

We know that,

Exterior Angle = sum of two remote interior angles

$\angle$AOC = $\angle$OAP + $\angle$OPA = 2 $\angle$OPA ------- (1)

Similarly, in $\triangle$ BOP

$\angle$ BOC = 2 $\angle$BPO -------- (2)

Adding (1) and (2), we get

$\angle$ AOC + $\angle$BOC = 2 ( $\angle$ APO + $\angle$BPO )

$\angle$ AOB = 2 $\angle$ APB -------- (3)

**COROLLARY**: **If AB is a semicircle then $\angle$ AOB = 180° ------- (4)**

**2 $\angle$ APB = 180°**

**$\angle$ APB = 90°**

**Thus, angle in a semicircle is right angle.**

# Spatial configurations and user preferences: Built environments in urban India

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*Abstract-* In an urban area, users use spaces on the basis of preferences and importances given. User preferences are usually common for a society due to common socio-cultural background. The paper attempts to understand the differences in user preferences of residents of two select localities in a developing city of Nagpur in India by studying the relationship between their spatial cognition and spatial configuration. Spatial configuration is quantified by axial line modeling based on space syntax theory. Local integration (R3), global integration (Rn) and connectivity are considered as parameters of spatial configuration. Interpretive parameters are synergy and intelligibility. The correlation study between parameters of cognition such as frequency of recognition, frequency of use and syntactic parameters is done. It has highlighted the differences in user preferences due to different spatial configurations.

*Index Terms-* Spatial Configuration, Spatial Cognition, User Preferences, Cognitive Constructs, Space Syntax

## I. INTRODUCTION

India is in a rapid phase of urbanisation. Up till now, the urbanisation process was mainly affecting megacities, but now small and medium size cities are also developing. These medium



**Fig 1: Conflicting Urban situation**
**Source: Author**

size cities mostly have traditional organic pattern of spatial configurations which has evolved over time. The new patterns of spatial configurations are based on modern city planning principles evolved after industrial development in Europe and

North America. These are adopted in Indian cities not giving much consideration to culture specific user preferences. In an urban area, users use spaces on the basis of preferences and importances given; which can be termed as cognitive constructs. These are usually common for a society due to common socio-cultural background. The user preferences in Indian context are quite different due to socio-economic, demographic and cultural differences. Traditionally evolved configurations are usually in congruence with user preferences as these preferences acted as a regulator of their progression. But there is a significant mismatch between the configurations of the contemporary built environments and the user preferences. The mismatch between the user preferences and the spatial configurations has led to rise of conflicting situations in developing cities as shown in figure 1. The present study does not want to discredit or discount the valuable contribution of modern city planning principles in building good cities in post independence India, but the paper puts forth a view that it may be useful to move ahead with the understanding of the user preferences specific to Indian context. There is a need for Indian built environment studies contributing to such positive theories. The paper deals with developing a methodological framework to understand the culture specific user preferences and the role of configurations in deciding preferences. The user preferences about using the environment can be learnt through the study of man-environment relationship. Spatial cognition is a mending mechanism between man and environment (Rapoport, 1977 pp 108). The understanding of cognitive constructs can help to comprehend user preferences.

The paper attempts to understand the differences in user preferences of residents of two select localities in a developing city of Nagpur in India. The two localities differ in their configurations. One locality is a part of old organically evolved part of the city and other locality is a planned development in post independence period. Thus they differ in terms of their configurations. The study has helped to understand the culture specific user preferences and effect of configuration in deciding preferences.

## II. METHODOLOGY

Spatial configuration is defined as a relation affected by the simultaneous co-presence of at least a third element and possibly all other elements in a complex. (Hillier, 1996, pp 71 ) Thus, configuration is a set of relations between spaces that exist at a particular point in time. Configuration may facilitate or restrict the possibility for visual and physical linkages. While using the built environments, human beings try to structure those linkages

to make it manageable. This process of deciding about behaviour on the basis of defining what is done, where and when, how here differs from there, in a built environment is called 'spatial cognition' (Rapoport, 977 pp113). The spatial configuration is not directly responsible for the behaviour. But the subjective structuring of that configuration in terms of spatial cognition is responsible for the behaviour. The relationship between spatial cognition and configuration is two way. Spatial configuration is responsible for shaping cognition and over a period of time, cognitive constructs shape spatial configuration.

Spatial cognition has two views. One is related to anthropological view and other is psychological (Rapoport, 1977 pp 108). Psychological view is about the correctness of schemata developed which depends on environmental knowledge. It varies individually due to age, sex, experience, exposure and spatial aptitude. But the anthropological view deals with the process of imposing order on the existing built environment by the society. The cognitive constructs develop by attaching importance and meaning to the built environment. Psychological view and anthropological view are related to each other.

**To quantify and understand spatial configuration**, there can be various methods of analysis of built environment to understand its configuration. Most of them depend on visual and physical aspects, metric distances and geometrical aspects of configuration. However such methods apparently lack in perceiving the 'spatial configuration- social behavior relationship' (Mohareb Nabil, 2009). Analysis till date suggests that far reaching practical implications on human response are not because of visual appearance but because of spatial configuration. The quality of individual space is not important; but the quality of relationship between spaces is important if we are discussing spatial configuration and user behaviour. Therefore, system of spaces needs to be considered with its topology rather than geometry of spaces.

Space syntax is used as a method to understand the topological relationships rather than metric distances between a space and all other spaces. The notion of syntax, derived from linguistics, refers to the relationships between different spaces or interactions between space and society (Jiang Bin, & Claramunt Christophe, 2002). Depth is defined as the minimum distance in terms of number of steps between two nodes. It is an important parameter of representing topological inter-relationships in a system of spaces. The quantification of relationships or configurations in terms of numerical parameters is based on the notion of topological distance or depth. The types of syntactic analysis include Visual-field analysis, Node analysis and Axial-line analysis.

Axial line modeling is chosen for the intended analysis. In axial-line analysis, the space is represented by straight lines called as axial-lines. In brief, the space to be examined is modeled by 'the fewest and the longest straight lines covering all convex spaces' (Hillier & Hanson, 1984, p. 91-92). The important syntactic parameters of spatial configuration are connectivity, integration (global and local), and the interpretive parameters are synergy and intelligibility. They are identified as parameters of spatial configuration. Intelligibility is defined as the correlation between connectivity and global integration and it is an indicator of how clear an urban system is for its users. Synergy is an indicator of 'part to whole relationship' in a system. 'UCL Depthmap' software is used for syntactic analysis. Figures 4, 5, 6 and 7 show axial maps generated by UCL Depthmap using 'graduated colour symbology' based on the integration values. Such graphic technique helps in visualization and comparison of spatial configuration of different systems. Generally, an accepted rule is to represent high global or local integration with warm colours such as red, orange and to display low integration values using cool colors, such as blue or green.

**User preferences** can be understood by externalizing cognitive map of users. Cognitive map is not a tangible entity and very difficult to externalize and comprehend. Spatial behaviour is an overt expression of spatial cognition (Markandey, 1997). Hence spatial behaviour in terms of pattern of use of spaces can help to understand cognitive constructs.

Sketch map method is often used by researchers. Sketch map assumes that a person understood the abstract representative notion of a map, its relation to the real world and translating spatial information from large to small scales. Through pilot survey, it was observed that the cartographic understanding of the respondents is very poor. Hence, a method of questionnaire based survey, recognition tests and behavior maps is used.

(i) A questionnaire was prepared and used to collect data about cognition and socio demographic character of the respondents, the data about the use of facilities, activity nodes within the locality and outside the locality.

(ii) A recognition test based on photographic information is worked out. For such a test, important landmarks located on axial lines with highest and second highest values of local/global integration are identified. The photographs of these landmarks were clicked at eye level in almost the same viewing angle as they are mostly seen while moving on the road. The photographs at these identified locations were then printed on photo-paper and respondents were asked to recollect, recognize and mention the locations of the photographed landmarks. Such a task is done for local level landmarks, nodes and paths and also for global level landmarks, nodes and paths.

(iii) Post recognition questions dealt with assessing the reasons for recognition.

(iv) For behaviour map, a photocopied map of the locality with North, all road network, important landmarks, and open spaces; is given to respondents. They are asked to mark their own residence, important roads and the facilities, activity nodes they use routinely on the given map. Figure 2 shows one of the behaviour maps by a respondent.

**Figure 2: Behaviour Map of a Respondent**
**Source: Author**

**To understand the user preferences through the study of the relationship of spatial configuration and spatial cognition**, the parameters of cognition are identified with the help of the scrutiny of the collected data. In anthropological aspect, the parameters of cognition were identified as frequency of use of local and global activity nodes and paths. The parameters of cognition in terms of psychological aspect were identified as frequencies of recognition of local and global landmarks. In the study, 'Local' activity nodes or landmarks refer to those which are within the delineated boundary of the localities studied and those which are outside delineated boundaries are referred as 'global'.

The parameters of configuration are already identified. Correlation analysis between parameters of configuration and cognition is carried out.

The study is carried out in the city of Nagpur which can be considered as a fair representative of developing cities in India because it is located at the centre of India and is a cosmopolitan city without any specific cultural, climatic, topographical peculiarity.

This study is conducted for two localities in Nagpur: Trimurti Nagar and Mahal. Mahal is an old locality that is selected as a representative of traditional, organically evolved old area and

Trimurti Nagar is a new planned locality which is selected as a representative of post independence orthogonal planning.

## III. FINDINGS

First part of the questionnaire was about socio-economic characteristics of the respondents of the select localities. The multiple bar diagram (figure 3) presents the comparative socio-economic characteristics of the respondents.
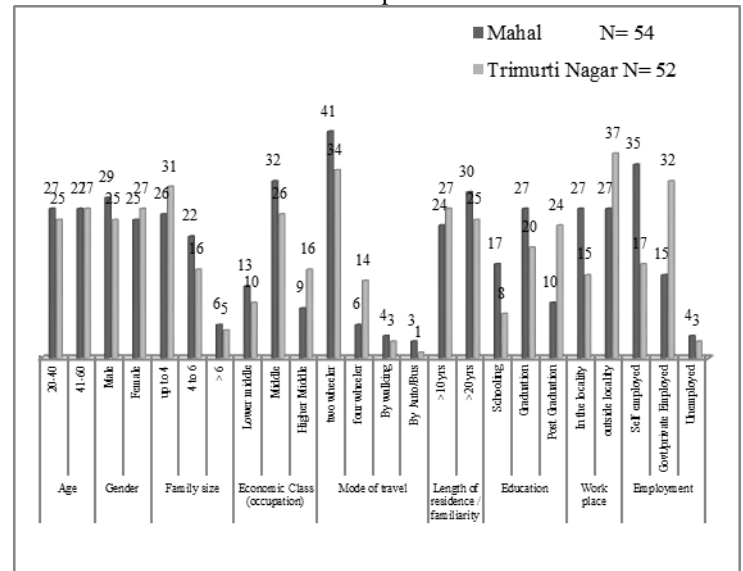


**Figure 3: Socio-Demographic Information of the Sampled Respondent Residents**

As mentioned already, for understanding the relationship between spatial configuration and cognition, it is important that the two groups should be homogeneous with respect to certain socio-economic-demographic characteristics. Hence by using Chi-Square test for homogeneity, one can test whether the two localities can be considered homogeneous with respect to the different socio-economic parameters. It was found that the composition of the sampled respondents from both the localities is homogeneous with respect to age, gender, family size, economic class, length of residence and mode of travel. However, there is a significant difference in the sampled respondents of the two localities with respect to education, employment and work-place location. To understand the role of configuration in development of these two aspects of cognition, co-relationships between syntactic parameters and parameters of spatial cognition are studied. For studying such relationship, correlation coefficients between syntactic parameters such as R**3**, Rn, Connectivity and frequency of use, frequency of recognition are calculated. Correlation matrix of these coefficients is shown in Table 1 and table 2. To test the significance of the observed correlation coefficients, 't – Test' is carried out. The correlation coefficients highlighted are found to be significant.

**Table 1 Correlation Matrix: Syntactic Parameters and Frequency of use**

| New planned locality : Use of roads/ paths within the locality | | | | |
|---|---|---|---|---|
| | R3 | Rn | Connectivity | Frequency Of Use |
| R3 | 1 | | | |
| Rn | 0.82 | 1 | | |
| Connectivity | 0.7 | 0.41 | 1 | |
| Frequency of use | 0.51 | **0.54** | 0.3 | 1 |
| **Old: Use of roads/ paths within the locality** | | | | |
| | R3 | Rn | Connectivity | Frequency Of Use |
| R3 | 1 | | | |
| Rn | 0.77 | 1 | | |
| Connectivity | 0.82 | 0.7 | 1 | |
| Frequency of use | 0.5 | 0.37 | 0.62 | 1 |
| **New planned locality: Use of activity nodes within the locality** | | | | |
| | R3 | Rn | Connectivity | Frequency Of Use |
| R3 | 1 | | | |
| Rn | 0.72 | 1 | | |
| Connectivity | 0.46 | 0.74 | 1 | |
| Frequency of use | 0.31 | 0.70 | 0.46 | 1 |
| **Old : Use of activity nodes within the locality** | | | | |
| | R3 | Rn | Connectivity | Frequency Of Use |
| R3 | 1 | | | |
| Rn | 0.69 | 1 | | |
| Connectivity | 0.82 | 0.66 | 1 | |
| Frequency of use | 0.58 | 0.013 | 0.27 | 1 |
| **New planned locality : Use of activity nodes outside the locality** | | | | |
| | R3 | Rn | Connectivity | Frequency Of Use |
| R3 | 1 | | | |
| Rn | -0.49 | 1 | | |
| Connectivity | 0.87 | 0.083 | 1 | |
| Frequency of use | 0.0017 | 0.25 | -0.13 | 1 |
| **Old : Use of activity nodes outside the locality** | | | | |
| | R3 | Rn | Connectivity | Frequency of Use |
| R3 | 1 | | | |
| Rn | 0.13 | 1 | | |
| Connectivity | 0.84 | 0.22 | 1 | |
| Frequency of use | 0.35 | 0.13 | 0.53 | 1 |

**Table 2 Correlation Matrix: Syntactic Parameters and Frequency of Recognition**

| New planned locality: Recognition of local landmarks/ paths | | | | |
|---|---|---|---|---|
| | R3 | Rn | Connectivity | Frequency of recognition |
| R3 | 1 | | | |
| Rn | -0.18 | 1 | | |
| Connectivity | 0.86 | -0.29 | 1 | |
| Frequency of recognition | 0.14 | 0.05 | 0.03 | 1 |
| **Old: Recognition of Local landmarks/ paths** | | | | |
| | R3 | Rn | Connectivity | Frequency of recognition |
| R3 | 1 | | | |
| Rn | 0.65 | 1 | | |
| Connectivity | 0.89 | 0.41 | 1 | |
| Frequency of recognition | -0.27 | -0.14 | -0.27 | 1 |
| **New planned locality: Recognition of Global landmarks/ paths** | | | | |
| | R3 | Rn | Connectivity | Frequency of recognition |
| R3 | 1 | | | |
| Rn | 0.47 | 1 | | |
| Connectivity | 0.93 | 0.5 | 1 | |
| Frequency of recognition | 0.03 | -0.12 | -0.008 | 1 |
| **Old: Recognition of global landmarks/ paths** | | | | |
| | R3 | Rn | Connectivity | Frequency of recognition |
| R3 | 1 | | | |
| Rn | 0.019 | 1 | | |
| Connectivity | 0.89 | 0.66 | 1 | |
| Frequency of recognition | -0.04 | 0.32 | -0.08 | 1 |

In the new planned locality, frequency of use of paths within the locality is positively correlated with R**3** and Rn but it is not correlated with connectivity. Thus, if the local Integration and global integration of a road are high then more is the frequency of use of the road in new planned locality. In old area, frequency of use of paths within the locality is positively correlated with R**3**

and connectivity, but there is no significant correlation between Rn and frequency of use.

This shows that residents of the old locality use locally integrated roads and subsequently local facilities more than the residents of new planned locality. This is because of the configurational peculiarity where people tend to move on local network before getting connected to global network. For use of activity nodes outside the locality, none of the configurational parameters have any significant relationship in case of new planned locality.

In case of old locality, the preferences about use of global activity nodes have significant correlation with connectivity. New planned locality residents have more education and mostly employed in public/private sector. The workplace locations are outside the locality. The residents of new planned locality have better commutability and they tend use facilities located on global network.

As seen from table 2, in new planned locality there is a significant correlation between Rn and frequency of recognition of global landmarks. However, it is observed through correlation study between frequency of recognition and syntactic parameters, that the role played by configuration in recognition or cognition in terms of psychological aspect is not significant.

## IV. DISCUSSION

The differences in use of global and local facilities by residents of old and new planned localities are due to configurational differences. The axial map of old locality showing global integration is shown in figure 4. The axial map of new planned locality indicating global integration is shown in figure 5. In case of old locality, there are many but small axes. The axes in new planned locality are longer and fewer. Though the average values of local and global integration are almost same, in case of old locality, there is significant variation in maximum and minimum values. Also the average values of connectivity are almost similar but in case of old locality, there are few axes with very high connectivity. As far as synergy and intelligibility are concerned, there is not much difference but still old locality is more synergistic and less intelligible as compared to new planned locality. Due to these syntactic peculiarities, the natural movement pattern in old locality is more restricted within the locality. It encourages the use of local facilities more and subsequently the social interaction and cohesion, making the locality much more humane.

In case of new planned locality, the syntactic configuration is such that the natural movement pattern encourages movement on longer paths with higher global integration, leading to more use of global facilities than local. That is further boosted by better commutability in case of new planned locality residents. Due to nature of employment and location of workplace, the commutability of the respondents from new planned locality is



**Figure 4: Global Integration map ( Rn) of Mahal - smaller but many axes**
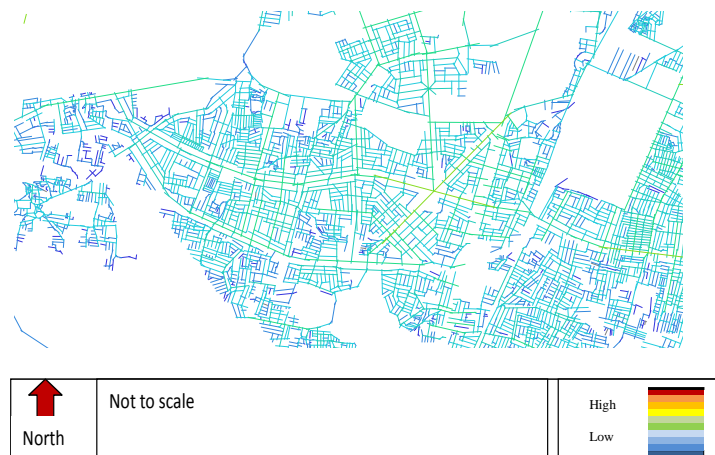


**Figure 5: Global Integration(Rn) map of Trimurti nagar- longer and fewer axes**

higher. Thus commutability has emerged as confounding variable. It is not actually studied but it has emerged out of study which affect the relationship between the dependant and independent variable.

The variations in maximum and minimum values of local integration in case of old locality helps in making residential streets physically segregated from the total system. Axial map indicating local integration of streets in old locality is shown in figure 6. This restricts the vehicular movement within streets encouraging their use as active social space. Similarly the axial map indicating local integration of streets in new planned locality is shown in figure 7. In case of new planned locality, mostly due to grid iron pattern, such variation in minimum and maximum values of integration does not exist.( fig 7) Many internal residential streets are equally physically integrated thus restricting their use as social spaces for playing or other activities such as celebration of festivals. More of physical integration of a space in a system restricts its role in social integration.

**Figure 6: Local integration map of Mahal**

**Figure 7: Local integration map of Trimurti nagar**

Not to Scale
North
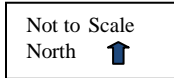
In new planned locality, there are higher numbers of spaces with higher values of global integration. This is responsible for making the locality more intelligible. But many of its axes are having less local integration. Thus making the locality less synergistic compared to old locality. In case of old locality, though it is less intelligible, it is more synergistic and spaces within system are not directly connected to global system but they have a hierarchy and spaces at local level gradually get connected to spaces at global level. This also helps in use of local facilities as you are confronted with local facilities before you get connected with global system.

It is observed through correlation study between frequency of recognition and syntactic parameters, that there is hardly role played by configuration parameters in recognition or cognition in terms of psychological aspect. Also there is any role of architectural characteristics of individual built-forms in cognizing the built environment for its use.

## V. CONCLUSION

It can be concluded that due to socio-demographic and economic peculiarity of the situation, the user preferences in India can be considered to be different. User cognize and then use built environments according to topological relationships. Physical and visual linkages through configuration play an important role in deciding the user preferences about the movement and use of facilities in built environment. These preferences are governed by various factors other than configuration at global level, but at local level, the preferences are significantly affected by configuration. Configuration affects the accessibility but the way accessibility is envisioned by the users, depend upon the common cognitive constructs due to socio-economic peculiarities of the Indian society. Hence instead of following westernized planning principles, it is important to understand the culture specific user preferences in Indian context for dealing emerging built environments in Urban India.

APPENDIX

**Following table gives the algorithm for calculations of syntactic measures.**

| Syntactic measure name/parameter | Description | Parameters | Remarks |
|---|---|---|---|
| Mean depth | Total Depth, TD(n), is the total of the shortest distances from node n to the other nodes in the systems, Mean Depth: Mean Depth for a node n is the average depth from node n to all the other nodes. | Mean Depth $MD = L/(N-1)$ where, L = Total Depth ( in terms of no. of steps) and N = total number of spaces in a system. | Very much a research number. |
| Relative Asymmetry | Relations of depth necessarily involves notion of asymmetry RA generalizes this by comparing | Relative Asymmetry $RA = 2(MD-1)/(K-2)$ MD: mean depth, K: number of space in a system | Lower value lesser depth more of integration |
| Real Relative Asymmetry (RRA) | RA values can be used to compare various spaces of approximately same size. But if one has to compare across systems which differ significantly in size, there is a need to take one more transformation to eliminate the effect of size. | Real Relative Asymmetry (RRA) = $RA/X$ where X = [ 6.644K. Log lo(K + 2) - 5.17K + 2 ] / ( K ~- 3 K + 2) | RA values are then adjusted between theoretical and empirical limits to allow direct comparisons across patterns regardless of their size. known as the Real Relative Asymmet |

| | | | ry (RRA). |
|---|---|---|---|
| Integration | Integration: Integration of a node is by definition expressed by a value that indicates the degree to which a node is integrated or segregated from a system as a whole (global integration), or from a partial system consisting of nodes a few steps away (local integration) | Integration $= 1/RRA$ | Low values indicate integration and high values indicate segregation |
| Connectivity: | It denotes the number of immediate neighbourhoods of an axial line. | It measures the number of lines that directly intersect given axial line. | |

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# Comparative analysis of rectangular and triangular cylindrical microstrip patch antenna

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**Abstract-** The objective of this paper is to develop a comparative analysis of rectangular and triangular cylindrical microstrip patch antenna. In this study we would like to take into account the problems of resonance and radiation of cylindrical rectangular and triangular microstrip patch antenna. Design procedure involves parameters related to cylindrical microstrip elements to realize the desired resonant frequency, input impedance, radiation patterns etc. Transmission line model is used to calculate the input impedance of the patch, while cavity model is used to calculate its radiation pattern. For a cylindrical-rectangular microstrip antenna, it is observed that the beam-width, resonant frequency, and resonant resistance decrease with cylinder radius. The bandwidth is not sensitive to curvature but it decreases as substrate permittivity increases. Triangular microstrip antennas are a good substitute for rectangular microstrip antennas, especially in microstrip array designs, due to their similar radiation properties and because the triangular patch is physically smaller than the rectangular patch

*Index Terms-* Cylindrical-rectangular patch, cavity model, conformal antenna, conformal mapping

## I. INTRODUCTION

As microstrip antennas are low profile antenna, one of the major advantages of microstrip antennas is that they can be made conformal to the surfaces on which they are mounted. A conformable antenna on a regular surface viz. cylindrical surface is easily achievable by conforming microstrip patch antenna on the surface. However the majority of the studies proposed in this area have been concentrated on rectangular and circular microstrip antennas. Mainly the triangular patch antenna has radiation properties similar to that of the rectangular antenna, with the advantage of being physically smaller. Rectangular and triangular type of radiating microstrip patch antenna mounted, as considered in this paper, on a cylindrical surface is chosen because major real world shapes can be approximated by cylindrical surface or cylindrical sector and uniformity in a plane provide ease of analysis.

This structure was first proposed by Krowne[1]. Using a cavity model, he observed that resonant frequency changes with surface curvature. Wu et al [2], calculated the radiation patterns using cavity model in conjunction with the method of images, but this method is not applicable when the ground plane is not flat. Fonseca and Giarola [3], the radiation from the wraparound cylindrical microstrip element was computed from a magnetic wall cavity model. Luk et al. [4], considered the case when the substrate thickness is much smaller than the wavelength and the

radius of curvature. Based on the cavity model, they found that the resonant frequencies and electric field under the patch were not affected by curvature. Kin-Lu Wong and Shan-Cheng Pan in 1997 again found the complex resonant frequencies of the cylindrical triangular microstrip patch are obtained. The real and imaginary parts of the complex resonant frequency give the resonant frequency and radiation loss of the structure. Mainly full wave analysis is applied to cylindrical microstrip patch antenna [6]-[7].At that time, method of moments (MoM), transmission line model is frequently used to analyze the patch fabricated on cylindrical substrate.

A comparative study of rectangular and triangular patch antenna may lead to new dimensions and types of conformal antenna.

Due to their smaller size and high bandwidth, a triangular patch antenna (TPA) is already in demand in planar antenna structure. The purpose of this paper is to make a comparative study of two types of non planar antenna in order to show the advantages of triangular patch antenna on curved surfaces.

## II THEORETICAL FORMULATION
### A. CYLINDRICAL RECTANGULAR PATCH ANTENNA

The basic design of cylindrical rectangular patch antenna is as shown in figure 1. The dimension of the straight edge is 2b and for curved edge is $2(a + h) \theta_1$, where a, radius of cylindrical ground plane and $2\theta_1$ the angle subtended by the curved edge. The fundamental mode $TM_{01}$ (to the $\rho$ direction) is considered, the patch is excited in the direction along with the cylinder axis. The conducting patch and ground cylinder is treated as electric and magnetic field of cavity, determined by dropping perpendiculars from the patch edges to the cylindrical conducting surface.
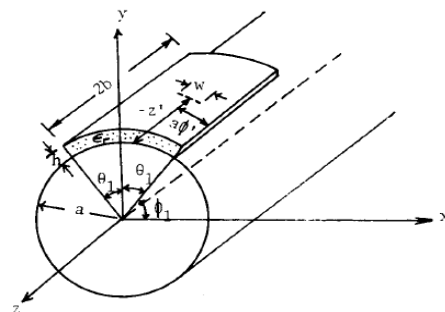


Fig.1 Geometry of cylindrical rectangular patch antenna

A.1 *Resonant frequency:* Krowne in 1983[1], theoretically calculated and make a comparative analysis between planar resonant and cylindrical resonant frequency ($f_{rR}$ and $f_{rC}$). The results demonstrate that assumption (h<<a) is good and that it is

excellent when considering excitation of the antenna with no spatial field variation normal to the surface Using cylindrical coordinates, the electric field satisfies the wave equation:

$$\frac{1}{\rho^2}\frac{\partial^2(\rho E_\varphi)}{\partial\rho\,\partial\phi} - \frac{1}{\rho^2}\frac{\partial^2 E_\rho}{\partial\phi^2} - \frac{\partial^2 E_\rho}{\partial z^2} + \frac{\partial^2 E_z}{\partial z\,\partial\rho} - k^2 E\rho = 0 \qquad (1)$$

Where $k^2 = \omega^2\mu\varepsilon$

Using approximation h<<a, assuming $\rho = a + h$, the eigen functions of $E_\rho$ and eigen values of k is given by:

$$E_\rho = \psi_{mn} = Eo\,\cos\left[\frac{m\pi}{2\theta_1}(\phi - \phi_1)\right]\cos\frac{n\pi z}{2b} \qquad (2)$$

$$k^2 = k^2_{mn} = \left(\frac{m\pi}{2(a+h)\theta_1}\right)^2 + \left(\frac{n\pi}{2b}\right)^2 \qquad (3)$$

The expression for $k_{mn}$ and $\psi_{mn}$ represent the field distribution and wave number of $TM_{mn}$ excitation. The equivalent magnetic currents along the edges of the curved patch are obtained from

$$M = E_\rho\,(\rho \times n)$$

Far field of these magnetic currents for $TM_{10}$ and $TM_{01}$ modes is given by following equations:

$TM_{10}$ mode:

$$E\varphi = \left(-\frac{2E_o h}{a\pi^2 r}\right)\frac{\sin(k_o b\cos\theta)}{k_o\cos\theta}e^{-jko(r+b\cos\theta)} \times$$

$$\sum_{p=0}^{\infty}\frac{\varepsilon_p\,j^p\cos(p\theta_1)}{H_p(k_o a\sin\theta)}\cos\left[p\left(\varphi - \frac{\pi}{2}\right)\right]$$

$$E_\theta \approx 0 \qquad (4)$$

$TM_{01}$ mode:

$$E_\theta =$$

$$\left(j\,\frac{2E_o h\theta_1}{\pi^2 r}\right)\frac{\cos\left(\frac{\pi}{2\sqrt{\varepsilon r}}\cos\theta\right)}{\sin\theta}e^{-jko(r+b\cos\theta)} \times$$

$$\sum_{p=0}^{\infty}\frac{\varepsilon_p\,j^p\cos(p\theta_1)}{Hp(k_o a\sin\theta)}\frac{\sin(p\theta_1)}{p\theta_1}\sin\left[p\left(\varphi - \frac{\pi}{2}\right)\right]$$

$$E_\varphi \approx 0 \qquad (5)$$

Both $TM_{01}$ and $TM_{10}$ modes are highly sensitive to curvature effects of cylinder and thus the resonant frequency.

The expression for the resonant frequencies is

$$f_{mn} = \frac{c}{2\sqrt{\varepsilon_r}}\left[\left(\frac{m}{2(a+h)\theta_1}\right)^2 + \left(\frac{n}{2b}\right)^2\right]^{\frac{1}{2}} \qquad (6)$$

It concludes that if dimensions 2 (a+h) $\theta_1$ and 2b of the patch are fixed, then the resonant frequency of $TM_{10}$ modes are not affected by curvature.

A. 2*Input impedance:* Curved patch is excited by a coax feed at z =- z', φ=φ'. The feed is modeled by a current ribbon of effective arc of length, w. The input impedance is obtained by evaluating the integral:

$$Z = -\frac{h}{w}\frac{a}{w}\int_{\varphi_1+\varphi'-w/2a}^{\varphi_1+\varphi'+w/2a}E\rho\,d\varphi \qquad (7)$$

The result thus obtained is given by:

$$Z = \sum_{m=0}^{\infty}\sum_{n=0}^{\infty}\frac{h\,e_m e_n}{8\pi\varepsilon_o\,\varepsilon_1 b\theta_1}\cos^2\left[\frac{n\pi z'}{2b}\right]\cos^2\left[\frac{m\pi\varphi'}{2\theta_1}\right]\cdot$$

$$j_o^2\left(\frac{m\pi w}{4a\,\theta_1}\right)\frac{\delta_{eff}f^3 - jf(f^2 - f_{mn}^2)}{\delta_{eff}^2 f^4 + (f^2 - f_{mn}^2)} \qquad (8)$$

Where,

$$e_m = \begin{cases}1 & m = 0 \\ 2 & n = 0\end{cases} \quad, e_n = \begin{cases}1 & n = 0 \\ 2 & n \neq 0\end{cases}$$

$\delta_{eff}$ is the effective loss tangent.

### B.  CYLINDRICAL TRIANGULAR PATCH ANTENNA

The basic geometry of CTPA is as shown in fig 2, the ground cylinder has a radius, a and the cylindrical substrate has a thickness of h and relative permittivity of $\varepsilon_r$. An isosceles triangular patch having flare angle of α subtended by bottom side of length $d_2$ and other two sides are of same length $d_1$.
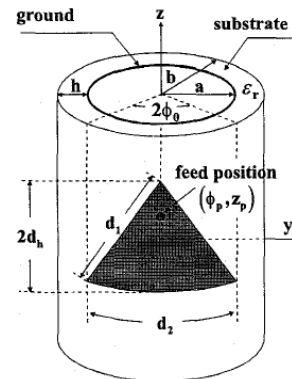


Fig.2 The geometry of a cylindrical triangular microstrip patch antenna

The relation between $d_1$ and $d_2$ is given by:

$$d_1 = \sqrt{\left(\frac{d_2}{2}\right)^2 + d_h^2} \qquad (9)$$

Where $d_h$ is the distance from the tip to bottom of the triangle. For analysis of triangular patch antenna only one expansion basis function for the unknown surface patch antenna is assumed, given by:

$$J_\varphi(\varphi, z) = -\frac{b\varphi_o}{z - d_h}\sin\left[\frac{(z+d_h)\pi}{2d_h}\right] \qquad (10)$$

$$J_z(\varphi, z) = \sin\left[\frac{(z+d_h)\pi}{2d_h}\right] \qquad (11)$$

Where $2d_h$ is the distance from the tip to bottom side (length $2b\varphi_o$) of the triangle.

B.1*Resonant Frequency:* By using full-wave analysis, homogenous matrix equation is obtained [8], given by:

$$\begin{bmatrix}Z_{\varphi\varphi} & Z_{\varphi z} \\ Z_{z\varphi} & Z_{zz}\end{bmatrix}\begin{bmatrix}I_\varphi & 0 \\ I_z & 0\end{bmatrix} = \begin{matrix}0 \\ 0\end{matrix} \qquad (12)$$

Where, elements of z matrix can be found by evaluating eq (11).By solving |z|, resonant frequency and radiation loss of cylindrical triangular microstrip patch is obtained.

### III   RESULTS ANALYSIS

Since the input impedance of both type of antenna is affected by the curvature of patch antenna, the 50 Ω input impedance is maintained and the impedance matching to 50 Ω coax is maintained [5].A rectangular patch is fabricated on a flexible substrate (RO3003) with $\varepsilon_r$=2.98 and h=0.762 mm. Figure 3 shows the input impedance variation with frequency having coaxial feed point at (90°, 0.93cm).From the reactance curve, resonant frequency at 1435 MHz is obtained.
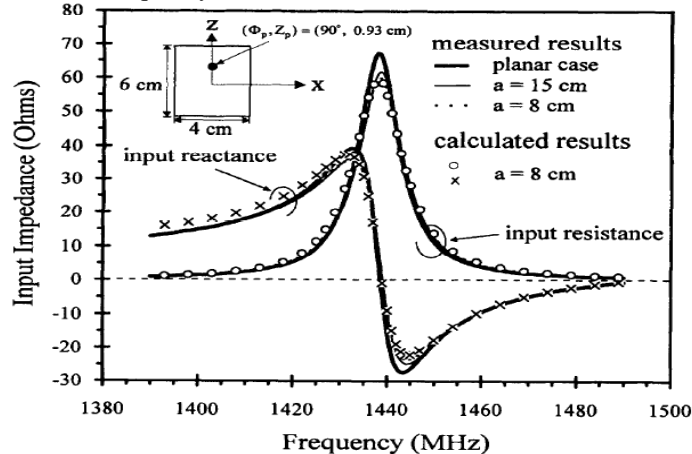


Fig.3 Input impedance calculated versus frequency for various cylinder radii.

Radiation pattern in (y-z) and (x-y) planes are plotted defining the E-plane and H-plane respectively. In Fig 4(a) E-plane pattern shows superstrate loading causes decrement in 3-dB bandwidth with increasing superstrate thickness and cylinder radius.



(a)
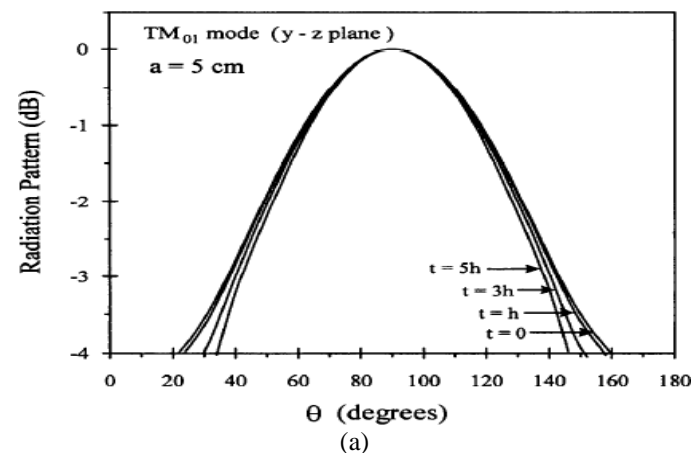
H-plane plotted in Fig 4(b) shows when microstrip antenna is excited at $TM_{01}$ mode ,H-plane gets broadened with decreasing cylinder radius, a. Pattern plotted for t=0 and t=3h shows the insensitivity for superstrate thickness.



(b)
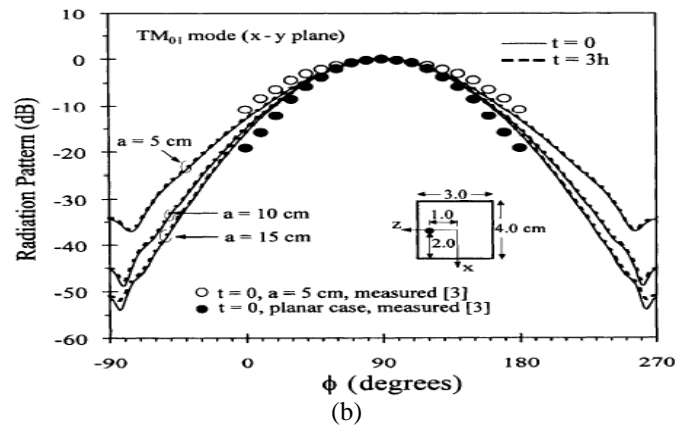
Fig. 4 Radiation pattern calculated at resonance for rectangular patch (a) E-plane, (b) H-plane

A triangular patch is fabricated on a flexible substrate with $\varepsilon_r$=3.0 and h = 0.762 mm. The geometry of patch includes $d_1$=$d_2$=7.18cm.The other design parameters are as discussed below:

| Parameter | Value |
| --- | --- |
| 2L | 6 cm |
| $2b\varphi_o$ | 4 cm |
| $(\varphi_p, z_p)$ | (90°,0.93 cm) |
| a | 8 cm |

The input impedance variation is as shown in Fig 5.Resonant frequency thus obtained from the curve be 1905MHz. Fig shows that resonant frequency increases with decreasing cylinder radius.
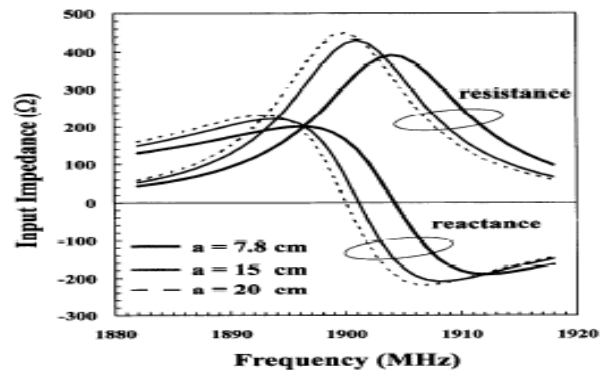


Fig. 5 Input impedance measured at $TM_{01}$ mode versus frequency

The results plotted for radiation pattern, Fig 6 indicates that with decreasing cylinder radius, both E-plane and H-plane are slightly broadened and radiation is increased in backward direction.

(a)



(b)
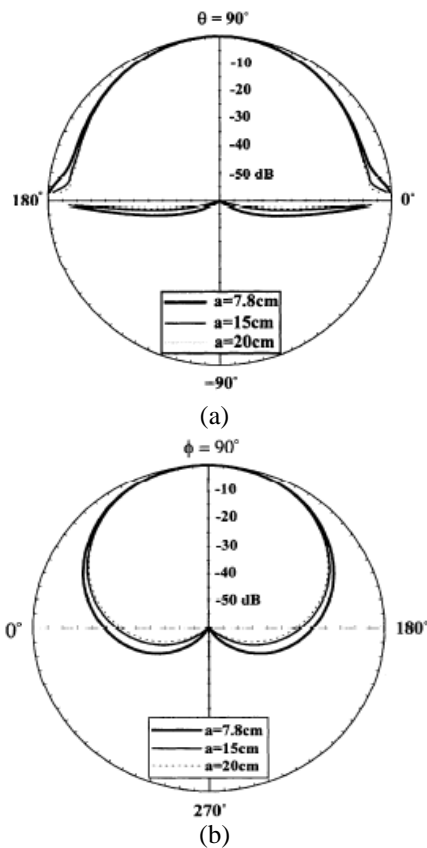
Fig. 6 Radiation pattern calculated at resonance for triangular patch (a) E-plane, (b) H-plane

## IV CONCLUSION

From the comparative analysis of rectangular and triangular microstrip patch antenna it can be conclude that TPA can be a good substitute for rectangular patch, due to its physical smaller size. As the most outstanding drawback of conformal antenna is its increased complexity and cost of designing. TPA can be used to overcome this drawback. Radiation patterns are obtained at resonant frequency of $TM_{10}$ mode for different values of a [9].TPA mounted on a cylindrical body of smaller radius has better linear polarization characteristics. Controlling polarization properties of microstrip antenna is another area of development due to need of making greater use of polarization properties of waves in radars. As the TPA shows good linear polarization characteristics, it can be advantageous for avionics application in future. Array configurations of conformal antennas would be the next step for the general conformal antenna study [13].

Different types of structure can be analyzed for better application of microstrip patch antenna, most popular design are spherical and toroidal structures [14]. A toroidal microstrip antenna is analyzed as a quasi-omnidirectional conformal antenna.

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# A Review on applications and challenges of Nano-fluids as coolant in Automobile Radiator

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***Abstract* -**Nanofluids are potential heat transfer fluids with enhanced thermo physical properties and heat transfer performance can be applied in many devices for better performances (i.e. energy, heat transfer and other performances). Evaluating the heat transfer enhancement due to the use of nanofluids has recently become the center of interest for many researchers. This newly introduced category of cooling fluids containing ultrafine nanoparticles (1–100 nm) has displayed fascinating behavior during experiments including increased thermal conductivity and augmented heat transfer coefficient compared to a pure fluid. In this paper, a comprehensive literature on the applications and challenges of nanofluids have been compiled and reviewed in Automobile sector.

Latest up to date literatures on the applications and challenges in terms of PhD and Master thesis, journal articles, conference proceedings, reports and web materials have been reviewed and reported. Recent researches have indicated that substitution of conventional coolants by nanofluids appears promising in Automobile radiator. Nanofluids have great potential to improve automotive and heavy –duty engine cooling rates by increasing the efficiency, lowering the weight and reducing the complexity of thermal management. Alternatively, it is beneficial to design more compact cooling system with smaller and lighter automobile radiators.

*Index Terms*- applications and challenges of Nano-fluids as coolant in Automobile Radiator

## I. INTRODUCTION

The automotive industry is continuously involved in a strong competitive career to obtain the best automobile design in multiple aspects (performance, fuel consumption, aesthetics, safety, etc.). The air-cooled heat exchangers found in a vehicle (radiator, AC condenser and evaporator, charge air cooler, etc.) have an important role in its weight and also in the design of its front-end module, which also has a strong impact on the car aerodynamic behavior. Looking at these challenges, an optimization process is mandatory to obtain the best design

compromise between performance, size/shape and weight. This optimization objective demands advanced design tools that can indicate not only the better solution but also the fundamental reason of a performance improvement**.**

In looking for ways to improve the aerodynamic designs of vehicles, and subsequently the fuel economy, manufacturers must reduce the amount of energy needed to overcome wind resistance on the road. At high speeds, approximately 65% of the total energy output from a truck is expended in overcoming the aerodynamic drag. This fact is partly due to the large radiator in front of the engine positioned to maximize the cooling effect of oncoming air.

The use of nanofluids as coolants would allow for smaller size and better positioning of the radiators. Owing to the fact that there would be less fluid due to the higher efficiency, coolant pumps could be shrunk and truck engines could be operated at higher temperatures allowing for more horsepower while still meeting stringent emission standards.

These novel and advanced concepts of coolants offer intriguing heat transfer characteristics compared to conventional coolants. There are considerable researches on the superior heat transfer properties of nanofluids especially on thermal conductivity and convective heat transfer. Eastman et al [40], Liu et al.[41], Hwang et al.[42], Yu et al[43]. and Mintsa et al.[44] , observed great enhancement of nanofluids' thermal conductivity compared to conventional coolants. Enhancement of convective heat transfer was reported by Zeinali Heris et al.[45] , Kim et al., Jung et al.[46] and Sharma et al.[47] . Applications of nanofluids in industries such as heat exchanging devices appear promising with these characteristics. However, the development and applications of nanofluidsm may be hindered by several factors such as long term stability, increase pumping power and pressure drop, nanofluids' thermal performance in turbulent flow and fully developed region, lower specific heat of nanofluids and higher production cost of nanofluids.

This paper review application of nanofluids as coolant in Automobile radiator as a coolant and challenges related to the it. The Below figure 1 shows the the different types of Nano-particles with Length scale and some examples related to it
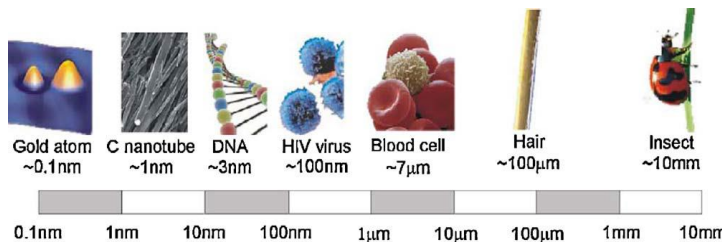
Fig. 1. Length scale and some examples related [50]

## II.  OVERVIEW APPLICATION OF NANOFLUID

The advent of high heat flow processes has created significant demand for new technologies to enhance heat transfer. For example, microprocessors have continually become smaller and more powerful, and as a result heat flow demands have steadily increased over time leading to new challenges in thermal management. Furthermore, there is increasing interest in improving the efficiency of existing heat transfer processes. An example is in automotive systems where improved heat transfer could lead to smaller heat exchangers for cooling resulting in reduced weight of the vehicle. Many methods are available to improve heat transfer in processes. The flow of heat in a process can be calculated based on [49].

$$Q = hA\Delta T$$

where Q is the heat flow, h is the heat transfer coefficient, A is the heat transfer area, and $\Delta T$ is the temperature difference that results in heat flow. It can be stated from this equation that increased heat transfer can be achieved by:

i)   Increasing $\Delta T$;
ii)  Increasing A;
iii) Increasing h

A greater temperature difference $\Delta T$; can lead to increase the heat flow, but $\Delta T$; is often limited by process or materials constraints. For example, the maximum temperature in a nuclear reactor must be kept below a certain value to avoid runaway reactions and meltdown. Therefore, increased $\Delta T$ can only be achieved by decreasing the temperature of the coolant. However, this would reduce the rate of the nuclear reaction and decrease the efficiency of the process[49].

Maximizing the heat transfer area A is a common strategy to improve heat transfer, and many heat exchangers such as radiators and plate-and-frame heat exchangers are designed to maximize the heat transfer area. However, this strategy cannot be employed in microprocessors and micro electro mechanical systems (MEMS) because the area cannot be increased. In aerospace and automotive systems, increasing the heat transfer area can only be achieved by increasing the size of the heat exchanger which can lead to unwanted increases in weight [49].

Heat transfer improvements can also be achieved by increasing the heat transfer coefficient h either by using more efficient heat transfer methods, or by improving the transport properties of the heat transfer material. For example, heat transfer systems which employ forced convection of a gas exhibit a greater heat transfer coefficient than systems which employ free convection of a gas. Alternatively, the heat transfer coefficient can be increased by enhancing the properties of the coolant for a given method of heat transfer. Additives are often added to liquid coolants to improve specific properties. For example, glycols are added to water to depress its freezing point and to increase its boiling point. The heat transfer coefficient can be improved via the addition of solid particles to the liquid coolant (i.e. nanofluids).[49-57]

Nanofluids can be used for a wide variety of industries, ranging from transportation to energy production and in electronics systems like microprocessors, Micro-Electro-Mechanical Systems (MEMS) and in the field of biotechnology. Recently, the number of companies that observe the potential of nanofluids technology and their focus for specific industrial applications is increasing. In the transportation industry, nanocars, GM and Ford, among others are focusing on nanofluids research projects[54-56].

Nanofluids can be used to cool automobile engines and welding equipment and to cool high heat-flux devices such as high power microwave tubes and high-power laser diode arrays. A nanofluid coolant could flow through tiny passages in MEMS to improve its efficiency. The measurement of nanofluids critical heat flux (CHF) in a forced convection loop is useful for nuclear applications. If nanofluids improve chiller efficiency by 1%, a saving of 320 billionkWh of electricity or an equivalent 5.5 million barrels of oil per year would be realized in the US alone. Nanofluids find potential for use in deep drilling application. A nanofluid can also be used for increasing the dielectric strength and life of the transformer oil by dispersing nanodiamond particles[56,57].

Kostic [59]  reported that nanofluids can be used in following specific areas:

• Heat-transfer nanofluids.
• Tribological nanofluids.
• Surfactant and coating nanofluids.
• Chemical nanofluids.
• Process/extraction nanofluids.
• Environmental (pollution cleaning) nanofluids.
• Bio- and pharmaceutical-nanofluids.
• Medical nanofluids (drug delivery and functional tissue–cell interaction).

Figure 2 shows the market volume of nanomaterials, tools and devices in past , present and future.
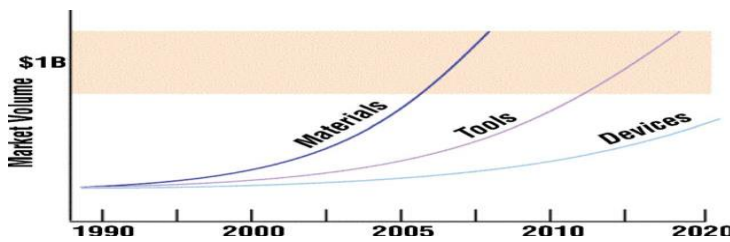
Fig. 2. Nanotechnology is poised to impact dramatically on all sectors of industry[60].

III.    THERMAL CONDUCTIVITY OF NANOFLUIDS

Numerous studies have shown that nanofluids have superb physical properties, among which thermal conductivity has been studied most extensively but remains controversial. Considerable research has been carried out on this topic. Eastman et al found [3] that a "nanofluid" consisting of copper nanometer-sized particles dispersed in ethylene glycol has a much higher effective thermal conductivity than either pure ethylene glycol or ethylene glycol containing the same volume fraction of dispersed oxide nanoparticles. Thermal conductivity of ethylene glycol can be increased by 40 % for a nanofluids consisting of ethylene glycol containing approximately 0.3 vol% Cu nanoparticles of mean diameter <10 nm. S.M. Peyghambarzadeh [1]  found that nano fluid consisting of Copper oxide (CuO) and Iron oxide ($Fe_2O_3$) nono particles dispersed in water has much higher heat transfer coefficient than pure water. In this paper ,the heat transfer performance of the automobile radiator is evaluated experimentally by calculating the overall heat transfer coefficient ($U$) according to the conventional ε-NTU technique. Copper oxide (CuO) and Iron oxide ($Fe_2O_3$) nanoparticles are added to the water at three concentrations 0.15, 0.4, and 0.65 vol.% with considering the best pH for longer stability. In these experiments, the liquid side Reynolds number is varied in the range of 50–1000 and the inlet liquid to the radiator has a constant temperature which is changed at 50, 65 and 80 °C. The ambient air for cooling of the hot liquid is used at constant temperature and the air Reynolds number is varied between 500 and 700. From these experiments he found that nanofluids show greater overall heat transfer coefficient in comparison with water up to 9%.

M. Naraki,[4] found that thermal conductivity of CuO/water nanofluids much higher than that of base fluidwater. He found that the overall heat transfer coefficient increases with the enhancement in the nanofluid concentration from 0 to 0.4 vol.%. Conversely. The implementation of nanofluid increases the overall heat transfer coefficient up to 8% at nanofluid concentration of 0.4 vol.% in comparison with the base fluid. Liu et al. [5], investigated the thermal conductivity of copper–water nanofluids produced by chemical reduction method. Results showed 23.8% improvement at 0.1% volume fraction of copper particles. Higher thermal conductivity and larger surface area of copper nanoparticles are attributed to this improvement. It is also noted that thermal conductivity increases with particles volume fraction but decreases with elapsed time. Lee et al. [6] revealed thermal conductivity of nanofluids is affected by pH   level and addition of surfactant during nanofluids preparation stage. Better dispersion of nanoparticles is achieved with addition of surfactant such as sodium dodecylbenzenesulfonate. Optimum combination of pH and surfactant leads to 10.7% thermal conductivity enhancement of 0.1% Cu/H2O nanofluids. Thermal conductivity of ethylene glycol based ZnO nanofluids measured by transient short hot wire technique is found to be increased non-linearly with nanoparticles volume fraction.

Vajjha and Das [7] also agreed that thermal conductivity is dependent not only on the nanoparticles concentration but also on the temperature. Authors concluded that, it will be more beneficial if nanofluids are used in high temperature applications. It has been noticed that most authors agreed that nanofluids provide higher thermal conductivity compared to basefluids. Its value increases with particles concentration. Temperature, particles size, dispersion and stability do play important role in determining thermal conductivity of nanofluids [8]. Fig. 3 shows the comparison of thermal conductivity of heat transfer fluids and nanofluids. Figs. 4 and 5 show the thermal conductivity of nanofluids at different temperatures. Table 1 also shows the enhanced thermal conductivities of metallic and non-metallic nanofluids as reported by Shen [9]. Table 2 shows the thermal conductivity ratio (i.e. thermal conductivity of solid to liquids) of nanofluids.The ratios are found to be in the range of 3–17,100. This shows an indication that when solid particles are added in conventional liquids/coolants, thermal conductivity can be increased tremendously.

Choi et al.observed that the thermal conductivity of this nanofluid was 150% greater thanthat of the oil alone. Tables 1–6 show the thermal performances of different types (metallic, non-metallic, MWCNT) and concentrations of nanofluids. Recently, tribology research shows that lubricating oils with nanoparticles additives (MoS2, CuO, TiO2, diamond, etc.) exhibit improved load-carrying capacity, anti-wear and friction-reduction properties.These features made nanofluids very attractive in some cooling and/or lubricating application in many industries including manufacturing, transportation, energy, and electronics, etc.
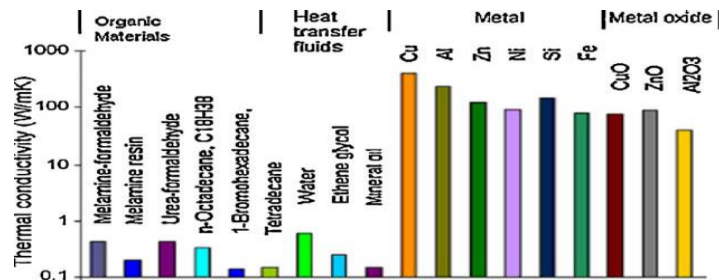
Fig. 3. Comparison of the thermal conductivity of common liquids, polymers and solids [10]
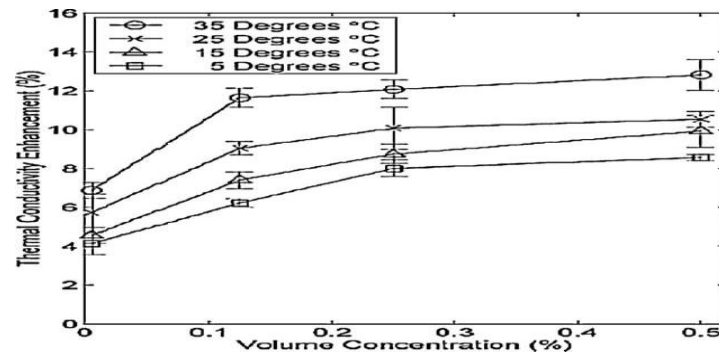


Fig. 4. Thermal conductivity enhancement of 2 nm gold nanoparticle in water as afunction of volume concentration [11].

Table no =1
Summary of literature review for thermal conductivity of nanofluids.[9]

|  | Particle | Base fluid | Average particle size | Volume fraction | Thermal conductivity enhancement |
|---|---|---|---|---|---|
| Metallic nanofluids | Cu | Ethylene glycol | 10 nm | 0.3% | 40% |
|  |  |  |  | 7.5% | 78% |
|  | Cu | Water | 100nm | 0.55% | 21% |
|  | Fe | Ethylene glycol | | 0.001% | 17% |
|  | Au | Water | 10-20 nm | | |
|  | Ag | Water | 60-80 nm | | |
| Non-metallic nanofluids | Al$_2$O$_3$ | Water | 13 nm | 4.3% | 30% |
|  | Al$_2$O$_3$ | Water | 33nm | 4.3% | 15% |
|  | Al$_2$O$_3$ | Water | 68nm | 5% | 21% |
|  | CuO | Water | 36nm | 3.4% | 12% |
|  | CuO | Water | 50 nm | 0.4% | 17% |
|  | SiC | Water | 26 nm | 4.2% | 16% |
|  | TiO$_2$ | Water | 15 nm | 5% | 30% |
|  | MWCNT | Synthetic oil | 25nm in diameter 50$\mu$m in length | 1% | 150% |

| | | | | |
|---|---|---|---|---|
| MWCNT | Decene/ethylene glycol/ water | 15nm in diameter 30$\mu$m in length | 1% 0.6% | 20%/13%/7% 38% |
| MWCNT | Water | 100nm in diameter 70$\mu$m in length | | |

Table 2 **:** Thermal conductivities ratio of different types of nanofluids.[9]

| Nano particles | k$_2$/k$_1$ (K$_1$ Thermal conductivity for liquid and k$_2$ Thermal conductivity for solid | Fluid |
|---|---|---|
| Al$_2$O$_3$ | 66 | Water |
| | 156 | Ethylene Glycol |
| | 140 | Glycol |
| | 342 | Glycerol Water |
| CuO | 127 | Water |
| | 300 | Ethylene Glycol |
| TiO$_2$ | 14 | Water |
| | 33 | Ethylene Glycol |
| Fe$_3$O$_4$ | 11.5 | water |
| ZrO$_2$ | | water |
| WO$_3$ | | Ethylene Glycol |
| ZnO | 48 | Water |
| | 113 | Ethylene Glycol |
| SiO$_2$ | 2.2 | Water |
| | 5.2 | Ethylene Glycol |
| Cu | 655 | Water |
| | 1550 | Ethylene Glycol |
| | | Water+ Ethylene Glycol |
| Ag | 697 | Water |
| Au | 518 | Water |
| | 1830 | Ethanol |
| | 2370 | Toluene |
| Fe | 132 | Water |
| | 311 | Ethylene Glycol |
| Alxcuy | | Water |
| | | Ethylene Glycol |

| | | |
|---|---|---|
| Alxcuy | | Oil |
| Alxcuy | | Water |
| | | Ethylene Glycol |
| Carbon nonotubes | 3290 | Water |
| | 7780 | Antifreeze |
| | 17100 | Oil |
| | 14300 | |
| Carbon nonotubes | 21 | Water |
| | 111 | Oil |
| | 3 | Toluene |
| Graphite | 1020 | Oil |
| Diamond | 3500 | Ethylene Glycol |

Table no 3

The augmentation factor ($\alpha_{cond}$) of A12O3 nanofluids.  [9]

| Practical Material | Particle size (nm) | Base Fluid Material | $\alpha_{cond}$ |
|---|---|---|---|
| $Al_2O_3$ | 33 | Water | 6 |
| $Al_2O_3$ | 24.4 | Water | 2.5 |
| $Al_2O_3$ | 28 | Water | 4 |
| $Al_2O_3$ | 38.4 | Water | 2.5 |
| $Al_2O_3$ | 36 | Water | 6 |
| $Al_2O_3$ | 47 | Water | 5 |
| $Al_2O_3$ | 20 | Water | 1.3 |
| $Al_2O_3$ | 11 | Water | 12 |
| $Al_2O_3$ | 47 | Water | 6 |
| $Al_2O_3$ | 150 | Water | 3 |
| $Al_2O_3$ | Not reported | Water | 4.6 |
| $Al_2O_3$ | 24.4 | Ethylene Glycol | 3 |
| $Al_2O_3$ | 28 | Ethylene Glycol | 3.4 |
| $Al_2O_3$ | Not reported | Ethylene Glycol | 6 |
| $Al_2O_3$ | 28 | Pump Fluid | 2.4 |
| $Al_2O_3$ | Not reported | Engine oil | 7.6 |
| $Al_2O_3$ | Not reported | Glycerol | 5.4 |

Table 4

The augmentation factor ($\alpha_{cond}$) of Oxide nanofluids[9]

| Practical Material | Particle size (nm) | Base Fluid Material | $\alpha_{cond}$ |
|---|---|---|---|
| CuO | 36 | Water | 12 |
| CuO | 18.6 | Water | 50 |
| CuO | 23 | Water | 3.8 |
| CuO | 28.6 | Water | 3.8 |
| CuO | 33 | Water | 3 |
| CuO | 18.6 | Ethylene glycol | 5 |
| CuO | 23 | Ethylene glycol | 3.9 |
| CuO | 12 | Ethylene glycol | 6 |
| CuO | 29 | Ethylene glycol | 4.5 |

| | | | |
|---|---|---|---|
| $TiO_2$ | 15 | water | 6 |
| $TiO_2$ | 40 | water | 2.4 |
| $ZrO_2$ | 20 | water | 2.5 |
| $Fe_3O_4$ | 9.8 | water | 8 |

Table 5

The augmentation factor ($\alpha_{cond}$) for metal nanofluids [9]

| Practical Material | Particle size (nm) | Base Fluid Material | $\alpha_{cond}$ |
|---|---|---|---|
| Cu | 18 | Water | 6 |
| Cu | 100 | Water | 10.1 |
| Cu | 100-200 | Water | 232 |
| Cu | 10 | Ethylene Glycol | 133 |
| Cu | 100 | Transformer | 5.9 |
| Au | 10-20 | Toluene | 818 |
| Fe | 10 | Ethylene glycol | 32.7 |
| $B_{i2}Te_3$ | 100 | FC72 | 10 |

Table 6

The augmentation factor ($\alpha_{cond}$) for metal nanofluids[9]

| Practical Material | Particle size (nm) | Base Fluid Material | $\alpha_{cond}$ |
|---|---|---|---|
| CNT | 15/30 | Water | 7.5 |
| CNT | 150/10 | Water | 44 |
| CNT | 40/50 | Water | 37 |
| CNT | 15/30 | Ethylene | 12 |
| CNT | 15/30 | Decene | 818 |
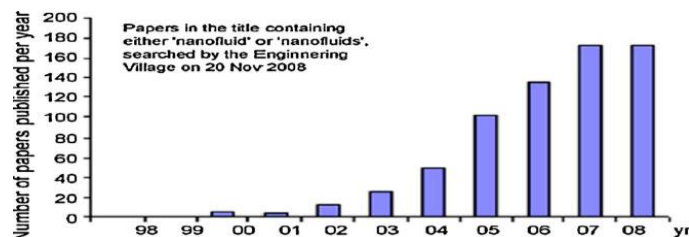


Fig. 6. Growth of publications by the nanofluids community [10]

## USES OF NANOFLUIDS AS A COOLANTS IN AUTOMOBILE RADIATOR

Nanofluids have great potentials to improve automotive and heavy-duty engine cooling rates by increasing the efficiency, lowering the weight and reducing the complexity of thermal management systems. The improved cooling rates for automotive and truck engines can be used to remove more heat from higher horsepower engines with the same size of cooling system. Alternatively, it is beneficial to design more compact cooling system with smaller and lighter radiators. It is in turn benefit the high performance and high fuel economy of car and truck. Ethylene glycol based nanofluids have attracted much attention in the application as engine coolant [56-58], due to the low-pressure operation compared with a 50/50 mixture of ethylene glycol and water, which is the nearly universally used automotive coolant. The nanofluids has a high boiling point, and it can be used to increase the normal coolant operating temperature and then reject more heat through the existing coolant system [13].

Argonne researchers, Singh et al. [12], have determined that the use of high-thermal conductive nanofluids in radiators can lead to a reduction in the frontal area of the radiator by up to 10%. This reduction in aerodynamic drag can lead to a fuel savings of up to 5%. The application of nanofluid also contributed to a reduction of friction and wear, reducing parasitic losses, operation of components such as pumps and compressors, and subsequently leading to more than 6% fuel savings. It is conceivable that greater improvement of savings could be obtained in the future. In order to determine whether

nanofluids degrade radiator material, they have built and calibrated an apparatus that can emulate the coolant flow in a radiator and are currently testing and measuring material loss of typical radiator materials by various nanofluids. Erosion of radiator material is determined by weight loss-measurements as a function of fluid velocity and impact angle.

In their tests, they observed no erosion using nanofluids made from base fluids ethylene and tri-cloroethylene gycols with velocities as high as 9m/s and at 90°–30° impact angles. There was erosion observed with copper nanofluid at a velocity of 9.6 m/s and impact angle of 90°. The corresponding recession rate was calculated to be 0.065 mils/yr of vehicle operation.Through preliminary investigation, it was determined that copper nanofluid produces a higher wear rate than the base fluid and this is possibly due to oxidation of copper nanoparticles. A lower wear and friction rate was seen for alumina nanofluids in comparison to the base fluid. Some interesting erosion test results from Singh et al. [12] are shown in Tables 7 & 8.

Table 7. Erosion Test Results for 50% Ethlyene Glycol, 50% $H_2O$ [12].

| Impact Angle (*) | Velocity (m/s) | Time (hrs) | Weight Loss (mg) |
|---|---|---|---|
| 90 | 8.0 | 236 | 0 ± 0.2 |
| 90 | 10.5 | 211 | 0 ± 0.2 |
| 50 | 6.0 | 264 | 0 ± 0.2 |
| 50 | 10.0 | 244 | 0 ± 0.2 |
| 30 | 8.0 | 283 | 0 ± 0.2 |
| 30 | 10.5 | 293 | 0 ± 0.2 |

Table 8. Erosion Test Results for Cu Nanoparticles in Trichloroethylene [12].

| Impact Angle (*) | Velocity (m/s) | Time (hrs) | Weight Loss (mg) |
|---|---|---|---|
| 90 | 8.0 | 236 | 0 ± 0.2 |
| 90 | 10.5 | 211 | 0 ± 0.2 |
| 50 | 6.0 | 264 | 0 ± 0.2 |
| 50 | 10.0 | 244 | 0 ± 0.2 |
| 30 | 8.0 | 283 | 0 ± 0.2 |
| 30 | 10.5 | 293 | 0 ± 0.2 |

Shen et al. [14] researched the wheel wear and tribological characteristics in wet, dry and minimum quantity lubrication (MQL) grinding of cast iron. Water-based alumina and diamond nanofluids were applied in the MQL grinding process and the grinding results were compared with those of pure water. Nanofluids demonstrated the benefits of reducing grinding forces, improving surface roughness, and preventing burning of the work piece. Contrasted to dry grinding, MQL grinding could considerably lower the grinding temperature.More research must be conducted on the

tribological properties using nanofluids of a wider range of particle loadings as well as on the erosion rate of radiator material in order to help develop predictive models for nanofluid wear and erosion in engine systems. Future research initiatives involve nanoparticles materials containing aluminium and oxide-coated metal nanoparticles. Additional research and testing in this area will assist in the design of engine cooling and other thermal management systems that involve nanofluids.

Choi et al. [15] showed that nanofluids have the potential of being recognized as a new generation of coolants for vehicle thermal management due to their significantly higher thermal conductivities than the base fluids. The heat rejection requirements of automobiles and trucks are continually increasing due to trends toward more power output.

Ollivier et al. [16] numerically investigated the possible application of nanofluids as a jacket water coolant in a gas spark ignition engine. Authors performed numerical simulations of unsteady heat transfer through the cylinder and inside the coolant flow. Authors reported that because of higher thermal diffusivity of nanofluids, the thermal signal variations for knock detection increased by 15% over that predicted using water alone.Thermal management of heavy vehicle engines and support systems is a technology that addresses reduction in energy usage through improvements in engine thermal efficiency and reductions in parasitic energy uses and losses. An ethylene glycol and water mixture, the nearly universally used automotive coolant, is a relatively poor heat transfer fluid compared to water alone. Engine oils perform even worse as a heat transfer medium. The addition of nanoparticles to the standard engine coolant has the potential to improve automotive and heavy-duty engine cooling rates. Such improvement can be used to remove engine heat with a reduced-size coolant system. Smaller coolant systems result in smaller and lighter radiators, which in turn benefit almost every aspect of car and economy. This may reduce the coefficient of drag and thus resulting in less fuel consumption. Alternatively, improved cooling rates for automotive and truck engines can be used to remove more heat from higher horsepower engines with the same size of coolant system.

A promising nanofluids engine coolant is pure ethylene glycol with nanoparticles. Pure ethylene glycol is a poor heat transfer fluid compared to a 50/50 mixture of ethylene glycol and water, but the addition of nanoparticles will improve the situation. If the resulting heat transfer rate can approach the 50/50 mixture rate, there are important advantages. Perhaps one of the most prominent is the low pressure operation of an ethylene-glycol-based nanofluids compared with a 50/50 mixture of ethylene glycol and water. This nanofluid also has a high boiling point, which is desirable for maintaining single-phase coolant flow. In addition, a higher boiling point coolant can be used to increase the normal coolant operating temperature and then reject more heat through the existing

coolant system. More heat rejection allows a variety of design enhancements including engines with higher horsepower.

Ollivier et al.[16] found that the use of the nanofluids leads to increased thermal signal variations by around 15% over that predicted using water alone. Authors employed a CFD numerical simulation method to analyze the application value of nanofluids in engine cooling. The simulation results indicated that nanofluids could enhance engine heat dissipating capacity and Cu–water nanofluids had better heat-transfer capability. It was also found that the more concentrations of the nanoparticles, the more enhancement of the engine heat dissipating capacity. When the concentration reached 5%, the heat dissipating capacity increased by 44.1%. With a remarkable enhancement on heat-transfer capability, the workload of the pump of engine cooling system only increased by 6%, which could be acceptable.

Tzeng et al. [17] dispersed CuO and $Al_2O_3$ nanoparticles into engine transmission oil. The experimental platform was the transmission of a fourwheel- drive vehicle. The temperature distribution on the exterior of the rotary-blade coupling transmission was measured at four engine operating speeds. The temperature distribution on the exterior of the rotary-blade-coupling transmission was measured at four engine operating speeds (400, 800, 1200, and 1600 rpm), and the optimum composition of nanofluids with regard to heat transfer performance was investigated. Authors reported that CuO nanofluids produced the lowest transmission temperatures at both high and low rotating speeds. Thus, use of nanofluids in the transmission
has a clear advantage from the thermal performance viewpoint.

As in all nanofluids applications, however, consideration must be given to such factors as particle setting, particle agglomeration, and surface erosion. In automotive lubrication applications, surface modified nanoparticles stably dispersed in mineral oils are reported to be effective in reducing wear and enhancing load-carrying capacity. Results from a research project involving industry and university points to the use of nanoparticles in lubricants to enhance tribological properties such as load-carrying capacity, wear resistance, and friction reduction between moving mechanical components. Such results are encouraging for improving heat transfer rates in automotive systems through the use of nanofluids.

The trend toward higher engine power and EGR inevitably leads to larger radiators and increased frontal areas, resulting in additional aerodynamic drag and increased fuel consumption. Therefore, cooling is one of the top technical challenges facing the truck industry [11].

Choi [11] reported the limitations of existing technologies as follows:
• Liquid-side: traditional coolants and oils have inherently poor heat transfer properties.

• Air-side: current radiator designs for increasing air-side heat transfer have already adopted extended surface technology to its limits.
• Therefore, there is a steadily increasing need for new concepts and technology for improving HV cooling system performance.

Choi [11] reported that in US a project was initiated to target fuel savings for the HV industry through the development of energy efficient nanofluids and smaller and lighter radiators. A major goal of the nanofluids project is to reduce the size and weight of the HV cooling systems by >10% thereby increasing fuel efficiency by >5%, despite the cooling demands of higherpower engines and EGR. Nanofluids enable the potential to allow higher temperature coolants and higher heat rejection in HVs. A higher temperature radiator could reduce the radiator size by perhaps 30%. This translates into reduced aerodynamic drag and fluid pumping and fan requirements, leading to perhaps a 10% fuel savings.

The new radiator design will be used in new general motors hybrid vehicles. These hybrid vehicles have multiple cooling systems for the internal combustion engine, electric engine, and batteries. The popularity of these hybrid vehicles is on the rise due to the decreasing fossil fuel supply, increasing the importance of a new radiator design that can possibly replace these multiple cooling systems.

These properties would be very beneficial to allow for an increased amount of heat to be removed from the engine. This is important because it will allow for a greater load to be placed on the fluid for cooling. However, these nanofluids do not show considerable improvement in heat transfer when used with current radiator designs. This is because there are several limitations to current radiator designs.

A steady-state heat exchanger consists of a fluid flowing through a pipe or system of pipes, where heat is transferred from one fluid to another. Heat exchangers are very common in everyday life and can be found almost anywhere. Some common examples of heat exchangers are air conditioners, automobile radiators, and a hot water heater. A schematic of a simple heat exchanger is shown in Figs. 7 and 8. Fluid flows through a system of pipes and takes heat from a hotter fluid and carries it away. Essentially it is exchanging heat from the hotter fluid to the cooler fluid as can be seen in Fig. 7.

Almost all automobiles in the market today have a type of heat exchanger called a radiator. The radiator is part of the cooling system of the engine as shown in Fig. 8. As can be can be seen in the figure, the radiator is just one of the many components of the complex cooling system.
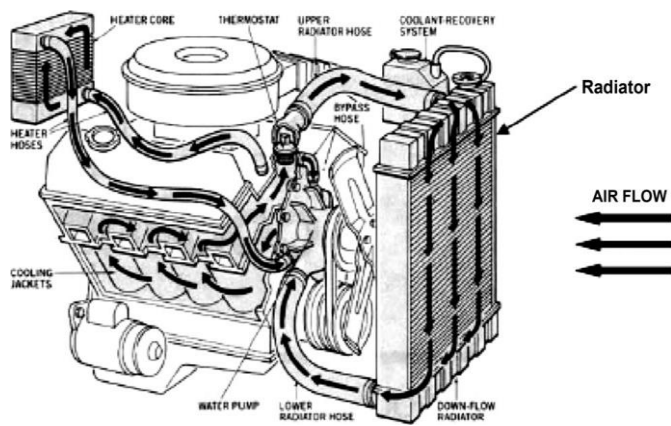
Fig. 7. Radiator of an engine.
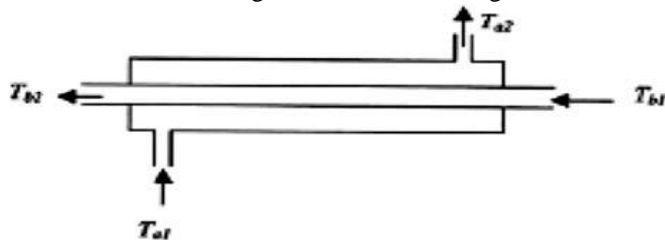


Fig. 7. Fluid flows in a radiator

Kole *et al.* prepared car engine coolant ($Al_2O_3$ nanofluid) using a standard car engine coolant (HP KOOLGARD) as the base fluid , and studied the thermal conductivity and viscosity of the coolant. The prepared nanofluid, containing only 3.5% volume fraction of Al2O3 nanoparticles, displayed a fairly higher thermal conductivity than the base fluid, and a maximum enhancement of 10.41% was observed at room temperature [13].

Tzeng *et al*. applied nanofluids to the cooling of automatic transmissions. The experimental platform was the transmission of a four-wheel drive vehicle. The used nanofluids were prepared by dispersing CuO and Al2O3 nanoparticles into engine transmission oil. The results showed that CuO nanofluids produced the lower transmission temperatures both at high and low rotating speeds. From the thermal performance viewpoint, the use of nanofluid in the transmission has a clear advantage [13].

## IV. CHALLENGES OF NANOFLUIDS

Many interesting properties of nanofluids have been reported in the review. In the previous studies, thermal conductivity has received the maximum attention, but many researchers have recently initiated studies on other heat transfer properties as well. The use of nanofluids in a wide variety of applications appears promising. But the development of the field is hindered by (i) lack of agreement of results obtained by different researchers; (ii) poor characterization of suspensions; (iii) lack of theoretical understanding of the mechanisms responsible for changes in properties. Therefore, this paper concludes several

important issues that should receive greater attention in the near future. Experimental studies in the convective heat transfer of nanofluids are needed. Many issues, such as thermal conductivity, the Brownian motion of particles, particle migration, and thermo physical property change with temperature, must be carefully considered with convective heat transfer in nanofluids. Though, all the convective studies have been performed with oxide particles in high concentrations (for example Pak and Cho [18] used 10 vol.% of $Al_2O_3$ which increased the viscosity and pumping power of the fluid, it is interesting to know the energy transport in low concentration(<1 vol.%) nanofluids with metallic particles since the thermal conductivity of pure metallic nanoparticles is more than 100 times higher than that of the oxide nanoparticles.

Future convective studies must be performed with metallic nanoparticles with different geometries and concentrations to consider heat transfer enhancement in laminar, transition and turbulent regions. The use of nanofluids in heat pipes has shown enhancement in performance and considerable reduction in thermal resistance. However, recent studies indicate particle aggregation and deposition in micro-channel heat sinks. Further study is required in these areas to identify the reasons for and the effects of particle deposition. Finally, there appears to be hardly any research in the use of nanofluids as refrigerants. Nanoparticle refrigerant dispersions in two-phase heat transfer applications can be studied to explore the possibility of improving the heat transfer characteristics of evaporators and condensers used in refrigeration and air-conditioning appliances. Applied research in nanofluids which will define their future in the field of heat transfer is expected to grow at a faster pace in the near future [19].

### 4.1. Long term stability of nanoparticles dispersion-

Preparation of homogeneous suspension remains a technical challenge since the nanoparticles always form aggregates due to very strong van der Waals interactions. To get stable nanofluids, physical or chemical treatment have been conducted such as an addition of surfactant, surface modification of the suspended particles or applying strong force on the clusters of the suspended particles. Dispersing agents, surface-active agents, have been used to disperse fine particles of hydrophobic materials in aqueous solution [20]. On the other hand, if the heat exchanger operates under laminar conditions, the use of nanofluids seems advantageous, the only disadvantages so far being their high price and the potential instability of the suspension [21].

Generally, long term stability of nanoparticles dispersion is one of the basic requirements of nanofluids applications. Stability of nanofluids have good corresponding relationship with the enhancement of thermal conductivity where the better dispersion behavior, the higher thermal conductivity of nanofluids [22]. However the dispersion behavior of the nanoparticles could be

influenced by period of time as can be seen in Figs. 8 and 9. As a result, thermal conductivity of nanofluids is eventually affected. Eastman et al. [23] revealed that, thermal conductivity of ethylene glycol based nanofluids containing 0.3% copper nanoparticles is decreased with time. In their study, the thermal conductivity of nanofluids was measured twice: first was within 2 days and second was two months after the preparation. It was found that fresh nanofluids exhibited slightly higher thermal conductivities than nanofluids that were stored up to two months. This might due to reduced dispersion stability of nanoparticles with respect to time. Nanoparticles may tend to agglomerate when kept for long period of time. Lee and Mudawar [24] compared the Al2O3 nanofluids stability visually over time span. It was found that nanofluids kept for 30 days exhibit some settlement and concentration gradient compared to fresh nanofluids. It indicated long term degradation in thermal performance of nanofluids could be happened. Particles settling must be examined carefully since it may lead to clogging of coolant passages.
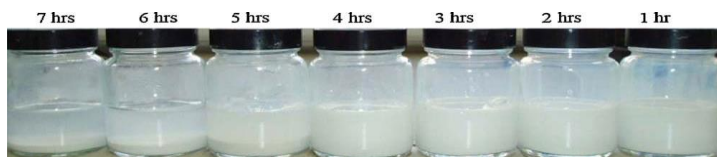


Fig. 8. Samples of $Al_2O_3$ nanofluids (without any stabilizer) stability change with time [22].
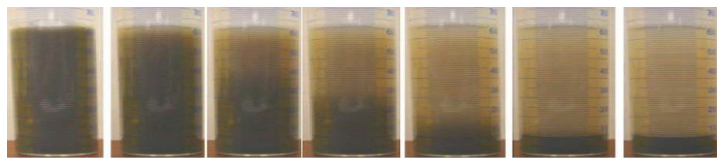


Fig. 9. The sedimentation of diamond nanoparticles at settling times of (a) 0 min, (b) 1min, (c) 2min, (d) 3min, (e) 4min, (f) 5min, and (g) 6min [39].

Choi et al. [25] reported that the excess quantity of surfactant has a harmful effect on viscosity, thermal property, chemical stability, and thus it is strongly recommended to control the addition of the surfactant with great care. However, the addition of surfactant would make the particle surface coated, thereby resulting in the screening effect on the heat transfer performance of nanoparticles. Authors also mentioned that the surfactant may cause physical and/or chemical instability problems.

## 4.2. Increased pressure drop and pumping power-

Pressure drop developed during the flow of coolant is one of the important parameter determining the efficiency of nanofluids application. Pressure drop and coolant pumping power are closely associated with each other. There are few properties which could influence the coolant pressure drop: density and viscosity. It is expected that coolants with higher density and viscosity experience higher pressure drop. This has

contributed to the disadvantages of nanofluids application as coolant liquids. Lee et al. [26] and Yu et al. [27] investigated viscosity of water based Al2O3 nanofluids and ethylene glycol based ZnO nanofluids. Results clearly show, viscosity of nanofluids is higher than basefluid. Namburu et al. [28] in their numerical study reviewed that density of nanofluids is greater than basefluid. Both properties are found pro portional with nanoparticles volume fraction. Several literatures have indicated that there is significant increase of nanofluids pressure drop compared to basefluid. Lee and Mudawar [24] revealed that single phase pressure drop of Al2O3 nanofluids in microchannel heat sink increases with nanoparticles concentration. Vasu et al. [29] studied the thermal design of compact heat exchanger using nanofluids. In this study, it is found that pressure drop of 4% Al2O3 +H2O nanofluids is almost double of the basefluid. Pantzali et al. [31] reported there was substantial increase of nanofluids pressure drop and pumping power in plate heat exchanger. About 40% increase of pumping power was observed for nanofluids compared with water.

Peng et al. [30] reported that the frictional pressure drop of refrigerant-based nanofluids flow boiling inside the horizontal smooth tube is larger than that of pure refrigerant, and increases with the increase of the mass fraction of nanoparticles. The maximum enhancement of frictional pressure drop can reach 20.8% under the experimental conditions.

An important parameter in the application of nanofluids in heat exchanging equipment is the pressure drop developed during the flow through the Plate Heat Exchanger (PHE). In Fig. 10 the total pressure drop P,measured inside the PHE, is plotted versus the cooling liquid volumetric flow rate for both the water and the nanofluid. Pantzali et al. [31] observed that the measured viscosity of the suspension (i.e. nanofluids) exhibits a twofold increase compared to water. This leads to a significant increase in the measured pressure drop and consequently in the necessary pumping power when the nanofluids are applied. Authors calculated that the pumping power increased about 40% compared to water for a given flow rate. Authors observed that for a given heat duty the required volumetric Flow rates for both the water and the nanofluid are practically equal, while the necessary pumping power in the case of the nanofluid is up to two times higher than the corresponding value for water due to the higher kinematic viscosity of the fluid [31].

## 4.3. Nanofluids thermal performance in turbulent flow and fully developed region-

Apart from thermal conductivity, convective heat transfer performance of the nanofluids also attracted maximum attention from the researchers. Most of the literatures reported that this property is greatly enhanced with the application of nanofluids. However, there is an issue that must be addressed carefully especially on the thermal performance of nanofluids in turbulent flow. Recently, there was inconsistence of results reported by the researchers. For instance [32] revealed that no

convective heat transfer improvement was noticed for amorphous carbonic nanofluids in turbulent flow despite 8% improvement in laminar flow. However, Duangthongsuk and Wong wises[33] reported that heat transfer coefficient of TiO2–water nanofluids is higher than basefluid. This property increases with the increase of Reynold numbers and particle concentrations ranging from 0.2% to 2%. Although the study revealed that 26% enhancement can be observed for nanofluids with 1% of TiO2 nanoparticles, it showed contradictory results at 2.0% volume fraction. Study indicated that heat transfer coefficient of nanofluids at this condition was 14% lower than basefluid. Pantzali et al. [31] added substitution of conventional coolants by nanofluids seemed beneficial for laminar flow compared to turbulent flow. Another weakness of nanofluids is its thermal performance at fully developed region. Ding et al. [33] found that convective heat transfer coefficient of nanofluids at low Reynold number has the highest value at the entrance length of the tube, starts decreasing with axial distances and eventually reaches constant value in fully developed region.
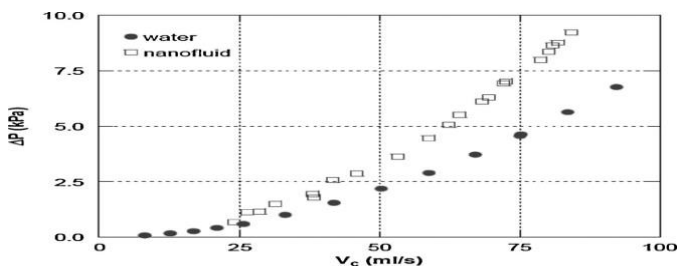


Fig. 10. Pressure drop of the cooling liquid inside the PHE versus the respective volumetric flow rate [31].

## 4.4. Higher viscosity-

The viscosity of nanoparticle–water suspensions increases in accordance with increasing particle concentration in the suspension. So, the particle mass fraction cannot be increased unlimitedly [34]. Pantzali et al. [31] concluded that in industrial heat exchangers, where large volumes of nanofluids are necessary and turbulent flow is usually developed, the substitution of conventional fluids by nanofluids seems inauspicious. Lee [35] reported that the viscosity increased so rapidly with increasing particle loading that volume percentages of CNTs are limited to less than 0.2% in practical systems.

## 4.5. Lower specific heat-

From the literatures, it is found that specific heat of nanofluids is lower than basefluid. Namburu et al. [28] reported that CuO/ethylene glycol nanofluids, $SiO_2$/ethylene glycol nanofluids and $Al_2O_3$/ethylene glycol nanofluids exhibit lower specific heat compared to basefluids. An ideal coolant should possess higher value of specific heat which enable the coolant to remove more heat.

## 4.6. Thermal conductivity-

The existing models for predicting thermal conductivities of CNT nanofluids, including Hamilton–Crosser model, Yu–Choi model and Xue model, cannot predict the thermal conductivities of CNT Nano refrigerants within a mean deviation of less than 15% [36].

## 4.7. High cost of nanofluids-

Higher production cost of nanofluids is among the reasons that may hinder the application of nanofluids in industry. Nanofluids can be produced by either one step or two steps methods. However both methods require advanced and sophisticated equipments. Lee and Mudawar [24] and Pantzali et al. [31] stressed that high cost of nanofluids is among the drawback of nanofluids applications.

## 4.8. Difficulties in production process-

Previous efforts to manufacture nanofluids have often employed either a single step that simultaneously makes and disperses the nanoparticles into base fluids, or a two-step approach that involves generating nanoparticles and subsequently dispersing them into a base fluid. Using either of these two approaches, nanoparticles are inherently produced from processes that involve reduction reactions or ion exchange. Furthermore, the base fluids contain other ions and reaction products that are difficult or impossible to separate from the fluids.

Another difficulty encountered in nanofluid manufacture is nanoparticles' tendency to agglomerate into larger particles, which limits the benefits of the high surface area nanoparticles. To counter this tendency, particle dispersion additives are often added to the base fluid with the nanoparticles. Unfortunately, this practice can change the surface properties of the particles, and nanofluids prepared in this way may contain unacceptable levels of impurities. Most studies to date have been limited to sample sizes less than a few hundred milliliters of nanofluids. This is problematic since larger samples are needed to test many properties of nanofluids and, in particular, to assess their potential for use in new applications [37].

Yet the fact that nano-fluids have more points in favor of them than against, for usage as cooling fluid, has emerged as an undisputed view. This calls for amore intensified effort in the research on nano-fluids. In contrast to the traditional unilateral approach, this research needs to examine closely a variety of issues, such as synthesis, characterization, thermo-physical properties, heat and mass transport, modeling, and device- as well as system-level applications. Hence, amulti-disciplinary approach comprising researchers such as thermal engineers, chemical technologists, material scientists, chemists, and physicists needs to be undertaken. Only such an approach can ensure a "cooler future" with nano-fluids [38].

## V. Conclusion

- It has been seen that nanofluids can be considered as a potential candidate for Automobile application.
- As heat transfer can be improved by nonofluids, in Automobile radiators can be made energy efficient and

compact . Reduced or compact shape may results in reduced drag ,increase the fuel economy ,reduce the weight of vehicle**.**

- Exact mechanism of enhanced heat transfer for nanofluids is still unclear as reported by many researchers.
- There are different challenges of nanofluids which should be identified and overcome for Automobile radiators application.

Nanofluids stability and its production cost are major factors that hinder the commercialization of nanofluids. By solving these challenges, it is expected that nanofluids can make substantial impact as coolant in heat exchanging devices.

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# Phytochemical Investigation of Different Plant Parts of *Calotropis procera*

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**Abstract**: *Calotropis procera* are widely used traditional medicinal plant to treat various ailments. It is an erect, perennial shrub luxuriantly thriving in wastelands. Plants are the richest sources of bioactive organic chemicals on earth. They are the store house of secondary metabolites such as alkaloids, terpenoids, steroids and flavonoids etc. The traditional medicine involves the use of different plant extracts or bioactive chemicals. The results suggest that the Phytochemical properties of the stem, leaves and flower for curing various ailments.

**Index Terms:** *Calotropis procera*, Phytochemical, Traditional medicine.

## I. INTRODUCTION

Calotropis procera belongs to the family Asclepiadaceae and is a soft wooded, evergreen perennial shrub. It is a xerophytic erect shrub, growing widely throughout the tropical and sub-tropical regions of Asia and Africa. This plant is popularly known because it produces large quantity of latex. Medicinal plants have no doubt remained the major sources of traditional medicine worldwide (Goyal et al, 2011).

Many higher plants accumulate extractable organic approaches substances in quantities sufficient to be economically management of disease. Plants have been a rich source of medicines because they produce wide array of bioactive molecules, most of which probably evolved as a chemical defence against predation or infection (RamaPrabha et al, 2012). It is estimated that only one percent of 2,65,000 flowering plants on earth have been studied exhaustively for their chemical composition and potential against important medicinal value (Cox et al, 1994). All the parts, viz, root, stem, leaf and flowers of *Calotropis procera* are in common use in indigenous system of medicine (Mukherjee et al, 2010). Here an attempt has been made to investigate the chemical present in the plant for curing various diseases.

## II. MATERIAL AND METHODS:

1. **Plant material:**

*Calotropis procera* ( stem, leaves and flowers) collected in November 2012 from Rewa. The plant material was identified at the field using standard keys and descriptions. Its botanical identity was further confirmed at Pinnacle Biomedical Research Institute, Bhopal, India.

2. **Method of extraction:**

Solvent – Petroleum ether, Methanol

Method – Maceration

**Procedure:**

Plant part (leaf, stem and flower) powder was weighed 500 gm and kept in a container in contact with pet ether for seven days, with vigorous shaking at regular interval. Material was filtered a first with muslin cloth and then with filter paper. Filtrate was collected and dried in water bath till no further reduction in mass of extract was observed. Dried extract was weighed and packed in air tight container.

And the marc was air dried then kept in a container in contact with methanol for seven days, with vigorous shaking at regular interval. Material was filtered a first with muslin cloth and then with filter paper. Filtrate was collected and dried in water bath till no further reduction in mass of extract was observed. Dried extract was weighed and packed in air tight container.

**3.       Phytochemical Screening-**

Phytochemical Screening was carried out using standard methods to detect the bioactive compounds like alkaloids, tannins, phenols, steroids, flavonoids, saponins (Trease et al, 1989).

## III.    RESULT AND DISCUSSION

TABLE 1: Phytochemical Screening of *Calotropis procera*

| S.No. | Experiment | Pet ether extract of *Calotropis procera* leaves | Methanolic extract of *Calotropis procera* leaves | Pet ether extract of *Calotropis procera* stem | Methanolic extract of *Calotropis procera* stem | Pet ether extract of *Calotropis procera* flower | Methanolic extract of *Calotropis procera* flower |
|---|---|---|---|---|---|---|---|
| **1. Alkaloids** | | | | | | | |
| 1.1 | Mayer's reagent test | -ve | -ve | -ve | -ve | +ve | -ve |
| 1.2 | *Wagner's reagent test* | -ve | -ve | -ve | -ve | +ve | -ve |
| 1.3 | Hager's reagent test | -ve | -ve | -ve | -ve | +ve | -ve |
| **2. Carbohydrates** | | | | | | | |
| 2.1 | Molish's test | -ve | +ve | -ve | -ve | -ve | +ve |
| 2.2 | Barfoed's test | -ve | +ve | -ve | -ve | -ve | +ve |
| **3. Test for Reducing Sugar's** | | | | | | | |
| 3.1 | Fehling's test | -ve | -ve | -ve | -ve | -ve | +ve |
| 3.2 | Benedict's test | -ve | -ve | -ve | -ve | -ve | +ve |
| **4. Flavonoids** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3.1 | Alkaline reagent test | -ve | +ve | -ve | +ve | -ve | +ve |
| 3.2 | Shinoda test | -ve | +ve | -ve | +ve | -ve | +ve |
| 3.3 | Lead acetate test | -ve | +ve | -ve | +ve | -ve | +ve |
| **5. Glycoside** | | | | | | | |
| 4.1 | Borntrager test | +ve | +ve | -ve | +ve | +ve | +ve |
| 4.2 | Legal's test | +ve | +ve | -ve | +ve | +ve | +ve |
| 4.3 | Killer- Killiani test | +ve | +ve | -ve | +ve | +ve | +ve |
| **6. Tannin and Phenolic compound** | | | | | | | |
| 6.1 | Ferric chloride test | -ve | +ve | -ve | +ve | -ve | +ve |
| 6.2 | Lead Acetate test | -ve | +ve | -ve | +ve | -ve | +ve |
| 6.3 | Dilute Iodine solution | -ve | +ve | -ve | +ve | -ve | +ve |
| **7. Saponin** | | | | | | | |
| 7.1 | Faom Test | -ve | -ve | +ve | +ve | +ve | +ve |
| **8. Test for Proteins and amino acid** | | | | | | | |
| 8.1 | Ninhydrin test | +ve | +ve | +ve | +ve | +ve | +ve |
| 8.2 | Biuret test | +ve | +ve | +ve | +ve | +ve | +ve |
| **9. Test for Fats and Oils** | | | | | | | |
| 9.1 | Solubility test | -ve | -ve | +ve | +ve | +ve | +ve |
| **10. Test for Triterpenoids and Steroids** | | | | | | | |
| 10.1 | Salwonski Test | +ve | +ve | -ve | -ve | -ve | +ve |
| 10.2 | Libberman and Burchard's test | +ve | +ve | -ve | -ve | -ve | +ve |

**(+)** indicates presence      **(-)** indicate absence

Herbal medicines have been used from the earliest times to the present day. Herbal medicines exhibit a remarkable therapeutic diversity. *Calotropis procera* Linn. is an Ayurvedic plant which is used in several traditional medicines to treat a variety of diseases. The extracts from different parts of the plant have significant therapeutic value. The leaves are used to treat joint pain and reduce swelling. It is also used as a homeopathic medicine (Meena et al 2011).

Chemical investigation of this plant has shown the presence of triterpinoids, cardiac glycosides, calotropin, calactin, calotoxin (Ahmed et al, 2005). The parts of the plant used in Ayurvedic medicine are leaves (fresh or dried), the roots, root bark and the flowers. The powered leaves are used for the fast healing of wounds, as a purgative and to treat indigestion. They are used to treat skin disorders and liver problems. The dried leaves are used to promote sexual health including penile dysfunction and are reputed to be an aphrodisiac. The flowers are used as a milk drink to treat a variety of complaints including coughs and catarrh, asthma and indigestion, as well as cholera. Traditionally, the plant has been used as an antifungal (Larhsini et al, 1997), antipyretic (Al. Yahya et al, 1985) and analgesic agant (Mohsin et al, 1989). Phytochemical estimation of *Calotropis procera* agrees with the work of Kuta (2008) who evaluated Phytochemical and antifungal effect of *Calotropis procera* stem bark on *Epidermophyton flocosum* and *Trichophyton gypseum*. The result of Kuta (2008) suggested that *Calotropis procera* stem could be a potential source of chemotherapeutic drugs for the treatment of tinea associated with *E. flocosum* and *T. Gypseum*. Sharma et al (2011) studied the Pharmacognostical aspects of *Calotropis procera*. Murti et al, (2010) analysed Pharmacognostic standardization of leaves of *Calotropis procera*. Phytochemical and antimicrobial evaluation has been carried out on other species of *Calotropis*. Varahalarao et al (2010) examined bioassays for antimicrobial activities using stem, leaves and flowers of *Calotropis procera*. Different parts of *Calotropis procera* have been reported to exhibit medicinal and nutritional properties while Phytochemical evaluation of the plant parts revealed the presence of essential and trace elements in varied quantities (Olasupo et al, 2004). The present work reports the Phytochemical properties of *Calotropis procera* with the view to further substantiate the earlier claims by various researchers on its potential use in traditional medicine (Kawo et al, 2009).

This research has been proved as s path giver to many scientists who may implement the result of the present work in developing drugs from *Calotropis procera* against human pathogenic microorganism.

## IV. CONCLUSION

Since, ancient times, the plants have been a veritable source of drugs. Different extracts from traditional medicinal plants have been tested to identify the source of the therapeutic effects. *Calotropis procera* (stem, leaf and flowers) extract made in Methanol, Petroleum ether  contains different secondary metabolites (Phytochemicals) with biological activity that can be of therapeutic index.

Table 1 showed preliminary Phytochemical screening of plant parts of *Calotropis procera*. It is interesting to note that the action of the extracts of *Calotropis procera* is non toxic. The obtained result provide a support for the use of this plant in traditional medicine and suggest its further advance investigation. Phytochemical screening of the crude extracts revealed the presence of saponins, tannins, alkaloids, other phytoconstituents which were reported during present investigation were cardiac glycosides, flavonoids, glycosides, steroids, terpens and tannins. The consequences of this work has clarified that many active bioconstituents of *Calotropis procera* consist effective qualities in its tending action. Thus it may be exploited by Scientists in the development of human medicines and drugs.

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# An Efficient Microwave-assisted Suzuki Cross-coupling Reactions on Quinoline Derivatives in Water and Study the Electronic Effects Thereof

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*Abstract-* Simple and rapid synthesis of various diversely functionalized unprotected 4-amino-2-chloroquinoline-3-aryl derivatives were synthesized in high yields by Suzuki cross-coupling reaction using microwave irradiation in water and in presence of tetrakis(triphenylphosphine)palladium(0). Electronic effects of *o*-substituted functional groups on the reaction were studied conclusively**.**

*Index Terms*- Microwave assisted synthesis, Suzuki Miyura cross-coupling reaction, Electronic effects.

## I. INTRODUCTION

Quinolines play a very important role in medicinal chemistry. The latest quinoline contains drug is montelukast (Singulair®), an anti-asthmatic drug. The inimitable characteristic of quinoline chemistry, stem from the sterioelectronic effects that the nitrogen atom has exerted on the quinoline molecule. Basically it is $\pi$-electron-deficient heterocycle. Due to the electronigativity of the nitrogen atom in quinoline, the $\alpha$ and $\gamma$ position tolerate a partial positive charge, making these C (2) and C (4) position prone to nucleophilic attack. A similar trend occurs in the context of palladium chemistry. Halogen at the $\alpha$ and $\gamma$ position of quinoline are more liable to oxidative addition to Pd(0) in comparison to simple carbocyclic aryl halides.

A few direct cross-coupling reactions on unprotected [1] and protected amines [2] on 2-chloroheteroaryl moieties have been disclosed in literature by conventional heating in organic solvents. A more challenging coupling reaction of 2-chloroheterobiaryl on unprotected amine with heteroaryl boronic acids is also reported in literature [3-4] by conventional heating method. It is common practice to protect and deprotect the functional groups such as amines, alcohols/ phenols, thiols / thiophenols and carboxylic acids [5] during coupling reaction. The Suzuki reaction on unprotected 4-amino-2-chloroquinoline was reported using expensive catalyst (Pd(dppf)Cl$_2$) at higher temperature required longer reaction time in DMF-water mixture with low yield by conventional method [6].

Meanwhile, microwave assisted organic synthesis is rapidly growing field in organic chemistry [7]. This field is suited to the increased demand in the industries because; it makes reaction time shorter and expanding the reaction range. The introduction of dedicated equipments has a large impact on the further development of this young research field [8]. On the other hand; the pharmaceutical industries require the production of higher number of novel chemical entities, which requires chemists to employ a number of resources to reduce the time for the production of compounds. Microwave radiation provides an alternate to conventional heating as utilizes the ability of liquids or solids to transform electromagnetic energy into heat.

In this paper, we first time introduce an efficient microwave assisted Suzuki cross coupling reaction on diversely functionalized unprotected *o*-amino quinolines with aryl boronic acid in water and studied the electronic effect of substituents during course of reaction under similar conditions.

## 2. Result and findings

Recently we have reported the synthesis of arylbenzo[*h*][1,6]naphthyridine derivatives by Suzuki reaction only on 4-amino-2-chloroquinoline-3-carbaldehyde using conventional method and further *Friedländer* condensation [9]. The success of carbon–carbon cross coupling reaction on 4-amino-2-chloroquinoline-3-carbaldehyde by conventional method encourages us to explore microwave-assisted Suzuki reaction on diversely functionalized unmasked 4-amino-2-chloroquinoline derivatives. However, we have optimized the reaction conditions and done Suzuki reaction on unmasked *o*-amino quinolines in short reaction time with higher yields (**2a-5c**).
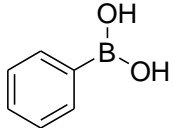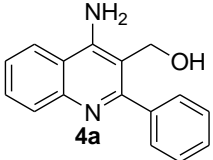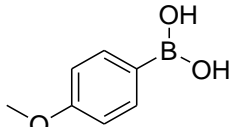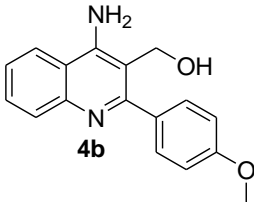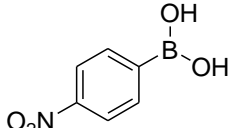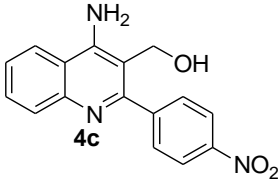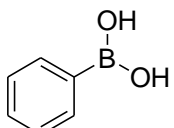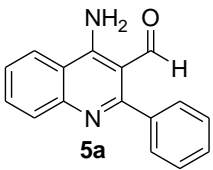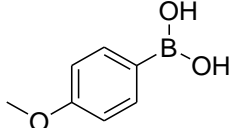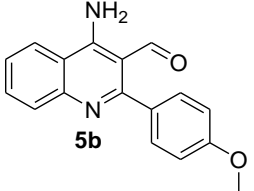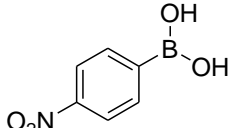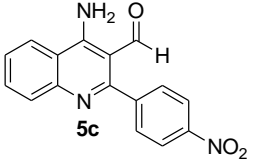
Based on several reports regarding the Suzuki-Miyaura reaction in aqueous media and in order to optimize the cross-coupling reactivity, we decided to use Na$_2$CO$_3$ as a base and Pd(PPh$_3$)$_4$ as a catalyst. It has been suggested that in the Suzuki reaction, the boronic acid is oxidized by the Pd(II) salt leading to formation of the Pd(0) complex and generation of a biaryl formed by concomitant homocoupling of boronic acid [10]. In light of this, we decided to use only Pd(PPh$_3$)$_4$ as a catalyst. We focused our research around the use of water as a solvent in conjunction with microwave heating. Water offers partial advantages over organic solvents. It is cheap,

readily available, non-toxic, nonflammable, and universally acceptable and proves to be an excellent solvent for microwave-promoted synthesis [11]. As well as being energy efficient, microwaves can also enhance rate of reaction and in many cases improve product yield. In this area the large number of papers and reviews available in the literature [12].

Furthermore, our attempts to use a lower catalyst loading (5 mol % Pd(PPh$_3$)$_4$ lead to increase the reaction time up to 1 hour (entry 12).

**Table 1.** Microwave-mediated Suzuki coupling reaction of 4-amino-2-chloro-3-substituted quinolines and aryl boronic acids in water using Pd(PPh$_3$)$_4$[a]



| Entry | Arylboronic acid | Product | $t$ (h) | Yield (%) |
|-------|-----------------|---------|---------|-----------|
| 1 | | 2a | 0.66 | 87 |
| 2 | | 2b | 0.33 | 88 |
| 3 | | 2c | 0.88 | 81 |
| 4 | | 3a | 0.66 | 79 |
| 5 | | 3b | 0.55 | 75 |
| 6 | | 3c | 0.75 | 83 |

| 7 | (phenylboronic acid) | 4a | 0.66 | 70 |
| 8 | (4-methoxyphenylboronic acid) | 4b | 0.33 | 68 |
| 9 | (4-nitrophenylboronic acid) | 4c | 0.88 | 71 |
| 10 | (phenylboronic acid) | 5a | 0.66 | 89 |
| 11 | (4-methoxyphenylboronic acid) | 5b | 0.33 | 91 |
| 12 | (4-nitrophenylboronic acid) | 5c | 0.88 | 95, 40[c] |

[a] Conditions: catalyst Pd(PPh$_3$)$_4$ 10 mol %, 4-amino-2-chloro-3-substituted quinolines (**1a-d**) (1equiv), arylboronic acid (1.3 equiv), Na$_2$CO$_3$ (3.0 equiv), H$_2$O. An initial microwave irradiation of 300 W was used, the temperature being ramped from rt to 105 $^{\circ}$C where it was then held for a *t* time

[b] Microwave irradiation (500 W, 105 $^{\circ}$C).

[c] Catalyst Pd(PPh$_3$)$_4$ 5 mol %

Initially, it was assume that due to the hydrogen-bonding between the NH$_2$ and carbonyl functionality at *ortho* position, the crowding at C$_2$ position decrease and the rate of oxidative addition on C$_2$-Cl bond increases or can also be due to the electron withdrawing effect of *ortho* substituent make C$_2$-position more prone for oxidative addition. To demonstrate the success of reaction whether due to the hydrogen-bonding or it was just electronic effect we discarded the hydrogen-bonding by introduction of nitrile at that position. Hence the 4-amino-2-chloroquinoline-3-carbonitrile **6** was obtained from 4-amino-2-chloroquinoline-3-carbaldehyde **1d** by using iodine and aqueous ammonia [13] (scheme 2). The reaction of interest compound **6** with phenylboronic acid under similar microwave conditions yield 74 % of 4-amino-2-phenylquinoline-3-carbonitrile **7**
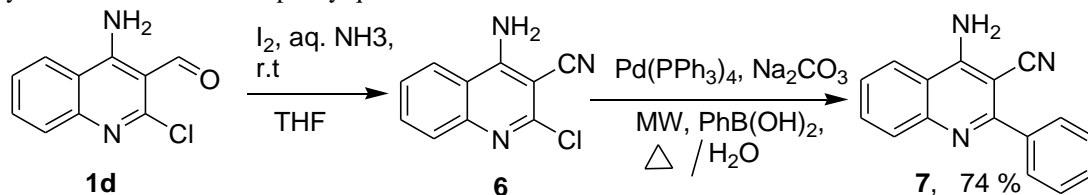


**Scheme 2**. Suzuki coupling reaction on 4-amino-2-chloroquinoline-3-carbonitrile
(To study the effect of Hydrogen bonding)

From this reaction the first assumption i.e. hydrogen-bonding was fail with conformation of only electronic effect which enhances the yields of coupling reaction. The electron withdrawing groups i.e. *o*-ester, acid, alcohol, aldehyde and nitrile at $C_3$-position of quinoline ring has inductive effect and it make $C_2$-position more deficient that favors oxidative addition on $C_2$-Cl bond.
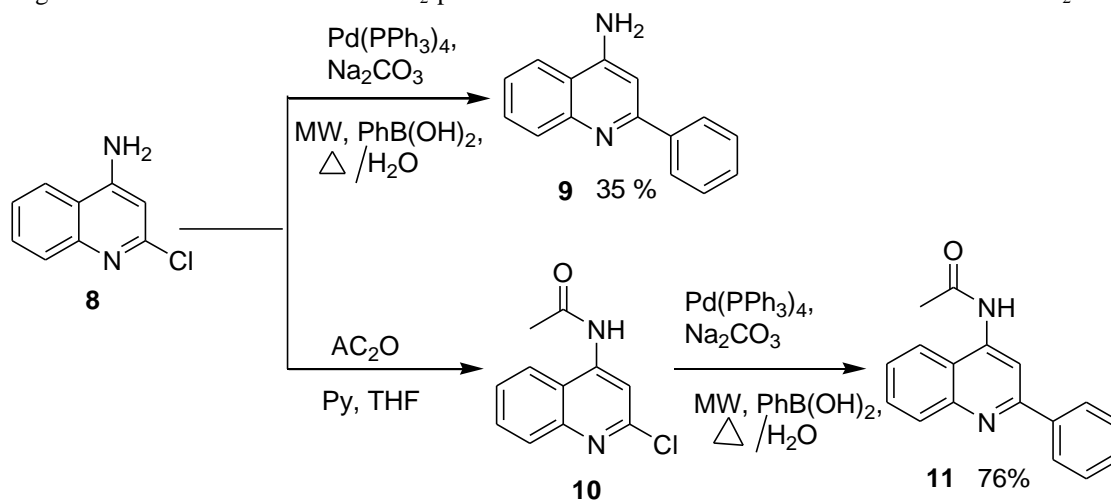


**Scheme 3**. Suzuki coupling reaction on unprotected 9 and protected 4-amino-2-chloro quinoline without o-substituent.

Further, the reaction on unprotected amine **8** (without *ortho* substituent) yield 4-amino-2-arylquinoline **9** in 35%, while the *N*-acetyl derivative **10** yields *N*-acetyl-2-phenylquinoline **11** in 76% yield, support the effect of electron withdrawing substituents on yields of coupling reaction (scheme 3). From the above experiments we observed that due to the electronic movement of lone pair of amine with *o*-substituted groups on quinoline ring make free amine busy so it does not required any special protection to complete the reaction and also it does not effect on the yield of the reaction.
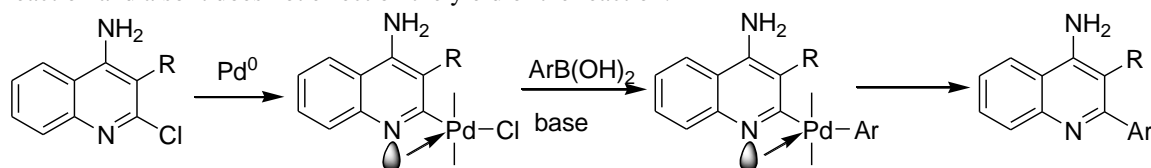


R= COOEt, COOH, CHO, CN and $CH_2OH$

**Figure 1** Plausible mechanism of Suzuki reaction on *o*-substituted unprotected 4-amino-2-chloroquinolines

The possible reaction mechanism of the present C-C bond forming reaction consisting of arylation is shown in figure 1. Due to the presence of electronegative nitrogen atom the chloro group at the azomethine carbon is more susceptible to undergo oxidative addition with Pd (0) to generated unisolated complex followed by trans-organometallation of the resultant aryl-palladium complex formed with arylboronic acids provides the desired compounds **2a-5c**.

## 3. Experimental section

### 3.1. General

All the microwave irradiation experiments were performed in a CEM Discover microwave system and reaction temperatures were monitored by an equipped IR sensor. All the 4-amino-2-chlorquinoline-3-carboxylic ethyl ester / acid / alcohol and aldehyde intermediates (**1a-d**) used in the reaction were synthesized by our literature method.[10] The detail synthetic procedures and spectroscopic data of compounds **6-11** and **3a-5c** given in the experimental section. All reactions were monitored by thin layer chromatography (TLC), carried out on 0.2 mm silica gel 60 F254 (Merck) plates using UV light (254 and 366 nm) for detection. ^{1}H NMR and ^{13}C NMR spectra were recorded on a Bruker spectrometer operating at 300 and 75 MHz for ^{1}H and ^{13}C respectively using either $CDCl_3$ or DMSO-$d_6$ as the solvent. Chemical shifts, δ, are reported in parts per million (ppm) relative to solvent resonance: $CDCl_3$, δ 7.26 (^{1}H NMR), and 77.3 (^{13}C NMR); DMSO-$d_6$, δ 2.50 (^{1}H NMR), and 40.2 (^{13}C NMR). Multiplicities are indicated by s (singlet), d (doublet), t (triplet), q (quartet), and m (multiplet). Coupling constants, *J*, are reported in Hertz. Mass spectral (MS) data were obtained on a Bruker Daltonics spectrometer using an electrospray ionizationquadrapole-time of flight (ESI-QTOF) analyzer. Infrared spectra were taken on Shimadzu IR-408, instrument in potassium bromide pellets unless otherwise stated. All melting points have been determined on a manually operated Veego (VMP-1) melting point apparatus and are uncorrected.

**Typical procedure for the coupling of ethyl-4-amino-2-chloroquinoline-3-carboxylate with phenylboronic acid in microwave condition**

A degassed mixture of ethyl-4-amino-2-chloroquinoline-3-carboxylate (**1a**, 250 mg, 1.00 mmol), phenylboronic acid (158 mg, 1.3 mmol), $Na_2CO_3$ (318 mg, 3.00 mmol), Pd(PPh$_3$)$_4$ (115 mg, 0.10 mmol) and water (15 mL) was introduced into CEM discover microwave reaction vessel equipped with a magnetic stirrer. The vessel was sealed and then placed into the microwave cavity. Initial microwave irradiation of 300 W was used, the temperature being ramped from room temperature to the desired 105°C temperature.

Once this was reached the reaction mixture was healed at this temperature for 20 min. The reaction mixture was stirred continuously stirring during the reaction. After allowing the mixture to cool to room temperature, the contents of the reaction vessel were poured into a separatory funnel. Water (20 mL) and ethyl acetate (15 mL) were added, and the organic material was extracted and removed. After further extraction of the aqueous layer with ethyl acetate (20 mL), combining the organic washings and drying them over anhydrous MgSO4, the ethyl acetate was removed in vacuum leaving the crude product, which was purified by flash column chromatography to yield pure product (**2a**).

**Ethyl-4-amino-2-phenylquinoline-3-carboxylate (2a)**

Yield: 254 mg (87%); White solid; mp 145-147 °C.

IR (KBr): 3410, 3280, 3182, 1679, 1620, 771 cm$^{-1}$.

$^1$H NMR (300 MHz, CDCl$_3$): δ = 0.76 (t, 3H, $J$ = 7.2 Hz, OCH$_2$CH$_3$), 3.95 (q, 2H, $J$ = 7.2 Hz, OCH$_2$CH$_3$), 6.71 (br.s, 2H, NH$_2$), 7.38-7.56 (m, 4H, ArH), 7.57-7.72 (m, 5H, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 12.9, 60.3, 102.5, 116.7, 122.5, 125.2, 127.7, 127.7, 128.7, 128.7, 128.8, 131.3, 132.2, 142.3, 146.9, 152.3, 159.1, 168.6.

MS (EI, 70 eV): $m/z$ (%) = 293.1 (M$^{+1}$), 294.1 (M$^{+2}$).

**Ethyl 4-amino-2-(4-methoxyphenyl)quinoline-3-carboxylate (2b)**

Yield: 283 mg (88%); White solid; mp 158-160 °C.

IR (KBr): 3475, 3365, 1680, 1252 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 0.81 (t, 3H, $J$ = 7.0 Hz, OCH$_2$CH$_3$), 3.79 (s, 3H, OCH$_3$), 3.94-4.01 (q, 2H, $J$ = 7.0 Hz, OCH$_2$CH$_3$), 6.99 (d, 2H, $J$ = 8.4 Hz, ArH), 7.42-7.51 (m, 5H, NH$_2$, ArH), 7.68-7.73 (t, 1H, $J$ = 8.0 Hz, ArH), 7.80 (d, 1H, $J$ = 8.0 Hz, ArH), 8.35 (d, 1H, $J$ = 8.4 Hz, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 13.2, 55.17, 60.1, 102.6, 113.1, 113.1, 116.8, 122.8, 124.6, 128.9, 129.3, 129.3, 130.9, 134.9, 147.3, 152.0, 158.3, 159.2, 168.8.

MS (EI, 70 eV): $m/z$ (%) = 323.1 (M$^{+1}$), 324.1 (M$^{+2}$), 325.1 (M$^{+3}$).

**Ethyl 4-amino-2-(4-nitrophenyl)quinoline-3-carboxylate (2c)**

Yield: 272 mg (81%); White solid; mp 243-245 °C.

IR (KBr): 3470, 3370, 1680, 1537, 1358 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 0.729 (t, 3H, $J$ = 7.1 Hz, OCH$_2$CH$_3$), 3.91-3.98 (q, 2H, $J$ = 7.1 Hz, OCH$_2$CH$_3$), 7.56 (t, 1H, $J$ = 8.0 Hz, ArH), 7.71-7.86 (m, 4H, ArH), 7.97 (br.s, 2H, NH$_2$), 8.31 (d, 2H, $J$ = 8.7 Hz, ArH), 8.41 (d, 1H, $J$ = 8.4 Hz, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 12.99, 60.28, 101.24, 117.2, 122.9, 122.9, 123.0, 125.6, 125.6, 128.9, 129.2, 131.6, 131.6, 146.7, 149.4, 153.4, 157.4, 167.8.

MS (EI, 70 eV): $m/z$ (%) = 338.1 (M$^{+1}$), 336.1 (M$^{-1}$).

**4-amino-2-phenylquinoline-3-carboxylic acid (3a)**

Yield: 235 mg (79%); White solid; mp 256-258 °C.

IR (KBr): 3376, 3264, 2821, 1680.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 5.97 (br.s, 2H, NH$_2$), 7.05-7.07 (d, 2H, $J$ = 8.2 Hz, ArH), 7.48-7.83 (m, 5H, ArH), 8.43-8.46 (d, 2H, $J$ = 8.0 Hz, ArH) 13.43 (s, 1H, COOH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 102.5, 118.7, 122.5, 125.2, 127.7, 128.7, 128.7, 128.7, 128.8, 131.3, 132.2, 142.3, 146.9, 152.3, 159.1, 171.6.

MS (EI, 70 eV): $m/z$ (%) = 265.1 (M$^{+1}$),  288.1 (M$^{+Na}$).

**4-amino-2-(4-methoxyphenyl)quinoline-3-carboxylic acid (3b)**

Yield: 249 mg (75%); White solid; mp 268-270 °C.

IR (KBr): 3364, 3276, 2864, 1720 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 3.83 (s, 3H, OCH$_3$), 5.29 (br.s, 2H, NH$_2$), 7.06-7.08 (d, 2H, $J$ = 8.2 Hz, ArH), 7.48-7.83 (m, 5H, ArH), 8.43-8.46 (d, 2H, $J$ = 8.1 Hz), 11.96 (s, 1H, COOH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 55.17, 102.6, 113.1, 113.1, 116.8, 122.8, 124.6, 128.9, 128.9, 129.3, 130.9, 134.9, 147.3, 152.0, 158.3, 159.2, 170.8.

MS (EI, 70 eV): $m/z$ (%) = 295.1 (M$^{+1}$), 318 (M$^{+Na}$).

**4-Amino-2-(4-nitroyphenyl)quinoline-3-carboxylic acid (3c)**

Yield: 290 mg (83%); Pale yellow solid; mp 195-197 °C.

IR (KBr): 3337, 3282, 2792, 1780, 1550, 1360 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 5.55 (br.s, 2H, NH$_2$), 7.04-7.07 (d, 2H, $J$ = 8.1 Hz, ArH), 7.50-7.85 (m, 5H, ArH), 8.45-8.47 (d, 1H, $J$ = 8.1 Hz), 12.33 (s, 1H, COOH).

MS (EI, 70 eV): $m/z$ (%) = 310.1 (M$^{+1}$), 333 (M$^{+Na}$).

**4-Amino-2-phenylquinolin-3-yl) methanol (4a)**

Yield: 210 mg (70%); White solid; mp 201-203 °C.

IR (KBr): = 3337, 3282, 3550 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ 4.50 (d, 2H, $J$ = 4.8 Hz, CH$_2$OH), 5.07 (t, 1H, $J$ = 4.8 Hz, CH$_2$OH), 6.69 (br.s, 2H, NH$_2$), 7.39-7.49 (m, 4H, ArH), 7.58-7.65 (m, 3H, ArH), 7.78 (d, 1H, $J$ = 7.8 Hz, ArH), 8.27 (d, 1H, $J$ = 8.1 Hz, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 57.99, 110.9, 117.6, 122.0, 123.7, 127.6, 127.6, 127.6, 128.8, 129.0, 129.1, 129.1, 141.3, 147.1, 151.0, 159.2.

MS (EI, 70 eV): $m/z$ (%) = 251.1 (M$^{+1}$).

**4-Amino-2-(4-methoxyphenyl)quinolin-3-yl)methanol (4b)**

Yield: 228 mg (68%); White solid; mp 176-178 °C.

IR (KBr): 3592, 3475, 3364, 1251 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 3.82 (s, 3H, OCH$_3$), 4.53 (d, 2H, $J$ = 4.8 Hz, CH$_2$OH), 5.10 (t, 1H, $J$ = 4.8 Hz, CH$_2$OH), 6.64 (br.s, 2H, NH$_2$), 7.00 (d, 2H, $J$ = 9.0 Hz, ArH), 7.36-7.63 (m, 4H, ArH), 7.71-7.77 (t, 1H, $J$ = 8.4 Hz, ArH), 8.22 (d, 1H, $J$ = 6.9 Hz, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 55.1, 58.1, 110.9, 113.0, 113.0, 117.5, 121.8, 122.0, 123.5, 128.7, 128.9, 130.4, 133.6, 147.1, 150.9, 158.8, 158.9.

MS (EI, 70 eV): $m/z$ (%) = 281.1 .1 (M$^{+1}$), 279.1 (M$^{-1}$),  301.1 (M$^{+Na}$).

**4-Amino-2-(4-nitrophenyl)quinolin-3-yl)methanol (4c)**

Yield: 251 mg (71%); White solid; mp 208-210 °C.

IR (KBr): 3605, 3479, 3350, 1560, 1390 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 4.46-4.47 (d, 2H, $J$ = 4.9 Hz, CH$_2$OH), 5.14-4.17 (t, 1H, $J$ = 4.9 Hz, CH$_2$OH), 7.01 (br.s, 2H, NH$_2$), 7.45-7.44 (m, 5H, ArH), 8.33-8.36 (d, 2H, $J$ = 8.7 Hz, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 28.9, 57.3, 110.9, 117.6, 122.3, 124.5, 128.1, 129.8, 130.4, 146.2, 147.0, 147.1, 151.8, 156.5, 163.2..

MS (EI, 70 eV): $m/z$ (%) = 296.1 (M$^{+1}$), 297.1 (M$^{+2}$), 298.1 (M$^{+3}$), 294.1 (M$^{-1}$), 295.1 (M$^{-2}$).

**4-Amino-2-phenylquinoline-3-carbaldehyde (5a)**

Yield: 267 mg (89%); White solid; mp 192-194 °C.

IR (KBr): 3444, 3307 (NH$_2$), 2769, 1710 (CHO) cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 7.49-7.58 (m, 5H, ArH), 7.76-7.85 (m, 4H, ArH), 8.68 (br.s, 1H, NH$_2$), 9.70 (br.s, 1H, NH$_2$), 9.79 (s, 1H, CHO).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 106.8, 117.5, 123.3, 125.2, 128.0, 128.0, 128.6, 129.2, 129.8, 129.8, 132.4, 138.9, 139.8, 147.8, 154.7, 163.2, 192.3.

MS (EI, 70 eV): $m/z$ (%) = 249.1 (M$^{+1}$), 279.1 (M$^{+2}$).

**4-Amino-2-(4-methoxyphenyl)quinoline-3-carbaldehyde (5b)**

Yield: 307 mg (91%); white solid; mp 182-184 °C.

IR (KBr): 3452 & 3310 (NH$_2$), 2780, 1715 (CHO), 1603 (aromatic) cm$^{-1}$

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 3.83 (s, 3H, OCH$_3$), 7.05 (d, 2H, $J$ = 9.0 Hz, ArH), 7.51 (d, 2H, $J$ = 9.0 Hz, ArH), 7.62-8.46 (m, 4H, ArH), 8.62 (br.s, 1H, NH$_2$), 9.54 (br.s, 1H, NH$_2$), 9.83 (s, 1H, CHO).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 55.2, 106.8, 113.4, 113.4, 117.4, 123.3, 124.9, 129.1, 131.1, 131.4, 131.4, 132.3, 148.0, 154.7, 159.6, 162.7, 192.5.

MS (EI, 70 eV): $m/z$ (%) = 279.1 (M$^{+1}$), 280.1 (M$^{+2}$).

**4-Amino-2-(4-nitrophenyl) quinoline-3-carbaldehyde (5c)**

Yield: 337 mg (95%); white solid; mp 163-164 °C.

IR (KBr): 3481, 3284 (NH$_2$), 2701, 1649 (CHO), 1530, 1332 (NO$_2$) cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 7.54 (d, 2H, $J$ = 8.2 Hz, ArH), 7.97 (d, 2H, $J$ = 8.2 Hz, ArH), 8.34-8.48 (m, 4H, ArH), 8.52 (br.s, 1H, NH$_2$), 9.54 (br.s, 1H, NH$_2$), 9.80 (s, 1H, CHO).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ 101.2, 117.2, 122.9, 122.9, 123.0, 125.6, 128.9, 129.2, 129.2, 131.6, 146.7, 149.4, 153.4, 157.4, 167.8, 192.5.

MS (EI, 70 eV): $m/z$ (%) = 294.08 (M$^{+1}$).

**4-amino-2-chloroquinoline-3-carbonitrile (6):** Iodine (203 mg, 1.60 mmol) was added to a stirring solution of 4-amino-2-chloroquinoline-3-carbaldehyde **1d** (300 mg, 1.45 mmol) in ammonia water (10 mL of 28% solution) and THF (2.0 mL) at room temperature. The dark solution became colorless (or light gray in some cases) after stirring for 5 hr, an indication that the reaction was complete. The reaction mixture was charged with aqueous Na$_2$S$_2$O$_3$ (5.0 mL of 5 % solution), followed by extraction with ether (2 × 10 mL), to give a practically pure product.
Yield: 177 mg (60%); Reddish solid.

IR (KBr): 3477, 3366, 1638 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 7.10-7.21 (m, 2H, ArH), 7.50-7.55 (t, 1H, $J$ = 7.2 Hz, ArH), 8.09-8.29 (d, 1H, $J$ = 8.1 Hz, ArH), 8.29 (br.s, 2H, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 89.43, 112.1, 115.3, 120.7, 123.7, 127.1, 132.3, 139.4, 156.8, 159.8.

MS (EI, 70 eV): $m/z$ (%) = 204.1 (M$^{+1}$), 206.1 (M$^{+2}$), 208.1 (M$^{+3}$).

## 4-amino-2-phenylquinoline-3-carbonitrile (7)

Yield: 223 mg (74%); White solid; mp 243-245 °C.

IR (KBr): 3478, 3371, 1630 cm$^{-1}$.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 7.60-7.63 (m, 4H, ArH), 7.75-7.85 (m, 2H, ArH), 8.25 (br.s, 2H, NH$_2$), 8.35-8.38 (d, 1H, J = 8.7 Hz, ArH), 8.42-8.45 (m, 2H, ArH).

$^{13}$C NMR (75 MHz, CDCl$_3$): δ = 96.5, 116.0, 120.4, 123.0, 125.1, 127.7, 129.2, 129.4, 129.7, 133.0, 134.8, 136.0, 145.9, 154.1, 158.0.

MS (EI, 70 eV): $m/z$ (%) = 246.1 (M$^{+1}$).

## 2-phenylquinolin-4-amine (9)

Yield: 108 mg (35%); White solid; mp 163-165 °C.

IR (KBr): 3478, 3358, 1633 cm$^{-1}$.

$^1$H NMR (300 MHz, CDCl$_3$): δ = 6.69 (br.s, 2H, NH$_2$), 7.02 (s, 1H, ArH), 7.69-7.87 (m, 5H, ArH), 7.97-8.02 (t, J = 7.5 Hz, ArH), 8.02-8.22 (m, 3H, ArH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ = 103.8, 117.5, 123.3, 125.2, 128.0, 128.6, 129.2, 129.8, 132.4, 138.9, 139.8, 147.8, 154.7, 156.2.

MS (EI, 70 eV): $m/z$ (%) = 221.1 (M$^{+1}$).

## N-(2-chloroquinolin-4-yl)acetamide (10)

Acetic anhydride (1.37 g, 0.013 mmol) and catalytic amount of pyridine was added in the mixture of 2-chloro-4-aminoquinoline (2.0 g, 0.011 mmol) in THF (15 mL) and the reaction mixture was stirred at 65°C for 3 h. (TLC monitoring, EtOAc / Pet-ether 9:1). After completion of reaction, remove THF by vacuum distillation, water (20 mL) was added and the aqueous solution was then extracted with ethyl acetate (3 x 20 mL). The ethyl acetate layer was washed with dilute citric acid to remove traces of pyridine. Combine organic layer and dried over anhydrous sodium sulphate and then evaporated under reduced pressure; the residue was chromatographed over silica gel column and eluted with chloroform-methanol (9.5: 0.5) to isolate the pure product.

Yield: 1.4 gm (60%); white solid; mp 147-149 °C.

$^1$H NMR (300 MHz, CDCl$_3$): δ = 2.51 (s, 3H, CH$_3$), 6.88 (s, 1H, ArH), 7.48-7.91 (m, 4H, ArH), 10.08 (br.s, 1H, amide).

$^{13}$C NMR (75 MHz, DMSO-d6): δ = 25.6, 103.8, 117.2, 123.1, 125.5, 127.6, 131.7, 146.3, 147.2, 152.6, 171.7.

## N-(2-phenylquinolin-4-yl)acetamide (11)

Yield: 226 mg (76%); White solid; mp 141-143 °C.

$^1$H NMR (300 MHz, DMSO-$d_6$): δ = 2.17 (s, 3H), 7.50-7.57 (m, 4H, ArH), 7.56-7.59 (m, 2H, ArH), 7.76-7.85 (m, 2H, ArH), 8.45 (s, 1H, ArH), 10.45 (br.s, 1H, NH).

$^{13}$C NMR (75 MHz, DMSO-$d_6$): δ 22.15, 102.5, 116.7, 122.5, 125.2, 127.7, 128.7, 128.7, 128.7, 128.8, 131.3, 132.2, 142.3, 146.9, 152.3, 159.1, 168.6.

MS (EI, 70 eV): $m/z$ (%) = 263.1 (M$^{+1}$), 221.1 (M$^{-41}$N-deacetyl).

## II. CONCLUSION

In summary, it was proved that by using microwave promotion, commercially available, cheap base (Na$_2$CO$_3$) and universal water solvent, it is possible to couple a range of arylboronic acids with diversely functionalized *o*-substituted unprotected 4-amino-2-

chloroquinolines more rapidly. In addition it was studied that the electron withdrawing substituents at C3 / C4 position on quinoline ring favors most important step in Suzuki coupling reaction i.e. oxidative addition on $C_2$-Cl bond. It was also conclude that due to the continuous electronic movement of lone pair of amine with *o*-substituted groups on quinoline ring make free amine busy so it does not required any special protection to complete the reaction.

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# EVCP-EW: Enhanced Variable-structure Congestion-control Protocol for Encrypted Wireless Networks

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*Abstract*- Now a days congestion in computer network is becoming an important issue. Variable-structure Congestion-control Protocol (VCP) and Double Packet Congestion Control Protocol (DPCP) operating in wireless networks are potentially faced with some challenges of performance degradation. These sources are: 1) The oscillatory behaviour of VCP in the presence of link bandwidth estimation errors is not good.  2) VCP exhibits poor fairness characteristics in high delay networks. 3) DPCP faces deployment obstacles in encrypted wireless networks due to the fact that it relies on partial information in the TCP header and the TCP header information is lost when crossing encryption boundaries. In this paper we propose an alternative congestion control protocol to which we refer as Enhanced Variable-structure Congestion-control Protocol for Encrypted Wireless (EVCP-EW) networks. It does so by passively utilizing the IP Identification field of a packet header instead of the TCP header in conjunction with a heuristic algorithm to differentiate between different sources of loss.

*Index Terms*- Markov chain, fading links, congestion control, wireless networks, ECN, Variable-structure Congestion-control Protocol(VCP),  eXplicit  Congestion-control  Protocol(XCP), Double Packet Congestion Control Protocol (DPCP).

## I. Introduction

It has been demonstrated in [4] that conventional TCP and end-to-end TCP-based Active Queue Management (AQM) schemes perform poorly in high Bandwidth-Delay Product (BDP) networks.

As surveyed by [8], there is  necessity for protecting not only a congestion-control protocol's data, but more importantly its metadata against bit errors. Such protection was provided relying on the use of FEC codes and/or improving the quality of a link by utilizing multiple antennas. Their results further revealed that VCP represents a high-performing yet practical congestion-control protocol for wireless networks, especially for encrypted networks restricting the number of available header bits for use by a congestion-control protocol.  There is necessity to improve the oscillatory behavior of VCP in the presence of link bandwidth estimation errors and enhancing the performance of VCP in encrypted wireless networks by designing and implementing a multipacket protocol version of the protocol.

The Variable-structure congestion Control Protocol (VCP) and eXplicit Congestion-control Protocol (XCP), both protocols encapsulates congestion related information into packet headers and exhibit high utilization and great fairness characteristics

while maintaining low persistent queue length and reducing congestion caused loss in wired networks. While XCP requires the use of a large number of IP packet header bits to relay congestion information thereby introducing significant deployment obstacles, VCP only uses the two existing ECN bits in the IP header to encapsulate three congestion levels. Given that VCP demands the use of no extra bits in the IP header, it represents a more practical alternative of deployment than XCP. However, VCP can only deliver limited feedback to end hosts since two bits can at most represent four levels of congestion. In order to avoid sudden bursts, VCP has to control the growth of transmission rates by setting artificial bounds. The latter, yields slow convergence speeds and high transition times. Moreover, due to the use of fixed parameters for fairness control, VCP exhibits poor fairness characteristics in high delay networks.

In contrast, as demonstrated in previous work DPCP proposes a distributed framework that allows for using no more than 2 ECN-bits to deliver a 4-bit representation of the LF. That said, DPCP needs to access partial information in the TCP header in order to be able to efficiently distribute and reassemble the LF. However, in encrypted networks protected by IPSec, TCP header information is lost when crossing encryption boundaries. Thus, DPCP cannot operate in such encrypted networks. Furthermore, wireless networks are characterized by fading related error-caused loss in addition to queuing related congestion-caused loss. Experiments have shown that the performance of any congestion control protocols relies on appropriate reaction to loss according to its source. Like VCP, DPCP reacts to loss without differentiating between the sources of loss and thus performs inefficiently over wireless networks.

In this paper, we propose a new congestion control protocol that improves the design of VCP and DPCP. In contrast to DPCP, our new protocol to which we refer as Enhanced Variable-structure Congestion-control Protocol for Encrypted Wireless (EVCP-EW) networks proposes two new schemes: First, a novel distributed scheme that allows for operation within encrypted networks, and second, a new heuristic loss differentiating scheme that can distinguish between error caused loss and congestion caused loss. Notably, these new schemes are added to EVCP-EW while preserving all of the benefits of DPCP. In EVCP-EW, a congestion level is carried by a chain of two packets and each packet provides two bits out of four bits of information associated with a congestion level. Utilizing a distributed scheme that deviates from that of DPCP, routers compute and distribute a congestion signal into two packets. A congestion level can be specified by concatenating a group of two ECN bits together from a pair of packets at an end node. Incorporated with a novel heuristic algorithm, EVCP-EW can

appropriately react to congestion caused loss while avoiding unnecessary reductions of the sending window sizes in response to error-caused loss.

The rest of the paper is organized as follows. In Section 2, we describe the methodology of VCP and DPCP along with their limitations that motivate the design of EVCP-EW. In Section 3, we provide a programmers design and detailed description of EVCP-EW. In Section 4, we discuss the results and related work. Finally, we present several coclusions in section 5.

## II. RELATED WORK

In the past few years, variety of techniques have been developed for increasing the efficiency of congestion-control protocols in high- BDP networks. All of the proposed works often fail to achieve both efficiency and fairness because they retain an integrated controller design. To improve the performance of TCP in wireless and satellite networks several approaches have been proposed. These approaches are grouped into three categories. These are split connection protocols such as I-TCP [5] and M-TCP [6], link-layer protocols such as AIRMAIL [7] and end-to-end protocols such as WTCP [9], TCP Westwood [10]. The split connection protocols and link-layer protocols are attempt to hide the errors of the wireless link from the TCP sender. Various approaches have been proposed for designing protocols for high-speed and long distance networks ranging from minor modifications to conventional TCP, to a complete protocol redesign. H-TCP[1] belongs to the former category and represents an evolution of conventional TCP rather than a radical departure from it. I-TCP [5] confines mobility related problems to the wireless link. Alleviate problems by adapting the TCP/IP software on the wireless link that requires no modifications from the hosts on the fixed network. I-TCP [5] particularly suited for applications which are throughput intensive. The snoop module deals with bit-error losses while the routing protocol eliminates the losses during handoff. The snoop modifications consist of caching packets and performing local retransmissions across the wireless link by monitoring the acknowledgments to TCP packets generated by the receiver.

Previous work evaluated the performance of VCP in wireless networks and highlighted several limitations of VCP. Besides DPCP from which EVCP-EW is derived, the closest bodies of work in congestion control to EVCP-EW include MLCP [11] and UNO [12]. The MLCP [11] analyzed the control algorithm of VCP and proposed a multi-level load-factor based protocol to increase the feedback information of VCP. However, MLCP requires the use of extra bits in the IP header. The UNO framework [12] utilizes the IPID field to passively encode the LF. The passive nature comes from a fact that the UNO framework does not modify the value of the IPID field. In EVCP-EW, the idea of passively using the LSB bit of the IPID field is inspired by the UNO framework. Nonetheless, while the work of UNO may seem to share a similar idea with EVCP-EW, it differs from EVCP-EW in several aspects. First, although UNO passively utilizes existing bits in the IPID field of the IP header, it introduces deployment issues. For example, UNO will not work in certain encrypted networks where only 6 ToS and 2 ECN packet header bits can pass through encryption boundaries. In contrast, EVCP-EW only requires the use of two ECN bits in

each packet. Second, UNO senders need to collect at least 8 specific packets translating to an average of 8 ln8 = 24 consecutively transmitted packets in order to derive the maximum congestion level before regulating *cwnd*, while EVCP-EW senders perform regulations on a per-ACK basis. Over lossy wireless links, consecutive loss of packets associated with the maximum LF yield an oscillatory behavior in the case of UNO.

## III. PROGRAMMER'S DESIGN

VCP operates in three congestion regions and attempts at decoupling efficiency and fairness aspects of congestion control. Window management mechanism of VCP is quite different than that of TCP. Instead of using the slow start and congestion avoidance algorithm of TCP, VCP regulates the value of congestion window (*cwnd*) with different congestion control policies defined according to the level of congestion in the network. VCP represents the network congestion status by a load factor which is further mapped into one of three congestion levels labeled as low-load, high-load, and overload. The design of VCP allows for encoding the value of the LF into two ECN bits in the IP packet header. The LF is computed and mapped into one of the three congestion levels mentioned above at a VCP router. Once a data packet arrives, the VCP router extracts the congestion level associated with its most congested upstream link from the ECN bits of the packet itself. It then updates the ECN bits of the packet only if its downstream link is more congested than what is already indicated by the ECN bits of the packet. Eventually, the data packet will carry the congestion level of the most congested link of its session. At the receiver, the congestion level is retrieved and sent back to the sender via an ACK packet. Consequently, VCP applies three congestion control policies: Multiplicative Increase (MI) in the low-load region, Additive Increase (AI) in the high-load region, and Multiplicative Decrease (MD) in the overload region. While the MI operation is utilized to eliminate TCP's slow start behavior, the AI and MD operations attempt at preserving the fairness characteristic of TCP. Since VCP can only provide limited feedback to the sender, its efficiency and fairness characteristics are negatively impacted in moderate bandwidth high delay network operation scenarios. Unlike VCP, DPCP uses four bits to represent the LF. Although DPCP increases the amount of feedback, it utilizes the two ECN bits of a pair of packets in order to encode the LF in a distributed way. For a given LF, the packet that carries the Most Significant Bits (MSBs) of the LF is referred to as *MSP*. Similarly, the packet that carries the Least Significant Bits (LSBs) of the LF is referred to as *LSP*. Each packet has a sequence (*seq*) number and an acknowledge (*ack*) number in its TCP header. During transmission, these two numbers never change. Thus the relative order of these two numbers can be used as a binary indication to tell if a packet is *MSP* or *LSP*. More specifically, if the *seq* number has a greater value than the *ack* number, then the packet is the *MSP*. Otherwise the packet is the *LSP*. Furthermore, DPCP maintains an *MSP* flag at the end nodes. The end nodes flip over the *MSP* flag of every packet to indicate if the next packet should be *MSP/LSP*.

Based on the value of *MSP*, end nodes may swap the value of *seq* and that of *ack* in order to use the packet as *MSP* or *LSP* and thus yield an interleaved packet flow with the pattern

"MSP:LSP:MSP:LSP:...". Once a packet arrives at a router, the router identifies a packet as *MSP* or *LSP* by checking the relative order of the *seq* and *ack* of the packet. Then, the router assigns either MSB or LSB bits of the associated LF to the packet depending on whether it is *MSP* or *LSP*. This way, DPCP can provide a more accurate feedback to the sender.

### 3.1. Mathematical Model

EVCP-EW: Enhanced Variable-structure Congestion-control Protocol for Encrypted Wireless Networks.

As surveyed by earlier work, the design of EVCP-EW is motivated by two observations. These sources are:1) most feedback based congestion control protocols are facing deployment challenges in encrypted network because these protocols either require the use of multiple bits in the IP header or even access to headers of the protocols above the IP layer. 2) most congestion control protocols are designed for wired networks and treat both types of loss as congestion caused loss. While error-caused losses are typically absent in wired networks, they are common in wireless networks. Thus, the target operating environments of EVCP-EW are IPSec-based encrypted wireless networks. The latter means that only eight bits of the IP header, two ECN bits and six Type of Service (ToS) bits, can bypass the encryption boundaries and are available for end to end signaling. As the ToS bits are reserved for signaling differentiated services as oppose to congestion control, EVCP-EW will only use the two ECN bits of the IP packet header for carrying congestion control signaling feedback.

### A. Overview

Relying on two new schemes, EVCP-EW extends VCP and DPCP to work efficiently in encrypted wireless networks. Just like DPCP, EVCP-EW uses a double packet four bit representation of the LF, but it introduces a packet ordering management that is quite distinct from that of DPCP. Unlike DPCP, EVCP-EW does not rely on the TCP header to manage packet ordering. Instead, it only utilizes the information available in the IP header and only manipulates two existing ECN bits to carry congestion information. The detail of new packet ordering management scheme of EVCP-EW will be presented in the next subsection. Second, EVCP-EW utilizes a heuristic scheme for differentiating error-caused loss from congestion-caused loss. This heuristic scheme runs at the transmitting side and maintains the history information of congestion status over the bottleneck link of a path. Upon detection of loss, the heuristic scheme makes an identification of the source of loss based on the saved history information. Other components of EVCP-EW such as the definitions of congestion levels, handling exceptions as well as encoding and decoding scheme remain the same as those of DPCP. In the following two subsections, we present the novel

aspects of EVCP-EW, namely, how the protocol manages packet ordering and how it differentiates between two types of loss.

### B. Packet Ordering Management

As EVCP-EW distributes the LF into two packets, a binary signal is enough to determine packet ordering. However, no free bit is available in the IP header for such signaling. That said, the IPID field of the IP header originating from a host is either monotonically increasing or chosen uniformly at random. In either case, the LSB of IPID flips over quickly enough to be used for signaling *MSP/LSP*. Specifically, EVCP-EW only uses the LSB of the IPID field. Further, the use of IPID field bits is passive, i.e., the bit values are inspected but not changed by EVCP-EW. In contrast to DPCP, EVCP-EW uses the LSB of IPID field in order to differentiate *MSP* from *LSP* at the receiving end, instead of swapping TCP *seq* and *ack* numbers. Namely, a packet with an LSB value of zero is used as the *MSP* and a packet with an LSB value of one is used as the *LSP*. As mentioned above, the value of the IPID is set by the IP protocol either incrementally or according to a uniform random distribution. In the former case, the LSB bit flips over for any pair of consecutive packets which is perfect for differentiating *MSP* from *LSP*. In the latter case and despite the fact that the LSB bit might not flip over in every pair of consecutive packets, EVCP-EW uses the first packet with an LSB value of zero for carrying *MSP* and the first packet with an LSB value of one for carrying LSP. As evidenced in our experiments, it is safe to assume that bit flips, with a probability of 0.5, occur quick enough with respect to necessary congestion reaction speed specially over large BDP networks. In what follows, we explain how EVCP-EW operates in IPSec encrypted networks. Assuming that at the encrypted boundaries, only two ECN bits can pass the boundary.

### C. Operation with IPSec

IPSec operates in two modes: transport mode and tunnel mode. In the transport mode, the original IP header is kept after getting authenticated by IPSec. Thus, EVCP-EW can still access IPID and ECN bits as usual in IPSec transport mode. In contrast, the entire packet is encrypted and authenticated in IPSec tunnel mode. As a result, the original IP header becomes invisible in the encrypted packet. Since the LSB bit of the IPID in the original IP header may not necessarily be the same as the one in the new IP header, EVCP-EW utilizes the IPID only on the Cypher Text (CT) side but not on the Plain Text (PT) side for packet ordering. In what follows, we present the details of the operation of EVCP-EW in IPSec tunnel mode. As EVCP-EW will be installed and configured at the IPSec router, it is safe to assume that EVCP-EW will have access to both CT and PT headers of a packet.
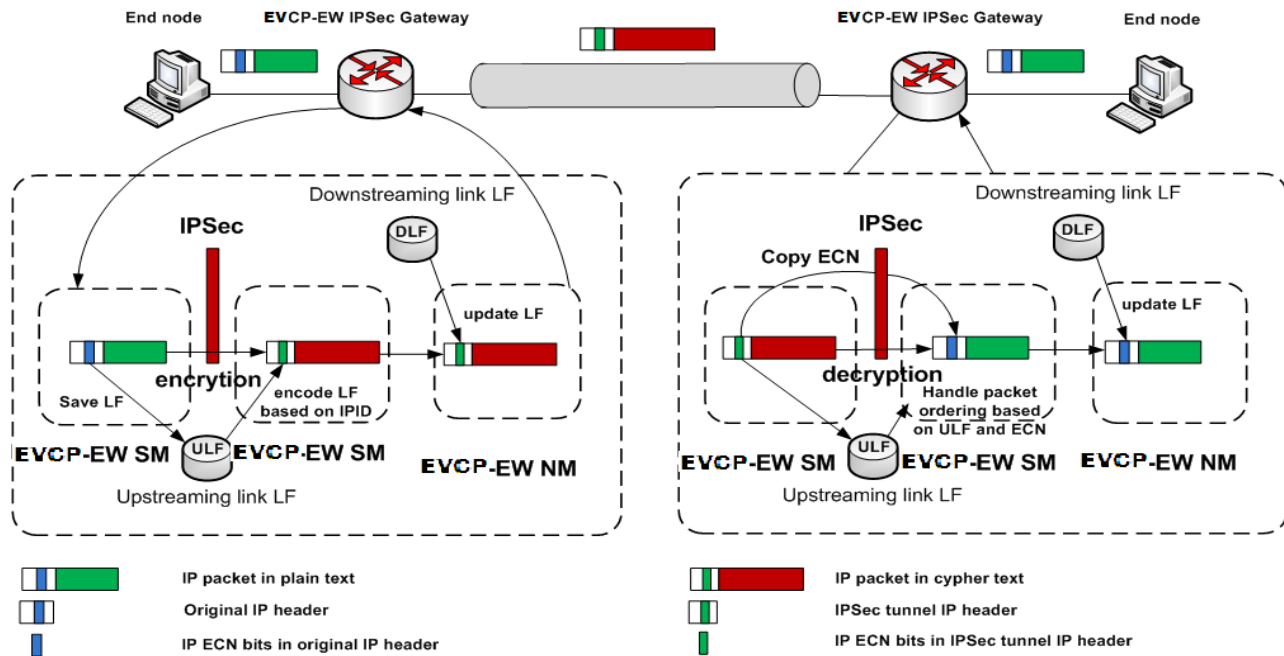
**Fig. 1. An example scenario of using EVCP-EW over an IPSec tunnel.**

Furthermore, because the operations of EVCP-EW in the PT side are similar to that presented in [15], we only focus on the operation of the IPSec router over encryption boundaries and the IPSec tunnel. Specifically, EVCP-EW provides two router modules: i) Security Module (SM) running only on IPSec routers that cooperates with IPSec gateways, and ii) Normal Module (NM) running on both IPSec gateways and other routers. Fig. 1 illustrates a scenario of using EVCP-EW over an IPSec tunnel. Assuming an FTP or a comparable connection has been established, the flow of events at the IPSec gateways is as follows:

1) A EVCP-EW packet arrives at the ingress of an IPSec gateway. Before the packet goes to the IPSec module for encryption, EVCP-EW SM will first catch the packet, save the packet ordering information, i.e., MSP/LSP and the value of the LF as indicated in the ECN bits. Then EVCP-EW SM delivers the packet to the IPSec module. After the new IP header is generated and ready to be transmitted through the tunnel, EVCP-EW SM catches the outgoing packet again and encodes ECN bits with MSB/LSB bits of the saved LF depending on the LSB bit of the IPID in the new IP header. Note that, after the original IP header is encrypted, EVCP-EW has no idea of if the new packet is a TCP packet or a packet using another protocol, e.g., UDP. Thus, EVCP-EW encodes ECN bits regardless of the original protocol type, which introduces overhead for non-TCP packets. In fact, this is the tradeoff between efficiency and protocol complexity. That said, we note that the resulting overhead is not significant because i) it is only introduced when transmitting over IPSec tunnels; and ii) it is only associated with the operations of encoding an LF.

2) At the output interface of the ingress IPSec gateway, EVCP-EW NM takes over. EVCP-EW NM compares the LF in the packet with the LF of its downstream link interface and

updates the LF in the packet if necessary following the algorithm introduced in earlier work.

3) At the intermediate router on the CT side, EVCP-EW NM operates as DPCP router module except that EVCP-EW uses the LSB bit of IPID to identify *MSP/LSP*.

4) At the egress of the IPSec gateway and before the encrypted packet goes to the IPSec module for decryption, EVCP-EW SM will catch the packet and save the LF value as indicated by the ECN bits of the packet. Note that after the packet is decrypted, the IPSec module will copy the ECN bits from the new IP header to the original IP header on the PT side. However, the packet ordering information cannot be simply transferred to the PT side. While EVCP-EW SM can access both CT and PT side, EVCP-EW SM dedicates to change the contents of the packet as minimally as possible. Simply put, EVCP-EW SM does not directly pass any bits from the CT side to the PT side. Note that, the LSB bit of the IPID in the original IP header is not necessarily the same as the one in the new IP header. Thus, instead of changing the value of the LSB bit of the IPID field in the original IP header for the purpose of matching the one in the IP header used by the IPSec tunnel, EVCP-EW uses the relative order of the TCP *seq* and *ack* numbers as the indication of MSP/LSP after the original IP header is retrieved. In this way, EVCP-EW will not change any bits in the IP header of the decrypted packet. Furthermore, EVCP-EW SM has to keep a copy of the LF of the upstream link of the egress IPSec gateway for each IPSec tunnel. EVCP-EW SM inspects the ECN bits in the packet and compares it with the *MSP/LSP* of the saved copy of the LF of its upstream link. Based on the results of the comparison, EVCP-EW SM manipulates the *seq* and *ack* numbers in order to mark the packet as *MSP* or *LSP*. Then the packet is delivered to EVCP-EW NM. EVCP-EW NM updates the ECN bits according to the LF of its downstream link following the operating mechanism of DPCP.

*Loss Differentiation Heuristic Algorithm*

When operating in any network, a sender can build knowledge about congestion in network as it receiving feedback from its intended receiver.

The congestion status of a network can be continuously tracked by the sender because the feedback is updated with the receipt of every ACK. In this case it is important to realize that a congestion-caused loss event has a much longer duration than an error-caused loss event.

Depending on the above fact, the heuristic algorithm for EVCP-EW assumes that by keeping track of the status of the network a sender can identify the cause of a loss. The heuristic algorithm maintains a revolving congestion theory Bit Map of size N at the sending side in order to track the status of the network. When the ACK is received, the bit at position BM(1) is dropped. After that the bit at position BM(i) with i€{1,…,N} is shifted to the left so it takes the position of bit BM(i-1) , and the bit at position BM(N) is set to 1 if the new ACK indicates congestion, or otherwise to 0. A binary flag called congestion flag (CF) is set to 1 when the rightmost T consecutive bits with T≤N are set to 1 in the bit map. Otherwise, the flag is set to 0. After detection of a loss, if CF flag is set, then that loss is safely determined as a congestion-caused loss triggering an MD operation to *cwnd*. Otherwise, that loss is considered to be an error-caused loss, then the sender simply maintains the current. As opposed to the consecutive T could represent the total number of bits set to 1 in every N bits. In the case of EVCP-EW, the link load factor (LF) is encapsulated in ACK packets, and the *OVER_LOAD* represents a load factor beyond 100%. As, the *OVER_LOAD* represents a LF beyond 100% it is used as the indicator of congestion. According to our experiments, setting N to 32 and T to 16 represents optimal choices. With these choices of values, maintaining a revolving bit map history only requires 4 bytes of storage on a per-flow basis. We set the value of N to 32 for the convenience of implementation. In this case the value of *cwnd* for larger flows could be easily scaled to fit the 32 bits of N. Fig. 2 illustrates the operation of the heuristic algorithm of EVCP-EW.
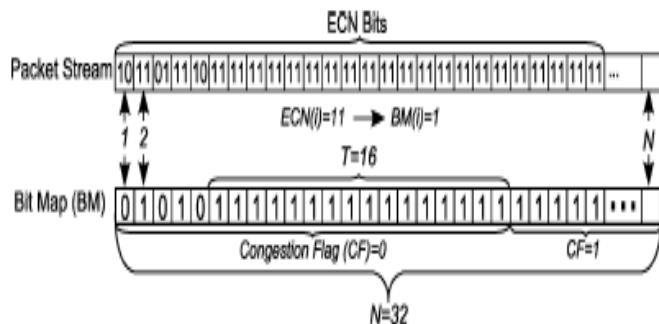


**Fig. 2. An illustration of the loss differentiation heuristic algorithm.**

### 3.2. Data Flow architecture

Figure 3 shows the flow of our proposed system.As shown in figure EVCP-EW packet arrives at the ingress of an IPSec gateway. Then packet goes to IPSec module for encryption.

**Figure 3: Data flow of proposed system**
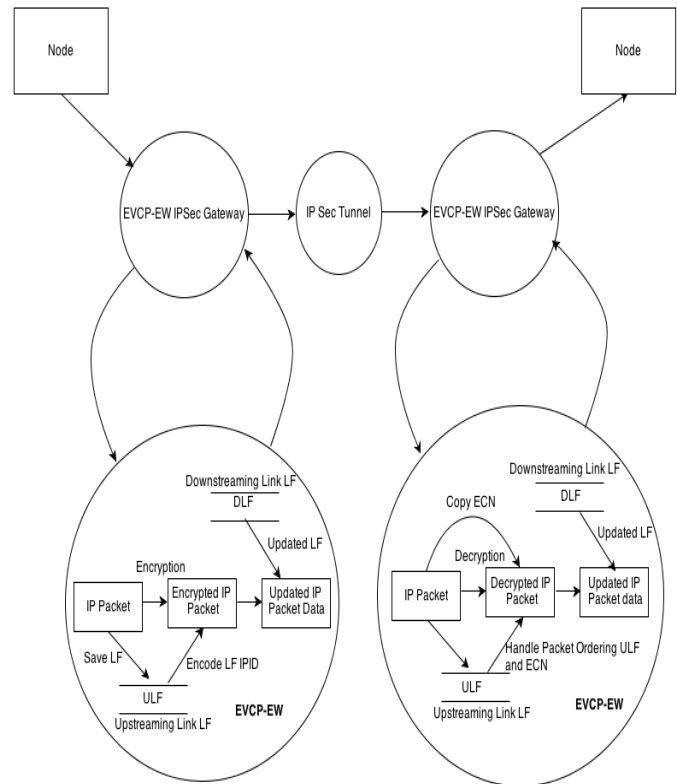


At the output interface of the ingress IPSec gateway, EVCP-EW NM takes over. EVCP-EW NM compares the LF in the packet with the LF of its downstream link interface and updates the LF in the packet if necessary.

At the egress of the IPSec gateway and before the encrypted packet goes to the IPSec module for decryption, EVCP-EW SM will catch the packet and save the LF value as indicated by the ECN bits of the packet. Note that after the packet is decrypted, the IPSec module will copy the ECN bits from the new IP header to the original IP header on the PT side.

### 3.3. Turing Machine
*State Diagram:*

We use the state diagram to specify the sequencing behavior of objects in a class. A state represents a discrete, continuous segment of time wherein the object's behavior will be stable. The object will stay in a state until it is stimulated to change by an event. Figure 4 shows the five main steps of our proposed system.

**Figure 4: State diagram of proposed system**
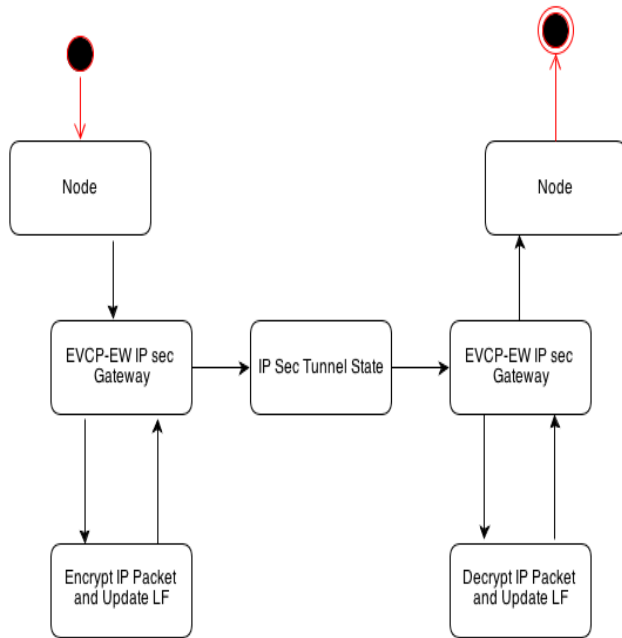


## IV. RESULTS AND DISCUSSION

Our recent work of [12] proposes a distributed approach that can overcome the limitations of VCP by increasing the amount of feedback to the sender. By distributing a 4-bit representation of the LF into two consecutive packets, DPCP only needs to use two ECN bits in one packet preserving the deployment potential of VCP. However, DPCP requires access to TCP header in order to perform encoding and decoding of the LF. The latter introduces difficulties for working in encrypted networks. It is also important to note that all VCP alternatives are faced with similar deployment issues in encrypted networks. In contrast, EVCP-EW proposed in this paper is capable of working in encrypted networks by using an alternative packet ordering management scheme. As EVCP-EW also distributes the LF into two consecutive packets the same way as DPCP does, this work can be viewed as an extension of DPCP for wireless networks. Most importantly, EVCP-EW provides a loss identification algorithm to enable proper reaction to loss depending on its cause, while other VCP alternatives have no such capability.

## V. CONCLUSION

In this paper, we proposed EVCP-EW as an extension of VCP & DPCP. We demonstrated how EVCP-EW overcomes the limitations of DPCP and VCP by using an alternative packet ordering management scheme. Rather than accessing the TCP header, EVCP-EW passively inspected the LSB bit of the IPID field in the IP packet header to identify whether a packet is the *MSP* or *LSP* in a packet pair sequence. Furthermore, EVCP-EW utilized a heuristic loss identification scheme to differentiate error-caused loss from congestion-caused loss such that it can appropriately react to loss. As the main differentiating factors, we will show that i) unlike DPCP, EVCP-EW can operate over

IPSec encrypted networks, and ii) relying on its heuristic loss identification algorithm, EVCP-EW will significantly outperform DPCP in wireless environments. As a future work, it would be interesting to study what improvements are possible in EVCP-EW by using more bits for the congestion related information.

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# Aromatase Inhibitors: How much it Bites the Bone?

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*Abstract-* Tamoxifen in treatment of breast cancer is replaced by aromatase inhibitors (AI's) which blocks and prevent estrogens by inhibiting aromatase enzyme. Treatments in breast cancer, such as oophorectomy, gonadotropin-releasing hormone (GnRH) agonists, chemotherapy and AIs, all decrease endogenous estrogens and cause significant decrease in bone mineral density (BMD) leading to bone loss and increase the risk of fractures. There is evidence to suggest that various musculoskeletal issues (pains) may be associated with low circulating estrogen levels. The most important and efficient step in preventing AI induced fracture risk is to assess for other clinical risk factors for osteoporosis before initiating AIs. The most robust non-BMD risk factors are age and prevalent fracture. The various steps in prevention of AIs induced fracture are.
1. Healthy and active lifestyle.
2. Regular Vitamin D and Calcium supplements.
3. Vigilant Monitoring of affected areas.

*Index Terms-* aromatase inhibitors, bone metastasis, fracture.

## I. Introduction

Breast cancer is the most common malignancy in women. It is estimated that in 1999, 30% of new cancer cases arose in this site, 176,300 cases were diagnosed and almost 44,000 women died. Bone is the most common site of metastasis in patients with breast cancer.[1] Fisher et al examined the site of first metastasis lesion in women undergoing radical mastectomy and found that bone was the initial site in 26% however; a substantially larger proportion of patients will ultimately develop metastasis to bone.[2] Median survival with metastatic breast cancer varies widely depending on the site(s) of involvement. In the past twenty years the role of tamoxifen has been greatly challenged by aromatase inhibitors. AI(s) block or prevent estrogens from stimulating the growth of cancer by inhibiting Aromatase from converting androgens into estrogen.[3]

They induce an increase in gonadotropin secretion secondary to the reduced negative feedback of estrogen to the pituitary, leading to ovarian stimulation and a potential increase in ovarian size which may result in ovarian cysts. The primary source of estrogen in premenopausal women is the ovaries; the primary source in postmenopausal women is the adrenal gland, where aromatase converts adrenal androgens to estrogens. AI(s) prevent conversion of androgens to estrogens leading to rapid decrease in circulating estrogen.[4]

Etiology of AIs induced bone loss: All modalities of Breast cancer treatments, such as surgical oophorectomy, hormonal therapy like GnRH agonists, chemotherapy and aromatase inhibitors (AIs), all decrease endogenous estrogens and cause bone loss and increase the risk of fractures.[5] The more sudden and severe the estrogen deprivation occurs, the greater the magnitude of bone loss.[6] Boneloss is most rapid in premenopausal women receiving both ovarian suppression therapy (GnRH agonist) and an AI.

Incidence of musculoskeletal events and fractures in patients using AI(s): Musculoskeletal issues, including joint pains, are a very significant issue for patients taking AIs and can result in non-adherence. The incidence of joint complaints ranged from 20% to more than 30% in the pivotal AI trials, and was significantly higher in patients receiving AIs compared with those treated with tamoxifen.[8] Almost 50% of the patients using AI(s) complained of vague musculoskeletal issues which were often under-reported in several trials. The IES [Intergroup Exemestane Study] trial more precisely defined the musculoskeletal events as arthritis, osteoarthritis, arthralgias, carpal tunnel syndrome, or musculoskeletal pain.[9] These effects may be contributed to decreased levels of circulating estrogens. A retrospective analysis of the ATAC trial suggested that the presence of joint symptoms may be associated with a decreased risk for recurrence,[10] although such an association was not confirmed in an analysis of the MA.27 trial.[11]

In several of the AI trials, fracture data has been reported.[12] In a meta-analysis of seven trials comparing AIs to tamoxifen in postmenopausal women with early stage breast cancer, use of AIs significantly increased the risk of bone fractures (OR 1.47, 95% CI 1.34-1.61).[13] The major drawback of these trials were that fracture outcomes were not the primary endpoints; therefore, fracture and other skeletal events were collected as adverse events as part of a long-term safety and tolerability assessment. With exception of the MA-17 trial, all adjuvant AI trials demonstrated a significant increase in the rate of overall fractures compared with tamoxifen. The MA-17 trial examined the efficacy of letrozole versus placebo in postmenopausal women who had completed five years of tamoxifen therapy. Of 5149 women, 256 had a clinical fracture (5.3 percent of patients assigned to letrozole compared with 4.6 percent assigned to placebo).[14] In the ATAC trial comparing anastrozole with tamoxifen described above, the annual incidence of fractures was higher in women receiving anastrozole (11 versus 7.7 percent) throughout the five years of treatment.[15] However, beginning in the sixth year, the fracture rate decreased in the women previously assigned to anastrozole treatment such that in years seven to nine the fracture rates with both treatments were similar.[16] This suggests that AI-related fracture rates will decrease upon cessation of the drug.

Prevention: The most easy and effective tool to assess bone loss and increased fracture risk in patients before starting AI(s) is a routine BMD (bone densitometry). The American Society of Clinical Oncology (ASCO) recommends BMD testing (DXA) for postmenopausal women taking AIs and for premenopausal women who develop treatment-related premature menopause following treatment.[19] In several of the AI trials, BMD and bone turnover markers were evaluated in a subset of women. BMD of the lumbosacral (LS) and total hip (TH) were significantly reduced in postmenopausal women receiving AIs versus tamoxifen or placebo.[7] Recommendations for Aromatase Induced Bone Loss (AIBL)[17]:

1. All patients initiating AI therapy should receive calcium and vitamin D supplements.
2. Any patient initiating or receiving AI therapy with a T-score ≥−2.0 and no additional risk factors should be monitored every 1–2 years for change in risk status and bone mineral density (BMD).
3. Any patient initiating or receiving AI therapy with a T-score <−2.0 should receive bisphosphonate therapy.
4. Any patient initiating or receiving AI therapy with any two of the following risk factors—T-score <−1.5, age >65 years, low BMI (<20 kg/m$^2$), family history of hip fracture, personal history of fragility fracture after age 50, oral corticosteroid use >6 months, and smoking—should receive bisphosphonate therapy.
5. BMD should be monitored every 2 years, and treatment should continue for at least 2 years and possibly for as long as AI therapy is continued.
6. To date, the overwhelming majority of clinical evidence supports zoledronic acid 4 mg every 6 months to prevent bone loss in women at high risk. Although there is a trend towards fewer fractures with zoledronic acid, studies completed to date have not been designed to capture significant differences in fracture rate, and longer follow-up is needed

Thus, fracture risk assessment should include evaluation of the following:

- Clinical risk factors for osteoporosis
- Bone mineral density (BMD) measured by dual energy x-ray absorptiometry (DXA)
- Several groups have published recommendations for the evaluation of fracture risk in women initiating AIs.

These guidelines for evaluating bone density were developed largely from guidelines for screening, monitoring, prevention, and treatment of osteoporosis in postmenopausal women.[18] Apart from AIs there are various other factors which lead to enhanced bone loss in postmenopausal breast cancer patients, some of them are listed below:

- Advancing age
- Prior history of fragility fracture
- Chronic glucocorticoid use
- Low BMI
- Parental history of hip fracture
- Cigarette smoking, and excess alcohol

A thorough check should be made regarding these factors and if found should be corrected.

Management of AIBL: (DO's and DON'T's)

1. Laboratory evaluation — All women being initiated on AIs should have a serum calcium level and serum Vitamin D3 levels checked routinely, as most of the women may have one of these deficiencies as the secondary cause of bone loss which might need primary correction. In a retrospective study of women (64 with breast cancer) referred to a bone health clinic during a six-year interval, 78 percent of the women with breast cancer had at least one secondary cause of bone loss, other than cancer or cancer-related therapies.[20] The most common finding was vitamin D insufficiency (38 percent with vitamin D <30 ng/mL [74.9 nmol/L]). Suggested intake of elemental calcium is 1200 mg (total diet plus supplement) and 800 international units of vitamin D daily. In women with low vitamin D levels (25-hydroxyvitamin D level <20 ng/mL), vitamin D supplementation should be provided prior to therapy with bisphosphonates. Other causes of bone loss included idiopathic hypercalciuria and normocalcemic hyperparathyroidism. Women with low bone mass (T-score below -2.5) who are initiating or already taking AIs should have the following basic tests.

- Biochemistry profile (especially calcium, phosphorous, albumin, total protein, creatinine, liver enzymes including alkaline phosphatase, electrolytes)
- 25-hydroxyvitamin D
- Complete blood count

2. Non-pharmacologic intervention: Women are encouraged to adopt lifestyle changes that promote not only bone health but overall health as well. These include increasing physical activity including weight bearing exercise, reducing or stopping smoking and taking calcium and vitamin D supplements.[21]

3. Pharmacologic intervention: The pharmacologic agents available for the prevention of aromatase inhibitor (AI)-induced bone loss in postmenopausal women are bisphosphonates and denusumab.

- Bisphosphonates— Bisphosphonates are specific inhibitors of osteoclast-mediated bone resorption.[22] They are considered first-line pharmacologic therapy for postmenopausal women with osteoporosis. In several randomized trials, bisphosphonates prevented or reduced bone loss in women receiving AIs.[23] In a meta-analysis of six trials evaluating bisphosphonates in women with breast cancer receiving AIs, bisphosphonates did not significantly decrease the number of fractures compared with placebo or no treatment (OR 0.79, 95% CI 0.53-1.17).[24] The wide confidence interval fail to emphasize the impact of bisphosphonates on prevention of AI induced fractures. The two largest randomized trials were the Zometa-Femara Adjuvant Synergy Trials (Z-FAST and ZO-FAST). In both trials, zoledronic acid (4 mg every six months) was evaluated for prevention of AI-induced bone loss. Postmenopausal women with estrogen receptor-positive early-stage breast cancer who were

receiving adjuvant letrozole were randomly assigned to immediate treatment with ZA for five years or to delayed administration (when spine or hip T-score decreased to <-2.0 or the occurrence of fracture).[25] All patients received 500 mg of calcium and 400 to 800 international units of vitamin D. The SABRE trial was designed to evaluate the effect of weekly oral risedronate on bone loss in postmenopausal women receiving anastrozole. In the SABRE trial, postmenopausal women receiving anastrozole were stratified by their baseline T-scores into low risk (T-score of ≥-1.0), moderate-risk (T-score between -1.0 and -2.0), and high risk (T-score <-2). The women with moderate risk were randomized in a double-blind fashion to receive oral risedronate 35 mg/week or placebo, whereas women at low risk received anastrozole alone and women at high-risk received anastrozole and risedronate.[26] After 24 months, there was a significant difference in the change in LS and TH BMD from baseline in moderate risk women, favoring risedronate (2.2 versus -1.8 percent and 1.8 versus -1.1 percent, respectively). LS and TH BMD increased significantly (2 to 3 percent) in women in the high risk group and LS decreased significantly (-2.1 percent) in the low risk group.

Choosing a candidate for bisphosphonate therapy should be based upon a combination of BMD and clinical risk factors which quantify the fracture risk probability.

- Denosumab is a fully human monoclonal antibody for the treatment of osteoporosis and treatment-induced bone loss. Denosumab is designed to target RANKL (RANK ligand), a protein that acts as the primary signal for bone removal. Bone remodeling (or bone metabolism) is a lifelong process where mature bone tissue is removed from the skeleton (a process called bone resorption) and new bone tissue is formed (a process called ossification or new bone formation). These processes also control the reshaping or replacement of bone following injuries like fractures but also micro-damage, which occurs during normal activity. Remodeling responds also to functional demands of the mechanical loading. In the first year of life, almost 100% of the skeleton is replaced. In adults, remodeling proceeds at about 10% per year.[27] An imbalance in the regulation of bone remodeling's two sub-processes, bone resorption and bone formation, results in many metabolic bone diseases, such as osteoporosis.[28] To summarise all patients initiating AIs should be thouroughly screened for other clinical risk factors leading to osteoporosis and fracture. The most robust non-BMD risk factors are age and prevalent fracture. All women should be encouraged to adopt lifestyle changes that promote not only bone health but overall health as well.

Not all women receiving AIs require treatment with pharmacologic therapy. Risk stratification based upon baseline BMD T-scores and clinical risk factors justifies the use of bisphosphonates. Denosumab is an alternative option for women who do not tolerate bisphosphonates. The choice of bisphosphonates depends upon patient preference and cost. Oral therapy with risedronate or alendronate should be favored as initial therapy. However, zoledronic acid is an option if the patient does not tolerate oral bisphosphonates. The optimal schedule and duration of ZA has not been defined for AI-induced bone loss.

Screening for AIBL is still an evolving area which should be taken care of diligently in all patients who are administered AIs. More and more emphasis should be placed on clinical examinations and laboratory evaluations and scans should be reserved for symptomatic patients.

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# Application of the Stock Selection Criteria of Three Value Investors, Benjamin Graham, Peter Lynch, and Joel Greenblatt: A Case of Shanghai Stock Exchange from 2006 to 2011

**Yangxiu Ye**

*Abstract* - The researcher would like to find out if the value investing methods work in the Shanghai Stock Exchange (SSE) or not, and if they do, then the research compared and identified the  method which give the highest return for the SSE.

The secondary data used in this research were the fundamentals of companies listed in the Shanghai Stock Exchange A Share Index from year 2006 to 2011. There were total of seven selection methods in this study. Three stock selection methods were applied from the Benjamin Graham's criteria, two selection methods were adopted from Peter Lynch's criteria, and two selection methods were from Joel Greenblatt's Magic formula. The stocks listed in SSEAI were filtered by these seven screening rules, and then equal-weight portfolios were set up with stocks which can pass the screening rules. The returns of portfolios were compared with market return.

This research found that the portfolios that created by Peter Lynch and Joel Greenblatt's methods produced higher return than market in each year from 2007 to 2010, and the portfolios that created by Benjamin Graham's method produced higher return than market in each year from 2007 to 2011, except eight portfolios had no stock and no return. The researcher also found that the returns of portfolios are not higher than the market returns in year 2006 due to the Chinese government launched the new policy for stock trading.

*Index Terms*– Value Investment, Return, Portfolio, Stock

## I. INTRODUCTION

Benjamin Graham created value investing which is a kind of stock investing approach (Truong, 2010). This method emphasizes buying the stocks with market prices that are lower than their intrinsic value and then selling them when their market prices are higher than intrinsic value. Graham & Zweig (2004) suggested that it is a wise action not overpaying for an investments. For selecting undervalued stocks, it needs to combine these criteria into stock selecting screening rules. Oppenhenimer (1984) mentioned that stock selection rules which are the combinations of criteria can produce different returns. It is not necessary that the combination of more criteria can make higher return or the combination of fewer criteria just make

lower returns. The researcher needs to find the best combination that produces that highest return.

Some tests of combination of criteria had been carried out in Malaysia and Thailand. Portfolios are set up by using these stock selecting screening rules which are made by criteria. The returns of the portfolios performed superior compared with the relevant stock market (Change, 2011).

In the short 20 years of China stock market, the investment philosophy of Chinese investors has changed many times.  With the bull market in year 2006 to the bear market in year 2008, the investors' attitude becomes pessimistic from optimistic. Is there one investment philosophy which can lead Chinese investors make effective decision on investment? Since 2003, the market has shown obvious signs of value investment, the fund as a representative launched the value investment in stock market. Does the value investing work in Chinese stock market?

Peter Lynch and Joel Greenbaltt are representative value investors. Although their theories are developed on the method of Benjamin Graham, these two investors applied criteria in different ways. The researcher will test combination of the three investors' criteria in Shanghai Stock Exchange.

Graham (2004) came up with seven criteria regarding quality and quantity for selecting common stocks. The first three criteria are representative of the financial strength of a company while the next four are representative of what returns can be expected from it. Lynch (1990) suggested there are nine quantitative data which he thinks investors should consider before investing in. The formula of price-to-earnings ratio compared with growth ratio is representative the reasonable of the stock price, the criterion of dividends reflects the return investors can get from company. The other criteria of Lynch are representative of the financial condition of a company.  Greenblatt (2004) said the companies were ranked base on two key factors: return on capital and earning yield. Return on capital can be measured by the first two criteria and earning yield can be measured by the last criterion. Guidolin and Nicodano (2009), Piotroski (2000), Ball, Sadka and Sadka (2009), Basu (1983), Lamont(1998), Rousseau and Renburg (2004) had proved these criteria can measure the company's financial condition and effect the investment return.

**Table 1 The three investors' stock selection criteria**

| Benjamin's stock selection criteria | Peter Lynch's stock selection criteria | Joel Greenblatt's stock selection criteria |
|---|---|---|
| 1.Sufficient size of enterprise<br>2.An good financial condition<br>3.Earnings stability<br>4.Dividend record<br>5.Earnings growth<br>6.Moderate price-to-earnings ratio<br>7.Moderate price-to-book ratio | 1.The percentage of total sales<br>2.The formula of price-to-earnings ratio compared with growth ratio<br>3.Cash position<br>4.Ratio of debt to equity<br>5.Dividends<br>6.Hidden Assets<br>7.Cash flow<br>8.Inventory<br>9.Pension fund asset | 1.Return on assets<br>2.Return on equity<br>3.Price-to-equity ratio |

## II. METHODOLAGY

**Research Data**

The researcher will test the stocks selected from Shanghai Stock Exchange A Share Index from year 2006 to 2011. All of the secondary data used in this research are obtained from Bloomberg Terminal and the website of SSE. The codes and name of all stocks in the SSEAI and financial data required in screening rules were got from Bloomberg Professional Terminal. Shanghai Stock Exchange posts the introduction, annual report and news of listed companies on their official website. There also have the whole basic information about each index. The researcher got the SSEAI data from this website.

**Screening Rules and Portfolio Construction**

To select the undervalued stocks from SSE, researcher combines some criteria of the three investors' as selection stock screening rule. There are total of seven selection stock screening rules in this research, three of them are applied from the Benjamin Graham's criteria, two of them from Peter Lynch's criteria, and two rules from Joel Greenblatt's Magic formula.

The rules from Benjamin Greham:

1. The portfolio which is created by criteria with PE < 15, PB < 1.5

2. The portfolio which is created by criteria with PE < 15, PB < 1.5 and DY > 3%

3. The portfolio which is created by criteria with PE < 15, PB < 1.5 and CR > 2

The rules from Peter Lynch:

1. The portfolio which is created by common stock selection formula

2. The portfolio which is created by common stock selection formula and DE < 0.334

The rules from Joel Greenblatt:

1. The portfolio which is created by using top 30 ranking of PE and ROA

2. The portfolio which is created by using top 30 ranking of PE and ROE

An equal weighted portfolio will be constructed by each screening rule for each year from 2006 to 2011. One-year return and two-year return of portfolio will be calculated for each year except there is not enough data for calculating.

The formula of total return:

Total return

= dividend paid + capital gains

Where Capital gain

= sell price − purchase price

Therefore the total return in ratio is:

Total return

$$= \frac{(\text{dividend paid} + \text{capital gains})}{\text{beginning price per share}}$$

To compare the return of each year, researcher needs to calculate one-year return and two-year return, the following one-year return formula was used:

$$1 - \text{year return at year t} = \frac{D_{t+1} + P_{t+1} - P_t}{P_t}$$

Where D = Dividend paid

P = Price of stock at year end

t = Current year

the two-year return formula was used:

$$2 - \text{year return at year t} = \frac{D_{t+1} + D_{t+2}}{P_t} + \frac{P_{t+2} - P_t}{P_t}$$

Where D = Dividend paid

P = Price of stock at year end

t = Current year

## III. STATISTICAL TREATMENT OF DATA

After getting the return of each year, the researcher will use the t-test statistic to test the hypothesis that measure the significance of each return compared to the return of the Shanghai Stock Exchange A Share Index. For this research, significance of the return of portfolio is tested by the one-tailed t-test to get the evidence to reject or not to reject the hypothesis.

In this research, the return of market refers to the return of SSE A share Index. A mean is used to test the hypothesis. Therefore each hypothesis is as follows:

$H_o$ : Return of the portfolio ≤ Return of the market
$H_a$ : Return of the portfolio > Return of the market

$$ t = \frac{\overline{X} - \mu}{\dfrac{s}{\sqrt{n}}} $$

Where $\overline{x}$ = mean of portfolio return

$\mu$ = mean return of SSE A share index

$s$ = standard deviation of the sample

$n$ = number of stocks in portfolio

## IV. RESULTS AND FINDINGS

The purpose of this research is to test if the value investing methods from Benjamin Graham, Peter Lynch, and Joel Greenblatt work in the Shanghai Stock Exchange (SSE) or not, and if they do, then the research will also compare and identify which method can get highest return from the Shanghai Stock Exchange from 2006 to 2011.

Using the first screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for three out of six years, and produced significantly greater two-year returns than the market for three out of five years. The portfolio that got higher return but cannot be tested by t-test is in the year 2008; because there is only one stock that can pass the screening rule in this year. No stock can be selected in year 2010, therefore there is no return and cannot compare with market return.

Using the second screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for two out of six years, and produced significantly greater two-year returns than the market for three out of five years. No stock can be selected in years 2008 and 2010, therefore there is no return and cannot compare with market return in these two years.

Using the third screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for two out of six years, and produced significantly greater two-year returns than the market for three out of five years. The portfolio that got higher return but cannot be tested by t-test is in the years 2008; because there is only one stock can pass the screening rule in this year. No stock can be selected in year 2010, therefore there is no return and cannot compare with market return.

For the forth screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for four out of six years, and produced significantly greater two-year returns than the market for all the five years.

For the fifth screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for four out of six years, and produced significantly greater two-year returns than the market for all the five years.

For the sixth screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for four out of six years, and produced significantly greater two-year returns than the market for all the five years.

For the seventh screening rule, researcher gets the portfolios which produced significantly greater one-year returns than the market for five out of six years, and produced significantly greater two-year returns than the market for all the five years.

The researcher found that the portfolio comprising stocks selected based on Lynch's formula and DE ratio of 33.4% or lower produced the highest returns for five times out of eleven comparison. Benjamin Graham and Joel Greenblatt each get three times.

In this research, there are 52 out of 77 hypotheses that obtained significantly higher returns than the return of the Shanghai Stock Exchange A Share Index. Out of the 25 hypotheses that did not generate significantly higher returns than the market return, 17 hypotheses tested Benjamin Graham's criteria, 4 hypotheses tested Peter Lynch's criteria, and last 4 hypotheses tested Joel Greenblatt's criteria. Out of the 17 hypotheses that did not generate significantly higher return for Graham, 8 hypotheses still produced higher return than market, and 6 hypotheses did not include any stock and no return.

## V. CONCLUSION

The returns of most hypotheses used in this research are higher than the return of stock market. Therefore, the stock selection criteria can be used in Shanghai Stock Exchange to choose stock to invest in. The stocks selection method which is based on Lynch's formula and debt-to-equity ratio had highest frequency to get highest return in SSE from 2006 to 2011. The portfolios which were created by this stock screening rule produced significantly higher return than market with most often. Consequently, it is the screening rule which can give the highest return in this research. Investor can apply this rule to select stock in SSE.

In consideration of the returns of all portfolio were not higher than market in year 2006, the researcher suggests that investor should pay more attention on policies issued by the Chinese government, because it can deeply affect stock price and return. The Chinese government made a decision that investors can trade the shares which could not be traded in stock market before year 2006. This decision makes the volume of shares in market increase and pushes the stock price up with much bubble.

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APPENDIX

**Table 1: Summary of 1-year return in the year 2006**

| Screening rule | 1-year return in year 2006 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | 130.57% | 66.14% | 66 | 1 | No |
| Benjamin's rule 2 | 130.57% | 73.38% | 37 | 0.999 | No |
| Benjamin's rule 3 | 130.57% | 58.11% | 6 | 0.983 | No |
| Peter's rule 1 | 130.57% | 97.61% | 132 | 0.999 | No |
| Peter's rule 2 | 130.57% | 113.72% | 37 | 0.807 | No |
| Joel's rule 1 | 130.57% | 82.09% | 30 | 0.999 | No |
| Joel's rule 2 | 130.57% | 81.32% | 30 | 0.999 | No |

*10% significant, **5% significant, ***1% significant

**Table 2: Summary of 2-year return in the year 2006**

| Screening rule | 2-year return in year 2006 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | 352.24% | 442.90% | 66 | 0.002 | Yes*** |
| Benjamin's rule 2 | 352.24% | 458.49% | 37 | 0.002 | Yes*** |
| Benjamin's rule 3 | 352.24% | 378.99% | 6 | 0.371 | No |
| Peter's rule 1 | 352.24% | 470.92% | 132 | 0.000 | Yes*** |
| Peter's rule 2 | 352.24% | 547.38% | 37 | 0.027 | Yes** |
| Joel's rule 1 | 352.24% | 500.60% | 30 | 0.001 | Yes*** |
| Joel's rule 2 | 352.24% | 498.12% | 30 | 0.000 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 3: Summary of 1-year return in the year 2007**

| Screening rule | 1-year return in year 2007 | | # stocks | p-value | Significant |
| --- | --- | --- | --- | --- | --- |
| | Market | Portfolio | | | |
| Benjamin's rule 1 | 96.14% | 243.44% | 31 | 0.000 | Yes*** |
| Benjamin's rule 2 | 96.14% | 247.60% | 12 | 0.001 | Yes*** |
| Benjamin's rule 3 | 96.14% | 305.61% | 4 | 0.064 | Yes* |
| Peter's rule 1 | 96.14% | 210.69% | 175 | 0.000 | Yes*** |
| Peter's rule 2 | 96.14% | 191.94% | 55 | 0.000 | Yes*** |
| Joel's rule 1 | 96.14% | 337.39% | 30 | 0.000 | Yes*** |
| Joel's rule 2 | 96.14% | 315.81% | 30 | 0.000 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 4. Summary of 2-year return in the year 2007**

| Screening rule | 2-year return in year 2007 | | # stocks | p-value | Significant |
| --- | --- | --- | --- | --- | --- |
| | Market | Portfolio | | | |
| Benjamin's rule 1 | -32.09% | 20.53% | 31 | 0.000 | Yes*** |
| Benjamin's rule 2 | -32.09% | 5.41% | 12 | 0.000 | Yes*** |
| Benjamin's rule 3 | -32.09% | 29.44% | 4 | 0.002 | Yes*** |
| Peter's rule 1 | -32.09% | 17.76% | 175 | 0.000 | Yes*** |
| Peter's rule 2 | -32.09% | 19.01% | 55 | 0.000 | Yes*** |
| Joel's rule 1 | -32.09% | 44.38% | 30 | 0.001 | Yes*** |
| Joel's rule 2 | -32.09% | 23.03% | 30 | 0.000 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 5. Summary of 1-year return in the year 2008**

| Screening rule | 1-year return in year 2008 | | # stocks | p-value | Significant |
| --- | --- | --- | --- | --- | --- |
| | Market | Portfolio | | | |
| Benjamin's rule 1 | -65.38% | 10.62% | 1 | NA | NA |
| Benjamin's rule 2 | -65.38% | NA | 0 | NA | NA |
| Benjamin's rule 3 | -65.38% | 10.62% | 1 | NA | NA |
| Peter's rule 1 | -65.38% | -58.07% | 176 | 0.000 | Yes*** |
| Peter's rule 2 | -65.38% | -54.93% | 53 | 0.000 | Yes*** |
| Joel's rule 1 | -65.38% | -59.74% | 30 | 0.068 | Yes* |
| Joel's rule 2 | -65.38% | -64.68% | 30 | 0.422 | No |

*10% significant, **5% significant, ***1% significant

**Table 6. Summary of 2-year return in the year 2008**

| Screening rule | 2-year return in year 2008 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | -37.74% | 150.01% | 1 | NA | NA |
| Benjamin's rule 2 | -37.74% | NA | 0 | NA | NA |
| Benjamin's rule 3 | -37.74% | 150.01% | 1 | NA | NA |
| Peter's rule 1 | -37.74% | -1.96% | 176 | 0.000 | Yes*** |
| Peter's rule 2 | -37.74% | 5.79% | 53 | 0.000 | Yes*** |
| Joel's rule 1 | -37.74% | 3.79% | 30 | 0.000 | Yes*** |
| Joel's rule 2 | -37.74% | -13.06% | 30 | 0.002 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 7. Summary of 1-year return in the year 2009**

| Screening rule | 1-year return in year 2009 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | 79.80% | 181.53% | 50 | 0.000 | Yes*** |
| Benjamin's rule 2 | 79.80% | 147.71% | 15 | 0.000 | Yes*** |
| Benjamin's rule 3 | 79.80% | 162.73% | 11 | 0.003 | Yes*** |
| Peter's rule 1 | 79.80% | 150.28% | 152 | 0.000 | Yes*** |
| Peter's rule 2 | 79.80% | 176.79% | 50 | 0.000 | Yes*** |
| Joel's rule 1 | 79.80% | 184.87% | 30 | 0.000 | Yes*** |
| Joel's rule 2 | 79.80% | 182.33% | 30 | 0.000 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 8. Summary of 2-year return in the year 2009**

| Screening rule | 2-year return in year 2009 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | 53.80% | 147.19% | 50 | 0.000 | Yes*** |
| Benjamin's rule 2 | 53.80% | 115.28% | 15 | 0.015 | Yes** |
| Benjamin's rule 3 | 53.80% | 146.20% | 11 | 0.006 | Yes*** |
| Peter's rule 1 | 53.80% | 167.18% | 152 | 0.000 | Yes*** |
| Peter's rule 2 | 53.80% | 229.81% | 50 | 0.000 | Yes*** |
| Joel's rule 1 | 53.80% | 195.57% | 30 | 0.000 | Yes*** |
| Joel's rule 2 | 53.80% | 179.23% | 30 | 0.000 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 9. Summary of 1-year return in the year 2010**

| Screening rule | 1-year return in year 2010 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | -14.46% | NA | 0 | NA | NA |
| Benjamin's rule 2 | -14.46% | NA | 0 | NA | NA |
| Benjamin's rule 3 | -14.46% | NA | 0 | NA | NA |
| Peter's rule 1 | -14.46% | 12.54% | 150 | 0.000 | Yes*** |
| Peter's rule 2 | -14.46% | 15.11% | 52 | 0.000 | Yes*** |
| Joel's rule 1 | -14.46% | 1.17% | 30 | 0.004 | Yes*** |
| Joel's rule 2 | -14.46% | 7.69% | 30 | 0.001 | Yes*** |

*10% significant, **5% significant, ***1% significant

**Table 10. Summary of 2-year return in the year 2010**

| Screening rule | 2-year return in year 2010 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | -32.97% | NA | 0 | NA | NA |
| Benjamin's rule 2 | -32.97% | NA | 0 | NA | NA |
| Benjamin's rule 3 | -32.97% | NA | 0 | NA | NA |
| Peter's rule 1 | -32.97% | -20.87% | 150 | 0.000 | Yes*** |
| Peter's rule 2 | -32.97% | -17.77% | 52 | 0.000 | Yes*** |
| Joel's rule 1 | -32.97% | -25.27% | 30 | 0.082 | Yes* |
| Joel's rule 2 | -32.97% | -22.58% | 30 | 0.034 | Yes** |

*10% significant, **5% significant, ***1% significant

**Table 11. Summary of 1-year return in the year 2011**

| Screening rule | 1-year return in year 2011 | | # stocks | p-value | Significant |
|---|---|---|---|---|---|
| | Market | Portfolio | | | |
| Benjamin's rule 1 | -21.64% | 4.57% | 15 | 0.064 | Yes* |
| Benjamin's rule 2 | -21.64% | -19.71% | 2 | 0.129 | No |
| Benjamin's rule 3 | -21.64% | -13.98% | 2 | 0.316 | No |
| Peter's rule 1 | -21.64% | -7.11% | 213 | 0.179 | No |
| Peter's rule 2 | -21.64% | -24.77% | 56 | 0.844 | No |
| Joel's rule 1 | -21.64% | -23.61% | 30 | 0.641 | No |
| Joel's rule 2 | -21.64% | -6.87% | 30 | 0.061 | Yes* |

*10% significant, **5% significant, ***1% significant

# Histochemical Localization of Alkaline Phosphatase Activity during Cutaneous Wound Healing In a Catfish under Acid Stress

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*Abstract- Heteropneustes fossilis* (Heteropneustidae) is an air breathing freshwater catfish, has an ever increasing demand as a major source of protein and vitamin A. Acid precipitation has detrimental effect on fish population. We have investigated the activity and localization of the enzyme alkaline phosphatase (ALP), by means of histochemical study on experimental wound repair in the fish skin under acid stress. After injury there was a significant decrease in ALP activity in the cells of the migrating epidermis. There was a gradual increase in the activity of ALP in basal cells, epithelial cells of the middle layer and outer layer and club cells after epithelialization (18 h) of the wound during the early stages of healing. By 96h – 10 days, a fairly high ALP activity in the basal cells was observed. With completion of dermal repair, there was a gradual disappearance of ALP activity. The granulation tissue and the differentiating muscle bundles showed a weak reaction for ALP activity. The late appearance and activity of ALP delayed the wound repair process under acid stress condition.

*Index Terms-* acid stress, alkaline phosphatase, histochemical, skin, wound repair.

## I. INTRODUCTION

Skin the utmost layer of all animals has an inevitable regenerative capacity. The fish skin has the ability to change in its structure in response to variety of external and internal stimuli (Blackstock & Pickering, 1982). Many researchers have paid attention to study the localization of enzymes,and alkaline phosphatase (ALP) in the various cells of the fish skin. Ross *et. al*., (2000) showed changes in hydrolytic enzyme activities in skin mucus of native Atlantic salmon, *Salmo salar*) due to infection with the Salmo louse *Lepeoptheirus salmonis* and cortisol implantation.Kori-Siakpere *et. al.*(2010) studied the variations in AcP and ALP activity in the plasma of the African Catfish *Clarias gariepinus* exposed to sublethal concentrations of potassium permanganate. Sanchooli *et. al.* (2012) measured the ALP and lysozyme enzymes in epidermal mucus of different weights of *Cyprinus carpio*. Loganathan *et. al.* (2013) examined the lysozyme, protease, ALP and esterase  activity of epidermal skin mucus of freshwater snake head fish *Channa striatus*. Enzymes are the biocatalysts

of biological origin which accelerates the various cellular reactions. ALP is a hydrolytic enzyme released by lysosomes for hydrolysis of foreign materials. ALP works in basic medium and takes part in active transport in cellular membrane. ALP is suggested to have a protective role in fishes during first stages of wound healing (Iger & Abraham 1994). There is a growing recognition of the role of ALP in the regenerative processes. The marked quantitative and qualitative alternations in ALP as a result of injury and subsequent regeneration have been the focus of extensive investigation in higher vertebrates, but little attention has been paid to such possible changes in fishes. Rai & Mittal (1983) reported the activity of ALP in the various tissue components of the regenerating skin of the catfish *Heteropneustes fossilis*. No literature have been found available pertaining to the activity and localization of ALP in different types of cells of fish skin during cutaneous wound healing under acid stress condition. Due to acid rain and acidic industrial effluents the pH of the aquatic medium is lowered which may be lethal or sublethal to an organism which may create any possible toxic effect to the organism. Therefore, the experiment was designed to study the localization and activity of ALP in the skin during wound healing in *Heteropneustes fossilis* under acid stress.

## II. MATERIALS AND METHODS

Adult live catfish, *Heteropneustes fossilis* (approximately, 17-18cm in length irrespective of sex) were collected from freshwater ponds at Dibrugarh, Assam and acclimatized to laboratory conditions for 7 days before setting the experiment. The fishes were fed with goat liver for maintaining fish in a healthy state (Dheer, 1978). Groups of fish were transferred to different aquaria containing acid water with pH 4.0 by adding $H_2SO_4$. This pH was maintained by changing acid water six hourly. The entire experiment was carried out in between pH 4.0 to 5.0, a sublethal pH range for this fish. Water pH (4.0 to 5.0) was maintained during the experimental period. Water of all the aquaria were changed regularly each at 6h intervals when the concentration of $H_2SO_4$ was adjusted to counteract slight pH drift due to release of excretory product and build up of any free $CO_2$ in the experimental aquaria. Free CO2 is toxic and also changes the pH of the medium (Doudoroff & Katz 1950; Lloyd & Jordan 1964; Eddy, 1974).

Before the creation of wound, fishes were anasthesized with 0.02% clove oil (Matin *et. al*., 2009). Incised wound of approximately 5mm in length and 3mm in depth parallel to the longitudinal axis of the body was made with a sharp scalpel blade between the dorsal fin and the lateral line canal in each fish. The fishes were returned immediately to the aquaria until sampling. After anasthesizing the fish, skin fragments each of which contained a wound were removed at various intervals (30min to 30 days) and were fixed in 10% neutral formalin at 4°C for 15 – 24h. For each experimental intervals 5 samples were taken in five different aquaria. Frozen sections were cut at 10 - 30µm using an American optical cryocut. ALP activity was visualized using calcium cobalt method (Gomori, 1952) and

coupling Azo-dye method (Pearse, 1968). In coupling Azo dye method for both ALP sodium – alpha-naphthyl-phosphate was used as substrate. Fast Red TR was employed as coupling diazonium salts for ALP. Control slides were prepared by incubating the sections in the absence of the substrate and in the presence of the substrate after inactivation of the enzymes by 10 minutes treatment with boiling water (Barka & Anderson, 1965).

## III.   RESULTS

### I.   **EPIDERMIS**

### a.   **BASAL CELLS AND EPITHELIAL CELLS (Table I )**

*After 30 min-2h -* Immediately after the infliction of the wound, the ALP of epithelial cells of  both in the middle layer and in the outermost layer and of the basal cells in the region I (wound gap) showed a sudden depletion and could not be located during this period in these cells but in the region II (surrounding area of wound gap) basal cells showed weak reaction for ALP whereas the epithelial cells of the middle layer remained very strong upto to the end period and cells of the outer layer exhibited moderate weak reaction throughout the experimental period (Fig. 1).

*After 4-18h -* At about 4h, small amount of ALP appeared in the basal cells and in the epithelial cells of the middle and outer layer of the region I (Fig. 2) whereas in region II, the basal cells showed a moderate increase in ALP activity at 8h to 18 h. However there was a slight decline in the enzyme activity in the middle layer of region II.

*After 24-96h -* After completion of epithlialization at 18h, there was a gradual increase in the activity of ALP in the basal cells in the both regions I and II. This condition continues without any significant change in the activity upto the end of this period (Fig. 3). The epithelial cells of middle and outer layer of region I showed a significant increase in the ALP activity which increase gradually and became more intense by the end of this period. Whereas the region II epithelial cells of middle layer showed a gradual decrease in the ALP activity which is comparatively opposite to region I activity but the outer layer did not show any change in the ALP activity.

*After 5 – 30 days -* At 5 days, the basal cells showed maximum ALP activity in both regions I and II, however there was a gradual decline in the intensity of the reaction after 5 day throughout this period. In the epithelial cells of middle and outer layer of both region I and II there was a gradual increase in ALP activity after 5 days and by the end of 30 days the activity of ALP becomes similar to that of the normal appearance, however the activity of ALP in the outer layer, epithelial cells of region II showed a constant reaction throughout the period (Fig. 4).

### b.   **Club cells (Table 1)**

*After 30 min – 18 h -* No ALP activity can be detected in the club cells present in the epidermis at region I. However, after 2h ALP gave weak reaction till the end of this period. In region II, there was a slight decline in ALP activity in the club cells than the normal skin.

*After 24 – 72h -* After epithelialization at 18 h, significant increase in the ALP activity was observed in club cells of epidermis in region I and II and remained constant upto the end of this period (Fig. 2).

*After 84h – 30 days -*In region I, the club cells showed dramatic increase in the ALP activity till 10 days and by the end of 30 days these cells of both regions I and II showed the same pattern of enzyme distribution as was observed in normal club cells (Fig. 4).

c.    **Mucous cells (Table I )**

Mucous cells donot show any activity of ALP during the wound healing process after acid stress.

**Table I. The distribution of ALP activity during the different stages of healing of skin wounds in *Heteropneustes fossilis* after acid stress.**

| Time of infliction | Region I | | | | | Region II | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Basal cell | Club cell | Mucous cell | Epithelial cell | | Basal cell | Club cell | Mucous cell | Epithelial cell | |
| | | | | Middle layer | Outer layer | | | | Middle layer | Outer layer |
| Normal | ++ | + | - | +++ | ± | ± | + | - | +++ | +± |
| 30min | - | - | - | - | - | ± | ± | - | +++ | +± |
| 1hr | - | - | - | - | - | ± | ± | - | +++ | +± |
| 2hr | - | ± | - | - | - | ± | ± | - | +++ | +± |
| 4hr | ± | ± | - | ± | ± | ± | ± | - | +++ | +± |
| 8hr | ± | ± | - | ± | ± | +± | ± | - | +++ | +± |
| 12hr | ± | ± | - | ± | ± | +± | ± | - | ++ | +± |
| 18hr | +± | ± | - | + | ± | +± | + | - | ++ | +± |
| 24hr | +± | + | - | + | ± | ++ | + | - | ++ | +± |
| 36hr | +± | + | - | + | ± | ++ | + | - | ++ | +± |
| 48hr | +± | + | - | + | ± | ++ | + | - | ++ | +± |
| 60hr | ++ | + | - | ++ | ± | ++ | + | - | + | +± |
| 72hr | ++ | + | - | ++ | + | ++ | + | - | + | +± |
| 84hr | ++ | +± | - | ++ | + | ++ | + | - | + | +± |
| 96hr | ++ | +± | - | ++ | + | +++ | + | - | + | +± |
| 5days | +++ | +± | - | +++ | + | +++ | + | - | + | +± |
| 10days | +++ | +± | - | +++ | ++ | ++ | + | - | ++ | +± |
| 15days | +++ | + | - | +++ | ++ | ++ | + | - | ++ | +± |
| 25days | ++ | + | - | +++ | ++ | ++ | + | - | +++ | +± |
| 30days | ++ | + | - | +++ | ++ | ++ | + | - | +++ | +± |

*ABBREVIATION USED:  Region I – wounded region, Region II – adjacent area of the wounded region, '-'–negative reaction, '±' – weak reaction, '+' – moderate reaction, '++' – strong reaction, '+++' – very strong reaction.

## II. **Dermis and subcutis (Table II)**

*After 30 min – 96h -* No reaction for the enzyme ALP was observed in subepidermal tissues. Only the RBC and WBC showed ALP activity. WBC being weak at the early hour gradually increased with strong reaction at 60h and becoming moderate to the end of the period whereas the appearance of activity of ALP in RBC started after 24h becoming strong to the end of this period.

*After 5 – 30 days -* The newly formed granulation tissues, near the cut edges of the dermis, showed moderate reaction for ALP (Fig. 4) activity at 5 days. After 15 days, the activity of this enzyme finally disappeared by the end of 30 days. At 96h, fibroblast cells showed weak reaction for ALP activity. While the intensity of enzyme in the fibroblast increased slowly from 5 days in the wound gap, the enzyme showed a strong reaction only till 15 days and disappeared by the end of this period with the maturation of collagen fibre bundles. Whereas, the activity of enzyme in the dermis and subcutis remained strong only for a few days starting from 5 days and gradually disappeared to the end of the period whereas in the subcutis it remained moderate till the end of the period.

## III. **Muscles**

Following injury, no reaction for ALP could be observed in the muscle bundles lying in wound area during the entire process of their complete degeneration. At about 96h, a weak reaction for ALP could be observed in the differentiating muscle bundles developing at the level of normal muscle bundles, lying immediately below the dermis.

**Table II. The distribution of ALP activity in various subepidermal tissues during different stages of healing of skin wounds in *Heteropneustes fossilis* after acid stress**

| Time of infliction | Amorphous substances | Granulation tissue | RBC | WBC | Fibroblast | Dermis | Subcutis | Dedifferentiating muscle bundle | Differentiating muscle bundle |
|---|---|---|---|---|---|---|---|---|---|
| 30min | - | - | - | - | - | - | - | - | - |
| 1hr | - | - | - | ± | - | - | - | - | - |
| 2hr | - | - | - | ± | - | - | - | - | - |
| 4hr | - | - | - | ± | - | - | - | - | - |
| 8hr | - | - | - | ± | - | - | - | - | - |
| 12hr | - | - | - | ± | - | - | - | - | - |
| 18hr | - | - | - | ± | - | - | - | - | - |
| 24hr | - | - | ± | ± | - | - | - | - | - |
| 48hr | - | - | ± | ± | - | - | - | - | - |
| 60hr | - | - | + | ++ | - | - | - | - | - |
| 72hr | - | - | + | + | - | - | - | - | - |
| 84hr | - | - | + | + | - | - | - | - | - |
| 96hr | - | - | + | + | ± | - | - | - | ± |
| 5days | - | + | + | + | ++ | + | - | - | ± |
| 10days | - | + | ± | ± | +++ | ++ | ± | - | ± |
| 15days | - | + | - | ± | +++ | ++ | + | - | ± |

| 20days | - | - | - | - | - | + | + | - | ± |
|---|---|---|---|---|---|---|---|---|---|
| 25days | - | - | - | - | - | - | + | - | ± |
| 30days | - | - | - | - | - | - | + | - | ± |

*ABBREVIATION USED: '-'–negative reaction, '±' – weak reaction, '+' – moderate reaction, '++' – strong reaction, '+++' – very strong reaction.

## IV.    CONCLUSION

The most immediate enzymatic change noted just after the wound in the skin of Asian stinging catfish *Heteropneustes fossilis* after acid stress was a significant decrease in ALP activity. These may be correlated with the significant increase in the activity of ALP in various cellular components of the migrating epithelium just after infliction of wound in the skin of Asian stinging catfish *Heteropneustes fossilis* (Rai & Mittal 1983, 1991).The low level of ALP indicated that the anabolic events in those cells are probably taking place at a very slow rate and these may be the reason for delay in epithelialization period after acid stress which completes within 18h instead of 4h in normal process of cutaneous wound repair (Mittal *et. al*., 1977). The involvement of ALP in active transport (Denielli, 1972), glycogen metabolism (Gupta & Rao, 1974), protein synthesis (Pilo *et. al*., 1972), synthesis of some enzymes (Sumner, 1965) and secretory activity (Ibrahim *et. al*., 1974) were reported. Thus, any alteration in the activity of ALP affects the process of epithelialization.

Rai & Mittal (1983) while studying the ALP activity during cutaneous woud healing of normal skin of Asian stinging catfish *Heteropneustes fossilis* reported that after epithelialization there was a gradual loss on ALP activity in the epidermal cells upto 24h was observed and they suggested that the anabolic events in these cells are probably taking place at a very slow rate. The present investigation revealed that after acid stress the activity of ALP in basal cells, epithelial cells of the middle layer and outer layer and club cells gradually increased. This is attributed to the anabolic events in these cells which are probably taking place at a very high rate. In normal skin wound healing of Asian stinging catfish *Heteropneustes fossilis* a fairly high ALP activity in the basal cells between 2 to 6 days was observed by Rai & Mittal (1983) which showed that this enzyme plays a significant role in cellular division and differentiation. The role of ALP in cell division has also been emphasized by Mori *et. al*., (1960) and Mittal & Banerjee (1975 a). Whereas in the present experiment after acid stress high ALP activity in the basal cells was observed between 5 and 15 days. It indicates that the wound healing process is taking place at slow rate as cell division and differentiation is delayed compared to the normal process of wound repair. In normal skin of Asian stinging catfish *Heteropneustes fossilis* strong ALP activity has been observed in the middle layers of epithelial cells which has been correlated with

the synthesis of mucopolysaccharides (Rai & Mittal, 1983). This enzyme is believed to be involved in the synthesis of mucopolysaccharides (Kroon, 1952; Banerjee *et.al*., 1976). Howerver, in the present observation after acid water treatment, high ALP activity was found in the epithelial cells of the middle layer and outer layer and in the club cells. It is also found that after epithelialization mucopolysaccharides synthesized more during wound repair in the epidermis. This is attributed with the high activity of ALP in the synthesis of mucopolysaccharides, required during wound repair after acid stress. Further, the mucopolysaccharides synthesized may be utilized in the formation of connective tissue. It is believed that ALP activity is associated with collagen fibre synthesis (Bradfield, 1951; Fell & Danielli, 1943) and has some function in phagocytosis and degradation of collagen (Ten Cate & Syrbu, 1974). In the present experiment the cut edges of dermis in the wounded region showed gradual increase in the ALP activity from 7th day rather than 5th day in normal repair. This is suggested that the activity of this enzyme have been involved in the synthesis and remodelling of the dermal connective tissue during repair which is occurring at a slow rate than normal cutaneous healing in this fish. The gradual disappearance of ALP with the maturation of the collagen fibre indicated that synthesis of collagen fibres have been ceased with the completion of dermal repair.

Rai & Mittal (1983) observed that the muscle bundles did not give a positive reaction for ALP under normal conditions, showed no significant activity throughout the degenerative and regenerative phases of the wound repair. The present investigation, however revealed that after acid stress, the dedifferentiating muscle bundles did not show any ALP activity whereas differentiating myoblast showed weak reaction for ALP. This may be attributed with the acute need of some metabolites during the regeneration of muscle bundles under acid stress condition. Vorbrodt (1959) has reported that ALP is an important enzyme of animal metabolism, which plays an important role in the transport of metabolites across the membranes, it also plays an important role in protein synthesis (Pilo *et. al*., 1972) and involved in the synthesis of certain enzymes (Sumner, 1965). During stress conditions, fishes need more energy to detoxify the toxicants to overcome stress. Since, fish have a very little amount of carbohydrates; the next alternative source of energy is protein to meet the increased energy demand. The depletion of protein fraction in liver and muscle tissues may have been due to their degradation and possible utilization of degraded product for metabolic purposes (Tiwari & Singh, 2003). This may be correlated with the present result that there is an increase in energy requirement by the differentiating myoblast cells under stress conditions, so these cells of the muscle bundle showed a weak reaction for ALP during the wound healing process after acid stress.In the present experiment, activity of the enzyme ALP involved in the wound repair process was delayed than the normal wound repair. The wound healing process was completed within 30 days after acid water treatment; the process was delayed than the normal repair process which is completed in 25 days (Rai & Mittal, 1983, 1991).

Therefore, present investigation revealed that due to acid stress the process of cutaneous wound repair is delayed and correspondingly

appearance and disappearance of enzyme ALP was also delayed.



Figure 1. Coupling Azo dye for ALP. A view of the wound gap showing very weak reaction for ALP in the migrating epithelium (arrows) (2h, after acid stress, 800X) WG wound gap



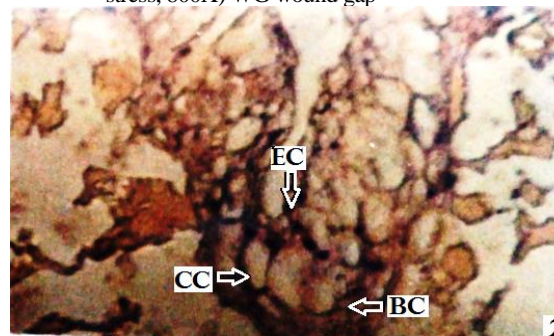Figure 2. Coupling Azo dye for ALP. After complete epithelialization of wound, strong ALP reactions in the basal cells, club cells and epithelial

cells (arrows) (18h, after acid stress, 800X). BC basal cells, CC club cells, EP epithelial cells
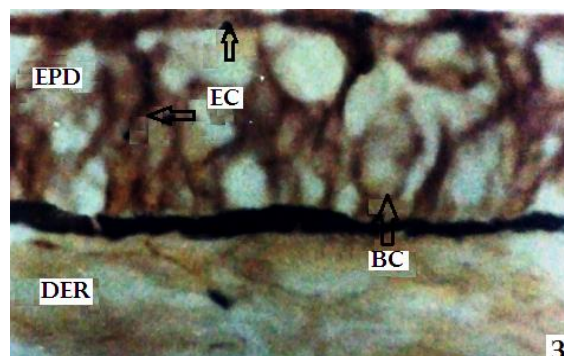


Figure 3. Coupling Azo dye showing more ALP activities in basal cells and epithelial cells (arrows) (60h, after acid stress, 800X). BC basal cells, EC epithelial cells.
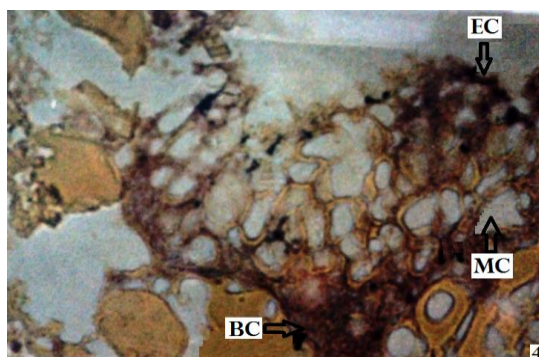
Figure 4. Coupling Azo dye showing ALP activities in the basement membrane, basal cells, club cells and epithelial cells (arrows) (5 days, after acid stress, 200X).BM basement membrane, BC basal cells, CC club cells, EC epithelial cells.

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# Corporate Governance and the Role of Internal Auditing

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## I. OBJECTIVE OF THIS RESEARCH

This paper aims to clarify the foundations of corporate governance and the role of internal audit about it as one of the key elements.

## II. RESEARCH PLAN

- be described in this paper to clarify the concept of internal audit, stating factors evolution and intellectual framework and functions terms of effectiveness and the role of the audit committee.
- as well as corporate governance, stating the concept and principles of relevance and responsibilities of the board of directors about it, as well as the terms of reference of internal audit-committees.
- The results and recommendations of the study.

## III. DEVELOPMENT OF INTERNAL AUDIT

Internal audit is one of the branches of the internal control, and enjoys the respect and confidence of both management of the enter pries and government agencies for their thorough examination and objective assessment of the activities.

## IV. THE FOLLOWING FACTORS HELPED TO DEVELOP

1 -The need for a means of detecting errors and fraud
Where you want the administration to make sure there are no errors or fraud in the operations and notebooks as you like in the case of and discovery early.

2- Emergence of enterprises with branches scattered geographically

Where summoned this send a representative mm in all policies the center to see that branches do their work in accordance with the policies set so accurately and the Secretariat of sufficient and was internal auditor time that the so-called internal auditor mobile, and was not his mission limited to the search for errors and fraud, but they include the following

A. Make sure that the foundations of sound settings with a proposal needed to be improved

B. Advising various branches

C. Ensure the safety of credit and collection operations end the movement of goods

D. Make sure there are no factors decrease profits
And so it became his duties to assure management that the policy applied in remote branches.

3- The need for regular payroll mathematically accurate and objective:

Where the expansion size of the facility appears a big gap between senior management and executive management was imperative for the administration to rely on the data, summaries and statistics in the management of the project and directed and featured here need management to internal auditor who has to see how a policy of senior management to know the staff implementing also achieved over health data and statistics provided to management.

D. Metwally Mohammed Jamal - Auditing - Faculty of Commerce -Cairo University 1964

4 - The emergence of banks and insurance companies:

This type of company has constant and continuous contact a third party which became requires not wait for the external auditor to verify the accuracy of calculations Here, there is a need to manage the internal audit review of operations first hand and on an ongoing basis.

The start of the rapid development of internal audit since *1940,* and was founded in the United States of America an independent institute to teach internal audit.

Internal audit and spread in large and medium-sized enterprises while in small projects there is no need for the existence of an internal a.udit management because the entrepreneur is usually familiar with all its different aspects in his administration.

## V. WHAT INTERNAL AUDIT AND NATURE

According to the definition of complex internal auditors issued in 1999, the internal audit is "Activity neutral objective consultant and reassuring aims to increase the value of the enterprise's operations and improve and help internal audit in achieving the goals established by style regular and disciplined to evaluate and improve the effectiveness of risk management procedures and controls and corporate governance."

It is clear from the definition that the internal audit services can be described as preventive services and construction management is preventive because it protects funds established and protects management plans against deviation and construction because they guarantee the accuracy of the data used by the Department in the policy guidance of the facility and they enter improvements to roads administrative and supervisory arrangements for pursuing the ongoing developments.

Internal audit is part of the internal control system as a whole it is not possible and a sound system of internal control without the presence of an internal audit system.

## VI.  INTELLECTUAL FRAMEWORK FOR INTERNAL AUDIT

Intellectual framework is intended that the integrated system of goals and policies to which they relate, which can lead to consistent standards and describes the integrated nature of the system and function and the limits of internal audit.

The importance of the existence of this conceptual framework to the need for standards governing the practice of internal auditing in order to be useful these standards and achieve their purpose must be built on a clear structure of objectives and principles.

The primary objective of internal audit to provide an assessment of the regulatory aspects of the organization which helps management in the performance of its functions, and considers the relative risk for the various activities is the main factor that affects the direction and the internal audit function.

It provides the relative independence of the internal audit for other jobs within the organization objectivity and impartiality.

D. Mohamed Samir SPI - internal control and audit - Faculty of Commerce - University of Damanhur 1996 And internal audit functions:

Can clarify the most important functions of internal .audit are as follows:

1 - evaluation of internal control systems and arithmetic, with the aim of

A. Ensure that the accounting system and internal control systems properly.

B. To ensure that these systems are best suited for the facility. C. Propose improvements to these systems first hand.

2- Assessment of plans and procedures:
Since the objective of this function is to detect weaknesses or deficiencies in the systems and procedures used by the company intended to propose amendments and improvements necessary not only examination to examine accounting systems or systems of internal control, but must give the internal auditor the authority to examine all aspects of the establishment activity.

3-  Into account the commitment of the staff of the policies and procedures set:

Since the internal auditor monitors the implementation of policies and procedures and to clarify these policies for employees in case of objection.

4-  Protect the funds established:

Since the development and implementation of systems for sound internal control to ensure the facility to protect assets and funds against what has committed staff of manipulation or fraud, and protect the funds established not only to detect fraud or followed but is also to avoid losses arising from neglect or abuse, such as loss of storage proper.

D.  Mohamed Mohamed Mr. Butcher - Auditing -. Faculty of Commerce in  Shams University, 1964

The protection also includes making the necessary insurance on assets of sufficient value to compensate for losses that may arise from incidents that are exposed and make dishonesty insurance to employees who trade assets in cash or cash equivalents.

5-  Achieve health accounting and statistical data:

Where different administrative levels based on the data and accounting and statistical reports made to it to take the necessary

decisions to facilitate the work of established and drawing future policies.

The internal auditor is to achieve and satisfy these data and suitability for the purposes for which will be used where it is directed Created by management in the direction and the right way.

## VII.  OTHER FUNCTIONS OF INTERNAL AUDIT

Internal audit department can serve established in:

1-  Detrain new employees or former employees transferred to jobs they do not learn where adequate training and that because of the internal audit department be fully aware of the systems and procedures for all the functions of the facility.

2 -  The presence management for internal audit and its:
The presence of management of internal auditing and its duties required of them in the examination and investigation calls itself to do all the staff established their duties with precision and care, and also calls for the prevention of opportunities to commit fraud or reduced to a minimum for fear the rest of the staff to detect any tampering them.

3 -  Internal Auditor helps outside observer which reassures observer to work safety and accuracy of the accounts established.

4-  The internal auditor surveys or special research required by the department such as analysis of the various expenses balances.

5 -  Contact customer periodically and ratification of their accounts and give their comments and checking accounts overdue and urged the Department to carry out their duties collection.

6-  Examination of procurement methods and the receipt of the goods and ensure the implementation of the orders.

7-  Examine ways of selling and sales and determine the policy and the cost of credit sales and tracking returns.

8-  Monitor and study the operations of industrial plants and analysis of costs and accounts linked to the financial accounts.

From the above it is clear that the internal audit department is working for the benefit of management and are helped right as the way reassure management that every person does the work assigned to him within the limits of its powers, the commands given to him as the internal audit also coordination between different departments, and by virtue of its contacts with all department of the project.

Functions and responsibilities of the internal audit department

The internal audit staff of independent management at the facility called "internal audit department" and in order to do its job, consider the following: -

1- To operate the internal audit department in complete independence from the rest of the departments in the sense that it should not be affiliated to any facility management and functional independence is one of the pillars of strength and the source of their adequacy.

And often the internal audit department reporting directly to senior management and a way to ensure the application of ihe recommendations of the internal audit department quickly which strengthens its position in the facility.

2- The Department of Internal Audit based on the explicit powers and all departments are aware of their rights and powers applied in the review of all operations, books and records.

3- Internal audit is part of internal control and should therefore not be confused with the internal control made after the completion of internal processes and the internal control restrictions are automatically at the time of the operation, or recorded in the books.

4- The internal audit is not of their duties monitoring managers or departmental policies not give any orders.

5- Does not interfere with the internal audit department directly in staff and should be the relationship between the staff of the Internal Audit Department and the rest of the staff based cooperation for the purpose of access to the common goal of raising facility would.

6- To internal audit department work entrusted with employees should be professionally qualified and trained in accounting, auditing and management

Audit Committee:

There is a growing trend in many companies towards the establishment of the so-called audit committee consists of the Audit Committee of the Board of Directors of part-time in order to oversee the internal audit function which increases the independence of the internal audit department and the more the relationship between the audit committee and the internal audit department, the more likely availability independence and objectivity in the examination and report.

And all are supported policies, standards and procedures for internal audit by the Audit Committee.

1- D. Mustafa Issa Khudair - Audit (concepts, standards and procedures) -College of Administrative Sciences - King Saud University

2- D. Ismail Ibrahim Juma - internal control and audit - Faculty of Commerce - Alexandria University 1996

The Audit Committee engaged in managerial accountability for the management of internal audit with senior management and the adoption and the hiring and firing of supervisors to manage the internal audit and the adoption of this administration work schedules as well as staffing and budget plans expenditures and review the performance of the internal auditors to participate in the senior management.

## VIII. THE CONCEPT OF CORPORATE GOVERNANCE

Corporate governance refers to the set of laws, rules and standards that define the relationship between the management of the company on the one hand owners and stakeholders on the other.

More specifically this concept offers the answers to several questions including: -

- How to ensure only harm investors use their money?
- How to make sure investors that the administration is seeking to maximize the profitability and value of the company's shares in the long term?
- How to enable investors to effective management control?

D. Samiha Fawzi - corporate governance and economic growth with the application on Egypt symposium Association of Accountants and Auditors on 04/07/2004 except accountant's role in governance

## IX. THE PRINCIPLES OF CORPORATE GOVERNANCE

Describes the Organization for Economic Cooperation and Development (Oecd 1999) corporate governance principles are as follows: -

**1-Equity:**

As a recording and transfer of stock ownership and effective participation and voting in the General Assembly and the selection board and get a return in profits and get all the information about the company and board members transactions on a regular basis and in a timely manner.

**2 - Equal treatment of shareholders :**

And dealing with the equality of all shareholders within each category in the former view, and rights as well as to protect them from any acquisitions or merge dubious or trafficking in inside information.

**3- The role of the parties with interests related to the company :**

They bondholders and workers, banks, suppliers, customers and include respect for their rights and to provide legal mechanisms for their participation in the control of the company's activities.

**4 - Disclosure and transparency:**

And include full disclosure of information related to the financial statements and the company's performance and ownership structure according to the accounting and auditing standards applicable international or domestic.

**5- Responsibilities of the Board of Directors:**

Include determining the structure of the Board of Directors and its core functions and supervisory role on the executive management and protection of the rights of shareholders and stakeholders of equal treatment to them and ensure the application of laws and rules.

The importance of corporate governance for the national economy:

Helps the proper application of the principles of corporate governance to achieve high growth rates and are fair and sustainable because it leads to

- Deepen the money market and savings mobilization and higher rates of investment.
- Increase the ability of companies to obtain financing and then the possibility of increasing job opportunities and employment within the Arab community.
- Encourage the growth of the private sector and support its competitiveness.
- Protect the rights of the minority.
- Increase confidence in the national economy.

Responsibilities of the Board of Directors regarding corporate governance

The board of directors any facility to achieve the principles of governance including the following:

- provide an effective control environment.
- The number of effective internal control system.
- Active participation of non-executive members.
- Formation of the audit committee of non-executive members.
- refrain from transactions which marred by conflict of interest. The Audit Committee shall including the following.
- inspect and review of internal control procedures and ensure .its effectiveness.
- Assessment of administrative procedures to ensure compliance with rules and laws.
- inspect and review of accounting policies used and the procedures to be followed in preparing the financial statements the estimated actual.
- Examination evaluation and follow-up work of the internal audit department.
- provide reports on their work and proposals and recommendations.

It is clear from the foregoing important and key role of internal audit in the field of corporate governance. Where it is an essential element in the work of the Audit Committee on the issue of board members is mainly responsible for the safety of the application of the principles of .corporate governance.

Therefore you must understand the principles of internal auditors basic governance and their role towards ensure compliance and that appropriate rehabilitation scientifically and practically.

## X.  RESULTS AND RECOMMENDATIONS

It is clear from the Displayed importance of internal audit (internal audit) as a key element of the work of the audit committee within the various facilities, which in turn formed the basis of the board members is full-time and it should.

### *The following:*

1- Definition members of the internal audit to the principles of corporate governance.

2- Insert review of the company's commitment to the principles of corporate governance within the internal audit programs.

3- Set artistic elements within the internal audit departments to ensure good functioning of the financially and technically.

4. Rehabilitation scientific and practical for members of internal audit departments including accommodate the foundations and principles of corporate governance policies and their intended developments.

5- The work of the various professional organizations to develop awareness of the importance of the principles of corporate governance and the importance of the role of internal audit on them.

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# GIANT ANTERIOR NECK LIPOMA WITH MEDIASTINAL EXTENSION: A RARE CASE REPORT

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*Abstract-* Lipomas are benign mesenchymal tumour. Thirteen percent of lipomas are seen in head and neck region[1]. Anterior neck lipoma is a rare one & anterior neck lipoma with mediastinal extension is extremely rare. We are reporting a case of 48 yr. old female who presented with a huge swelling in the anterior neck region simulating a goitre. It was one of the largest of its own kind. FNAC & sonography helps in making early diagnosis of lipoma apart from clinical examination. Enucleation of lipoma from neck as well as mediastinum was done & followed up for 1 year without any complication.

*Index Terms*- Anterior neck Lipoma, giant lipoma, mediastinum, mesenchymal tumour

## I. INTRODUCTION

Lipomas are the most common benign mesenchymal neoplasm of adulthood & are usually subcutaneous but may develop in other places, e.g. Intermuscular, Subfascial, Parosteal, Subserous, Submucous, Intra-articular, Subsynovial, Subendocardium, Subepicardiac, Myocardium, Subdural or Extradural. They are actually a cluster of fat cells which become overactive. This is the commonest tumor of subcutaneous tissue. They are skin colored lesions & are firm & somewhat lobulated on palpation. Common sites of lipoma are back, arms, shoulder, anterior chest wall, breasts, thighs, abdominal wall, legs, forehead & face[2]. In head & neck region, where only 13% of lipomas are seen, posterior cervical space is the commonest site[3]. Anterior neck lipoma is a rare location for lipoma[4] and anterior neck lipoma with mediastinal extension is very rare. Fine needle aspiration cytology (FNAC) & sonography helps in making early diagnosis which can be supported with computed tomography (CT) & confirmed with histopathology report. Surgical intervention is challenging because of proximity to the great vessels & vagus nerve and is reserved for patients coming for cosmesis (most common indication), pressure effects & to rule out malignancy. We report a case of 48 years old female patient who presented with a huge swelling in the anterior neck region extending into the anterior mediastinum mimicking goitre.

## II. CASE REPORT

48 years old, female presented in Otorhinolaryngology OPD in Silchar Medical College & Hospital, Silchar with a huge swelling in the anterior aspect of neck since 20 years, which gradually enlarged in size & complained of occasional history of dyspnoea. Pt. was not having dysphagia or any complain related to her voice.

After taking consent, physical examination was carried out. Though swelling appeared like goiter but found to be smooth, soft and compressible. Overlying skin was of normal colour, stretched, not adhered to tumor & dilated veins were present over the tumor. Swelling was mobile, nontender. The surface of the mass was smooth. Edges were definite above & slips under the palpating finger (slip sign) & fingers couldn't get below the lower margin.



Figure 1: Preoperative photo of pt. with giant lipoma in anterior aspect & left side of neck.

FNAC was done & report suggested benign lipomatous lesion. Ultrasonography of neck showed a large well circumscribed hypoechoic mass lesion noted in front & left side of neck. Thyroid was found to be normal. & left carotid was displaced posteriorly due to mass lesion. On colour Doppler study, no increase in vascularity was seen. All features were suggestive of lipomatous lesion.

Radiological imaging: X-ray soft tissue neck (AP & Lateral view) reports showed a large soft tissue swelling in anterior aspect & left side of neck with mild anterior compression over lower part of trachea. X-ray chest PA view report showed widening of upper mediastinum & trachea was noted to be in midline.

Figure 2: X-ray soft tissue neck (AP & Lateral view) : large soft tissue swelling in anterior aspect & left side of neck with mild anterior compression over lower part of trachea.
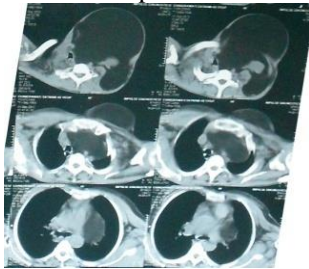


Figure 3: CECT: showing extension of lipoma into the mediastinum

On contrast enhanced computed tomography (CECT), a large homogeneous well defined fat density lesion of size 16×14.8×13 cm was noted involving the neck spaces on left side extending superiorly from the level of inferior aspect of parotid & inferiorly to the level of left hilum of mediastinum, anterolaterally the lesion was bounded by skin, posteriorly by pre & paravertebral muscles. Medially the lesion was crossing the midline, displacing the visceral space towards right side and in the mediastinum abutting the great vessels on left side. Left sternocleidomastoid muscle was compressed & thinned out. The lesion completely encased the internal jugular vein & encased part of IJV was showing dilatation. No intralesional soft tissue/ calcification/postcontrast enhancement was noted.

Thyroid profile of pt. was found to be normal.

Operative details : pt. was positioned in supine position under general anesthesia. After the surgical field was scrubbed sterile drapes were placed. A single transverse incision was made following the relaxed skin tension lines & was carried down through the skin & subcutaneous tissue to the level of the lipoma. Tumor mass was smooth, soft, yellow, mobile, shining and encapsulated. Encased part of IJV dissected out properly from tumor mass & preserved. Enucleation of the tumor mass from neck as well as mediastinal extension was done, followed by excision of the excess skin. Total weight of the tumor mass was 1200 gm. Wound was repaired in layers after proper hemostasis & a vacuum drain was put inside for 48 hrs.

Histopathology report suggested it to be a lipoma.
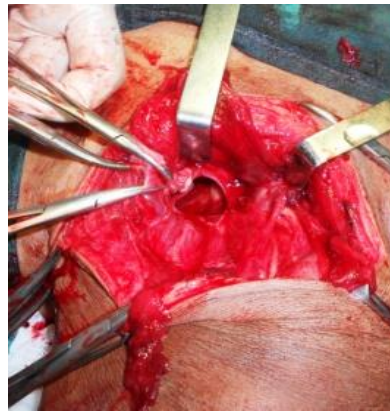


Figure 4: Intraoperative photo of pt. just after the enucleation of lipoma from neck & mediastinum



Figure 5: Lipoma after the enucleation



Figure 6: Lipoma after the enucleation

Pt. had a very good recovery without any complication & was followed for 1 year without recurrence.



Figure 7: Postoperative photo of pt. after 1 year of follow up.



Figure 8: Postoperative photo of pt. after 1 year of follow up.

## III. DISCUSSION

Now it is the time to articulate the research work with ideas gathered in Prevalence rate of lipoma is variable, 2.1:1000 to 1:100.[5,6] Lipoma is seen in all age group though mostly seen in fifth and sixth decade[7]. It constitutes five percent of all benign tumors of body and can be found anywhere in the body[8]. Lipoma in head and neck region is not commonly encountered (13%). The first case of lipoma in the neck was reported over 100 year's ago[9]. Amongst the head and neck lipomas, commonest location is posterior neck[3]. Anterior neck is a rare location for head and neck lipoma[4]. Lipoma of anterior neck with mediastinal extension is very rare.

Lipomas are slow growing, painless, mobile, non-fluctuant, soft masses & are generally well encapsulated. Lipomas can be singular or multiple & are typically asymptomatic unless they compress neurovascular structures. Beside frequent aesthetic consequences, lipomas can also exert pressure on surrounding tissues and structures. Patient with neck lipoma extending to mediastinum may present with complaint of dyspnoea as in our case.

Giant lipomas are defined by Sanchez et al as lesions with size of at least 10 cm in one dimension or weighing a minimum of 1,000 gm[10]. A large neck mass (>10 cm) with a rapid growth rate should raise concerns about a possible malignancy[10]. A long standing lipoma may undergo myxomatous degeneration, saponification, calcification, infection, ulceration due to repeated trauma & malignant change. Rarely malignant transformation of lipoma into liposarcoma has been described[13, 14]. Differentiation of lipoma from liposarcoma may be difficult.

Atypical lipomatous tumors are considered to be well-differentiated liposarcomas http://emedicine.medscape.com/article/987446-overview. When a fatty tumor is encountered in an intramuscular or retroperitoneal location liposarcomas should be considered in differential diagnosis, which has predilection for local recurrence but they don't metastasize generally. Although the diagnosis is mostly clinical, imaging tools are useful to confirm the adipose nature of the lesion and to define its anatomic border, & exclude possible communication with the spinal canal.

Histologically lipomas are composed of mature adipose tissue, and several subtypes occur when other mesenchymal elements are present[11], for example fibrous tissue, nervous tissue or vascular tissue. According to WHO classification of soft tumours these can be classified into nine groups, including lipoma, lipomatosis, lipoblastoma, angiolipoma, myolipoma of soft tissues, chondroid lipoma, spindle cell lipoma, and finally hibernoma and pleomorphic lipoma[12]. Most common subtype is conventional lipoma which is well encapsulated mass of mature adipocytes & varies considerably in size. All subtypes are painless except angiolipoma. Hibernomas are benign, uncommon tumors presumably arising from brown fat that may occur in the back, hips, or neck in adults and infants & has a slightly greater tendency to bleed during excision and to recur if intralesional excision is performed.

The characteristic sonographic appearance of head and neck lipomas is that of an elliptical mass parallel to the skin surface that is mostly hyperechoic relative to adjacent muscle and that contains linear echogenic lines at right angles to the ultrasound beam[15, 16].

Computed tomography is modality of choice to confirm lipoma. Lipomas appear as homogenous low density areas with a CT value of -50 to -150 HU with no contrast enhancement[17]. A thin soft tissue capsule may be seen surrounding a subcutaneous lipoma. Within the lesion there should be homogeneous fat density with few, if any internal septa. On CT scans capsule of lipoma is barely visible or adjacent mass effect may be the only clue to its presence. Larger lesions may contain blood vessels. A significant soft tissue element or heterogeneity of attenuation within a fatty lesion raises the possibility of liposarcoma.

In MRI, Lipomas have well defined margins with a uniform signal intensity of fat on all sequences (best confirmed using fat-suppressed sequences). Some lipomas may also have internal septa, an appearance mimicking a well differentiated liposarcoma (termed atypical lipoma). The use of contrast enhanced fat suppressed $T_1$-weighted images can be helpful in separating between enhancing nodular tumour & non-enhancing linear septas. Margin of lipoma is clearly defined as "black rim", distinguishing them from surrounding fat[18]. Calcification is rare & forms centrally within an area of ischaemic necrosis but more commonly it's a feature of a liposarcoma.

Surgical excision of lipoma is the definitive treatment. Surgery is reserved for patients coming for cosmesis (most common indication) and pressure effects & to rule out malignancy. Smaller lipomas can be excised easily with low recurrence rate because they usually grow expansively between different fascial planes without infiltrating the neighbouring structures. Surgical intervention of giant lipoma of anterior neck with mediastinal extension is challenging because of proximity to the great vessels, vagus & spinal accessory nerves, lungs & heart. Preoperative consent regarding possible complications such as injury to neurovascular structures etc. must be taken. Lipomas may be lobulated, and it is essential that all lobules be removed. Complete surgical excision with the capsule is advocated to prevent local recurrence. Other modalities of treatment have been reported, like liposuction[19, 20,21,22,23] & steroid injections[24]. Liposuction is sometimes preferred as there is less scarring[22,23] following the procedure but there is higher chance of recurrence compared to excision if residual tumour or capsule, remains after the procedure. For smaller lipomas steroid injections may also be used, but several injections are required and the overlying skin may be depigmented. Surgery for giant lipoma in anterior neck with mediastinal extension should be done in a meticulous way.

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# Mass transfer kinetics and optimization during osmotic dehydration of beetroot (*Beta vulgaris L.*).

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*Abstract* - The present study was carried out to investigate the mass transfer kinetics and optimization during osmotic dehydration of beetroot. The samples were osmotically treated in different hypertonic sugar solution (55, 65 and 75 $^0$ Brix) with salt concentration of 5 % (w/v), at different solution temperature (30, 45 & 60 °C). Mass transfer kinetics was modeled according to Magee and Azuara model, and kinetic parameters were calculated. It was found that the magee's model was appropriate for predicting water loss (WL) and solute gain (SG), while Azuara's model fitted water loss as well as solute gain (SG) data represented more accurately the condition of the complete process close to equilibrium. Quadratic regression equations describing effects of process variables on water loss, solute gain and weight reduction were developed and optimization of osmotic dehydration was done using response surface methodology (RSM). The regression analysis revealed that linear terms of all process parameters have a significant effect on all the responses. The optimum conditions were found to be as sugar of 75 $^0$Brix with 5% salt, solution temperature of 47.70 $^0$ C and immersion time of 120 min at constant osmotic solution to sample ratio of 4:1. At these optimum values, water loss, solute gain and weight reduction were observed as 28.78, 4.42 and 24.36 (g/100 g of initial mass) respectively.

*Index Terms -* Beetroot, osmotic dehydration, mass transfer kinetics, modeling, and optimization

## I.  INTRODUCTION

Osmotic dehydration (OD), initially proposed by Ponting (1973), has been studied in recent decades, especially as a    pre-treatment for foods to be subjected to air drying, freezing, freeze-drying and other processes, in order to guarantee and improve the composition of food by partial water removal and impregnation without affecting its integrity.

The sensory qualities of the food products with solute depend on the expected water loss (WL) to solid gain (SG) ratio. The prediction and control of WL/SG ratio resulting from a solute or solute combination is a basic requirement for process design. Solutes sugars (especially for fruits) and salts (for vegetables, fish, meat and cheese) are mostly used for osmotic treatment. Mixtures of solutes have also been used for both plant and animal treatment to obtain higher WL/SG ratios and to reduce impregnation. Salt and sucrose concentrations show a synergetic effect on food osmotic treatments, which has led researches to investigate optimum process conditions (Qi et al., 1999; Sereno et al., 2001; Mayor et al., 2007).

In the present work, osmotic dehydration was applied to beetroot because they are commonly used products and easy to store and process. Further, it has been chosen because it is a good source of vitamin C, folate, soluble and insoluble dietary fiber and antioxidants that are necessary in human nutrition and it can also be used as alternative for treatment of fever and constipation, amongst other ailments. The beetroot (*Beta vulgaris L.*) is considered a good model for dehydration studies because of homogeneity and extensive shelf-life that this vegetable tissue has.

Considering the potential importance of OD process for industrial applications, simple predictive models which supply further information on the variables that control the dehydration process (Azuara et al., 1992) have been developed. According to this purpose, numerous empirical models have been presented which establish direct relations between process variables and water loss (WL), solute gain (SG), etc. Among these models are the ones that use direct correlation such as Azuara's model (Azuara et al., 1992) and Magee's model as suggested by Magee et al., (1983), or the ones that utilize polynomial fitting (Shi et al., 2008).

Response surface methodology (RSM) has the ability to find a unique equation that can predict the evolution of process variables in a specific range of work. This ability can be used combined with other techniques to find optimal operating conditions in the food industry. In response surface methodology (RSM), several factors are simultaneously varied. The multivariate approach reduces the number of experiments, improves statistical interpretation possibilities and evaluates the relative significance of several affecting factors even in the presence of complex interactions. There are several work has been carried out on mathematical modeling and optimization of vegetables. However, no information is available on the statistical modeling of beetroot drying by osmotic dehydration. Hence the objectives of this study were to evaluate the adequacy of different empirical models to predict the evolution of water loss (WL) and Solute gain (SG) during osmotic dehydration (OD) and obtain optimal processing conditions of beetroot during osmotic dehydration in combined aqueous solution of salt and sugar, maximizing water loss (WL) and weight reduction (WR) and minimizing solute gain (SG) through response surface methodology (RSM).

## II.        MATERIAL AND METHOD

*Sample preparation*

Beetroots were procured from local market in a period between December and January and then stored at 5 $^0$C prior to experiments. Beetroots were thoroughly washed with water to remove dirt and dust. The beetroots were peeled manually and cut into 10x 10x 3 mm slices. The average moisture content of the beetroot was found to be 79.17 % wb. Considering the greater effectiveness of a mixture of solutes over a single solute, a binary solution of salt with 5 % and sugar of 55−75 °Brix (w/v) was prepared with the proper amount of pure water considering the experimental design of Box and Behnken (1960). The experiments

were conducted at temperatures of osmotic solution varied in the range of 30–60 °C. No blanching was done prior to osmosis as it is detrimental to the osmotic dehydration process due to loss of semi-permeability of cell membranes (Ponting, 1973) and reduction of β-carotene (Negi and Roy, 2000).

*Osmotic dehydration*

For each experiment, 10 g of beetroots were put into glass beakers of 250ml containing calculated volumes of osmotic solutions for different concentrations and thereafter placed inside a temperature and agitation controlled incubator. To prevent evaporation from the osmotic solution, glass beakers were covered with a plastic wrap during the experiments. For each experiment, the ratio of osmotic solution to beetroot sample was kept as 4:1 in order not to dilute the osmotic solution by water removal during the runs, which can lead to local reduction of the osmotic driving force during the process. During experimentation, it was assumed that the amount of solid leaching out of carrots during osmosis was negligible (Biswal and Bozorgmehr, 1992; Lazarides et al., 1995). At specified duration, the beetroot slices were removed from the osmotic solutions and rinsed with water to remove surplus solution adhering to the surfaces. These osmotically dehydrated slices were then spread onto absorbent paper to remove free water present on the surface. Beetroot sample of 3-5 g was used for determination of dry matter using oven-drying. All the experiments were replicated twice and the average value was taken for further calculations.

*Mass transfer parameters*

Mass exchange between the osmotic solution and beetroot sample during osmotic dehydration were evaluated using the parameters such as water loss (WL), solute gain (SG) and weight reduction (WR). In order to account for initial weight differences between the samples, water loss (WL), solid gain (SG) and weight reduction (WR) were calculated using the given equations:

$$WL = \frac{(M_t - M_0)}{M_0} \qquad (1)$$

$$SG = \frac{(m_t - m_0)}{M_0} \qquad (2)$$

$$WR = WL - SG \qquad (3)$$

where WL is water loss (g /100 g of initial mass), SG is solute gain (g /100 g of initial mass), WR is weight reduction (g /100 g of initial mass), $M_o$ is initial water mass (g), $M_t$ is the water mass at time t in the sample (g), $m_o$ is initial total solids (g), $m_t$ is total solids at time t in the sample (g), respectively.

*Kinetic models for osmotic dehydration*

Mass transfer kinetics during osmotic dehydration was modeled according to Magee's model and Azuara's model, which establishes a relation between kinetic variables such as water loss (WL) and solute gain(SG) with immersion time.

*Magee's model*

This model establishes that WL and SG vary linearly with the square root of time during osmotic dehydration (Magee et al, 1983):

$$WL_\tau \text{ or } SG_\tau = A + k\sqrt{t} \qquad (4)$$

Where, $WL_\tau$ is the water loss at time t, $SG_\tau$ is the solids gain at time t, A and k are model fitting parameters. Coefficients k represents the rate of water removal or solids intake, because of the osmotic-diffusive mechanism; meanwhile, A represents the contribution of the hydrodynamic mechanism, because of the action of capillary pressures at very short times, for mass transfer of water or solids.

*Azuara's model*

Azuara et al. (1992) modeled the rate of water loss (WL) and solute gain (SG) as function of time using a mass balance on water movement inside the food, obtaining equations with two fitting parameters. In the model formulation, the following relation for WL is established:

$$WL_\tau = \frac{S_1\, t \times WL_\infty}{1 + S_1\, t} \qquad (5)$$

Where WL∞ is the corresponding value at infinite time (i.e., at equilibrium) and $S_1$ is the constant related to the outward water diffusion rate in the food. Equation 5 can be expressed in linear form as:

$$\frac{t}{WL_\tau} = \frac{t}{WL_\infty} + \frac{1}{S_1\, t} \qquad (6)$$

The water loss at equilibrium (WL∞) and the constant $S_1$ were estimated from the slope and intercept of the plot (t / $WL_T$) vs. t using the eqn 6. Thus, the equations for SG can be written as:

$$SG_\tau = \frac{S_0\, t \times SG_\infty}{1 + S_0\, t} \qquad (7)$$

$$\frac{t}{SG_\tau} = \frac{t}{SG_\infty} + \frac{1}{S_0\, t} \qquad (8)$$

Where, SG∞ is the corresponding value at infinite time (i.e. at equilibrium) and $S_0$ is the constant related to the incoming solute diffusion rate in the food. Similarly to WL∞ and $S_1$, SG∞ and $S_0$ parameters are obtained from the straight line (t/$SG_T$) vs. t using equation 8.

The Magee's and Azuara's models adequacy for the best fitting of experimental data was evaluated by obtaining the coefficient of determination $R^2$ and least RMSEand percent mean relative deviation of modulus (P) using following equations:

$$RMSE = \sqrt{\left[\frac{\sum_{i=1}^{N}(Experimental\ value - Predicted\ value)^2}{N}\right]} \qquad (9)$$

$$P\ (\%) = \frac{100}{N} \sum_{i=1}^{N} \left| \frac{Experimental\ value\ - Predicted\ value}{Experimental\ value} \right| \qquad (10)$$

The nonlinear regression and statistical analysis was performed by using SPSS version 16.0 software.

*Process optimization and statistical analysis*

*Polynomial regression*

With the aim to predict the evolution of osmotic dehydration and investigate the effect of each process variable (immersion time, solution concentration, and solution temperature) at three levels each in the mass transfer kinetics, a second order polynomial model was developed for water loss (WL), solute gain (SG) and weight reduction(WR) using multiple linear regressions. The model proposed for each kinetic variable is described as follows:

$$y_k = \beta_0 + \sum_{i=1}^{n} \beta_i x_i \sum_{i=1}^{n} \beta_{ii} x_i^2 \sum_{i-1}^{n-1} \sum_{j=i+1}^{n} \beta_{ij} x_i x_j \qquad (11)$$

Where, $y_k$ represents response variables ($y_1$ = water loss, $y_2$ = solute gain and $y_3$ = weight reduction) $x_i$ represents the coded independent variables and $\beta_{ko}$, $\beta_{ki}$, $\beta_{kii}$, $\beta_{kij}$ represent constant coefficients. Three dimensional surface plots were generated as a function of two factors while keeping other factor at optimum level with the same software.

*Statistical analysis*

The analysis of variance (ANOVA) of the polynomial models was carried out using Design Expert 8.0.7.1 software and the adequacy of the model was tested using Fischer test & P value, coefficient of correlation ($R^2$) and lack of fit test. The models were considered adequate when the calculated Prob> F was less than 0.05, $R^2$>0.90 and lack of fit test ($L_oF$) was insignificant.

<div align="center">III.          RESULT AND DISCUSSION</div>

The effect of all process variables including solution concentration (salt and sugar), solution temperature and immersion time on mass transfer kinetics namely water loss, solute gain and weight reduction was investigated and response surface plots were plotted as shown in Fig 1. The detailed description of effect of process variables on mass transfer kinetics and its modeling has been discussed as below:

*Effect of Process variables on on mass transfer kinetics*

*Effect of immersion time*

From Figure 1 and 2 representing effect of immersion time on water loss (WL), solute gain (SG) and weight reduction (WR), it was observed that all the mass transfer parameters increased rapidly with increase in immersion time in comparison to later stage of osmotic dehydration. This might be due to facts that with passage of immersion time the osmotic driving force for water diffusion from sample to solution and solute transfer from solution to sample decreased. Further in salt-sugar mixed osmotic solution, sugar molecules due to high molecular weight accumulated in thin sub surface layer resulting in extra barrier to mass transfer, whereas salt molecules due to smaller size easily diffused inside the cell membrane and generated concentration gradient as a driving force for mass transport during osmotic dehydration. Besides, salt concentration also inhibited the formation of compacted surface layer of sugar and allowed higher transfer rate of water as well as solute. Similar results have been reported by Sereno et al., (2001) and Jokic et al., (2007). Conway et al., (1983) has reported that mass transport data were not significantly changed in the period between 4 h to 20 h. Therefore it is suggested that osmotic dehydration should be done not more than four hours.

*Effect of solution concentration (salt and sugar mixture)*

The effect of solution concentration on mass transfer (water loss, solute gain and weight reduction) has been presented in Figure 1. The figures showed that increase in solution concentration resulted gradual increase in rate of both water loss and solute gain, consequently the weight reduction. This was expected due to accumulation of solute with higher molecular weight possing an additional resistance to diffusion of water and solute. However, presence of salt prevented the formation of crust barrier and led to higher rate of water removal and solute uptake, probably due to an increase in osmotic pressure gradient and consequent increase in porosity and shrinkage of tissues that allowed higher rate of water removal and weight reduction than solute uptake.

*Effect of solution temperature*

The temperature of osmotic solution also play great role in kinetics of mass transfer during osmotic dehydration. The effect of changing solution temperature on water loss, solute gain and weight reduction has been shown in Figure 2. It was observed that the all the response variables i.e water loss, solute gain and weight reduction increased with increase in solution temperature. This might be due to swelling and plasticizing of cell membrane that promote faster diffusion of water from sample to solution and in the same time higher temperature reduced the solution viscosity of the osmotic medium and resulted in better water transfer characteristics at the product surface. On the other hand, solute transfer within product was found to increase with increase in solution temperature but at slower rate in comparison to water loss. This might be probably due to high molecular weight of solute and concentration of osmotic medium. Although increase in solution temperature promotes higher water removal from sample, but temperature above 60 °C modify the tissue structure and results impregnation phenomenon. Further higher temperature also results enzymatic browning and flavor deterioration as reported by Lenart and Flink (1984). Therefore, best processing temperature should be decided on the basis of foodtissue structure.

*Modeling of mass transfer kinetics*

The kinetic models (Magee and Azuara) were used to fit mass transfer parameter data over processing time as function of different concentrations of hypertonic solution and temperatures. The values of model parameters, together with the determination coefficient, RMSE and percent mean relative deviation of modulus (P) are reported in Table 1. As there was not any fixed trend in

the values of $R^2$, RMSE and P % values among different experiments, so average value of 9 experiments were determined to check the adequacy of fitted models.

The constant A representing the hydrodynamic mechanism for the action of capillary pressures at very short times for mass transfer of water showed a significant increase with increase in concentration as well as temperature of the osmotic solution, whereas for solute gain, A did not showed any clear trend with solution concentration as well as solution temperature. On the other hand, parameter k representing the rate of solute uptake, showed increasing trend with increase in solution concentration as well as temperature, if processed with high concentration (above 65 °Brix) at solution temperature over 45 °C. This investigation was in agreement with obtained result that solute uptake increased with increase in solution concentration and temperature. However, parameter k of Magee model for rate of water removal represented abrupt variation which was not in agreement with results obtained in present study that water loss increased with increase in the concentration and temperature of the osmotic solution. This implied that Magee model was not effective in describing the mass transfer characteristics (rate of water removal).On the other hand, the constant $S_1$ of Azuara model, which represents the water removal rate showed that rate of water diffusion increased with increase in concentration only if processed at higher temperature i.e over 45 °C. However, for solute uptake parameter $S_0$ decreased with increase in solution concentration as well increase temperature. Nevertheless, Azuara model was effective to identify the equilibrium conditions as much for water loss(WL) as for solute gain (SG) by obtaining the parameters WL∞and SG∞ respectively, presenting equilibrium values for the obtained WL and SG in salt+sugar solutions (Table 1) for beetroot. The obtained results, and average major values of coefficient of determination ($R^2$) and the minor average values of RMSE and P (%)) showed that Magee model has a very good fit to short times of processing with higher concentration and temperature, where the rate of mass transfer maximized whereas, Azuara model, adequately followed the evolution of the complete dehydration process tending to equilibrium, which occured at long times (not experimentally verified during the studied period of dehydration).

*Optimization*

Although from modeling with empirical equations a suitable monitoring of the different stages in osmotic dehydration process, an evaluation of the effect of different factors and a visualizing of certain optimal zones could be performed, this approach is not enough for the accurate identification of the optimal operation conditions. Therefore experimental data was fitted second order response surface model and three equations satisfactorily describing the relationship between process variables and response variables were obtained by analyzing the experimental data using RSM as shown below:

$$\text{Water loss(WL)} = 29.11 + 1.28\beta_1 + 1.15\beta_2 + 2.71\beta_3 - 0.53\beta_{12} - 0.42\beta_{13} + 0.22\beta_{23} - 0.02\beta_1^2 - 0.81\beta_2^2 + 0.65\beta_3^2$$

$$\text{Solute gain(SG)} = 5.23 + 0.23\beta_1 + 0.10\beta_2 + 1.06\beta_3 - 0.03\beta_{12} + 0.01\beta_{13} + 0.03\beta_{23} - 0.09\beta_1^2 + 0.07\beta_2^2 - 0.08\beta_3^2$$

$$\text{Weight Reduction(WR)} = 23.88 + 1.05\beta_1 + 1.05\beta_2 + 1.65\beta_3 - 0.50\beta_{12} - 0.43\beta_{13} + 0.19\beta_{23} - 0.11\beta_1^2 - 0.88\beta_2^2 + 0.73\beta_3^2$$

Where, 1, 2, and 3 represented coded values of the test variables solution concentration, solution temperature and immersion time respectively.

The results of multiple linear regression equation conducted for the second order response surface model were obtained and presented in Table 2. The significance of each coefficient was determined through the fischer F test and P values (Table 2). The larger the magnitude of the F value and the smaller the P value, the more significant is the corresponding coefficient (Morgan,1991). However, values of "Prob> F" less than 0.05 indicate model terms are significant. In present study, it was observed that linear effect of all variables namely solution concentration, solution temperature and immersion time had significant effect on water loss, solute gain and weight reduction as the P values were less than 5 %. However, among quadratic effects of process variables, immersion time had more effect on water loss and weight reduction and solution concentration had more effect on solute gain as F values were higher compared to other factors. The goodness of fit of model was verified by determination of regression coefficient ($R^2 > 0.9$). The coefficient of $R^2$was calculated to be 0.9403, 0.9736 and 0.8805 for water loss, solute gain and weight reduction respectively. Other authors obtained coefficients of regression of different products subjected to osmotic dehydration, e.g. green peppers (Ozdemir et al., 2008), carrots cubes (Singh et al., 2010) and cantaloupe (Corzo and Gomez, 2004) using the same predictive polynomial equation (eqn 11). In agreement with obtained results, positive and negative values in the linear, interaction and quadratic terms depending upon the best fitting of the experimental data were evaluated and presented in Table 2. It was observed that $\beta_1$, $\beta_2$,$\beta_3$, $\beta_{23}$ and $\beta_3^2$ have positive effect on water loss and weight reduction, whereas $\beta_{12}$, $\beta_{23}$, $\beta_1^2$ and $\beta_2^2$ had negative influence on both water loss and weight reduction. On the other hand, for solute uptake all the terms had positive effect except for $\beta_{12}$ and $\beta_3^2$.

Graphical multi-response optimization technique was adopted to determine the workable optimum conditions for the osmotic dehydration of beetroot. The contour plots (not shown) for all responses were superimposed and regions that best satisfy all the constraints were selected as optimum conditions. These constraints resulted in 'feasible zone' of the optimum conditions. The optimum range of process parameters for osmosed beetroot was: 55-65 $^0$B of sugar concentration with constant salt concentration of 5%, 30-60$^0$C of solution temperature and 120-240 minutes of immersion time in order to optimize the process parameters for osmotic dehydration of beetroot by numerical optimization; which finds a point that maximizes the desirability function. The

optimum operating conditions for solution concentration, solution temperature and immersion time was $75^0$Brix with 5 % salt, $47.70^0$C and 120 minutes. Corresponding to these values of process variables, the value of water loss was 28.78, solute gain 4.42 and weight reduction 24.36 g/100 g of initial mass. The overall desirability was 0.645.

Table I:   Model's parameters and goodness of fit for mass transfer during osmotic dehydration of beetroot

| | | | WATER LOSS | | | | | | | | |
| MODELS | | | MAGEE | | | | | AZUARA | | | |
| Temperature (°C) | conc. | A | k | $R^2$ | RMSE | P % | $S_1$ | $WL\infty$ | $R^2$ | RMSE | P % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 55 | -1.678 | 0.49 | 0.995 | 0.095 | 0.39 | 0.064 | 27.193 | 0.997 | 0.133 | 3.84 |
| | 65 | -1.692 | 0.512 | 0.996 | 0.332 | 1.27 | 0.042 | 32.555 | 0.993 | 0.182 | 5.65 |
| | 75 | -1.413 | 0.508 | 0.993 | 0.386 | 1.33 | 0.042 | 33.133 | 0.993 | 0.187 | 5.58 |
| 45 | 55 | -1.66 | 0.495 | 0.996 | 0.769 | 2.68 | 0.030 | 34.396 | 0.981 | 0.289 | 8.43 |
| | 65 | -0.746 | 0.446 | 0.962 | 0.817 | 2.92 | 0.035 | 34.794 | 0.985 | 0.256 | 8.21 |
| | 75 | -0.582 | 0.454 | 0.968 | 0.312 | 1.05 | 0.041 | 35.393 | 0.993 | 0.172 | 5.74 |
| 60 | 55 | -1.583 | 0.498 | 0.995 | 0.403 | 1.04 | 0.035 | 34.372 | 0.989 | 0.221 | 6.07 |
| | 65 | -0.695 | 0.449 | 0.97 | 0.739 | 2.55 | 0.036 | 34.730 | 0.987 | 0.235 | 7.71 |
| | 75 | -0.542 | 0.454 | 0.972 | 0.401 | 1.32 | 0.043 | 35.120 | 0.995 | 0.147 | 5.22 |
| Average | | | | 0.983 | 0.473 | 1.617 | | | 0.990 | 0.202 | 6.272 |
| | | | SOLUTE GAIN | | | | | | | | |
| Temperature (°C) | conc. | A | k | $R^2$ | RMSE | P % | $S_O$ | $SG\infty$ | $R^2$ | RMSE | P % |
| 30 | 55 | 0.563 | 17.209 | 0.997 | 0.111 | 2.69 | 17.317 | 0.002 | 0.907 | 1.317 | 3.34 |
| | 65 | 0.878 | 16.480 | 0.987 | 0.104 | 2.52 | 17.172 | 0.002 | 0.916 | 1.258 | 3.52 |
| | 75 | 0.884 | 16.930 | 0.983 | 0.141 | 3.62 | 13.799 | 0.004 | 0.976 | 0.818 | 2.71 |
| 45 | 55 | 1.071 | 14.004 | 0.956 | 0.108 | 2.69 | 17.088 | 0.002 | 0.896 | 1.427 | 3.85 |
| | 65 | 0.964 | 16.481 | 0.940 | 0.295 | 9.00 | 10.433 | 0.006 | 0.822 | 3.183 | 12.21 |
| | 75 | 0.968 | 17.649 | 0.991 | 0.276 | 7.68 | 10.346 | 0.007 | 0.867 | 2.698 | 11.41 |
| 60 | 55 | 1.044 | 15.186 | 0.987 | 0.115 | 2.73 | 15.194 | 0.003 | 0.970 | 0.829 | 2.48 |
| | 65 | 0.969 | 16.730 | 0.951 | 0.267 | 7.94 | 10.346 | 0.006 | 0.857 | 2.821 | 11.17 |
| | 75 | 0.962 | 18.045 | 0.985 | 0.259 | 7.09 | 10.262 | 0.007 | 0.886 | 2.501 | 10.88 |
| Average | | | | 0.975 | 0.186 | 5.107 | | | 0.900 | 1.872 | 6.841 |

Table 2:  Second order polynomial models for response variables during osmotic dehydration of  beetroot

| Source | | WL | | | SG | | | WR | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | df | coefficients | F value | p-value | coefficients | F value | p-value | coefficients | F value | p-value |
| $\beta_0$ | 9 | 29.11* | 12.26 | 0.0016 | 5.23* | 28.71 | 0.0001 | 23.88* | 5.73 | 0.0157 |
| $\beta_1$ | 1 | 1.28* | 16.29 | 0.0050 | 0.23* | 11.69 | 0.0111 | 1.05* | 9.74 | 0.0168 |
| $\beta_2$ | 1 | 1.15* | 13.10 | 0.0085 | 0.10 | 2.25 | 0.1775 | 1.05* | 9.72 | 0.0169 |
| $\beta_3$ | 1 | 2.71* | 73.03 | < 0.0001 | 1.06* | 242.12 | < 0.0001 | 1.65* | 24.13 | 0.0017 |
| $\beta_{12}$ | 1 | -0.53 | 1.38 | 0.2784 | -0.03 | 0.08 | 0.7843 | -0.50 | 1.11 | 0.3271 |
| $\beta_{13}$ | 1 | -0.42 | 0.88 | 0.3806 | 0.01 | 0.01 | 0.9205 | -0.43 | 0.82 | 0.3951 |
| $\beta_{23}$ | 1 | 0.22 | 0.24 | 0.6390 | 0.03 | 0.08 | 0.7843 | 0.19 | 0.16 | 0.6972 |
| $\beta_1{}^2$ | 1 | -0.02 | 0.00 | 0.9670 | 0.09 | 0.96 | 0.3590 | -0.11 | 0.06 | 0.8168 |
| $\beta_2{}^2$ | 1 | -0.81 | 3.42 | 0.1070 | 0.07 | 0.55 | 0.4818 | -0.88 | 3.61 | 0.0993 |
| $\beta_3{}^2$ | 1 | 0.65 | 2.23 | 0.1788 | -0.08 | 0.68 | 0.4379 | 0.73 | 2.50 | 0.1580 |
| Lack of fit | 3 | | 0.79 | 0.5608 | | 0.10 | 0.9570 | | 0.54 | 0.6818 |
| $R^2$ | | 0.901 | | | 0.9736 | | | 0.8805 | | |

 Note: * Significant at 5 % level, 1= solution concentration, 2= solution temperature and 3= immersion time

## IV.     CONCLUSION

The concentration and temperature of the osmotic solution increased the transfer rate in all studied experiments, while the immersion time had just a more significant effect on mass transfer parameters. Magee model proved to be adequate for the prediction of mass transfer kinetics. The prediction of the evolution of the complete process to equilibrium, of the osmotic dehydration of beetroot, was adequately achieved through Azuara model. Response surface methodology was effective to determine the optimal processing conditions to maximize the water loss and weight reduction, and minimize the solute gain during the osmotic dehydration of beetroot. The analysis of variance showed significance from all second-order polynomial models developed for the three responses. The optimum operating conditions for solution concentration (sugar and salt), solution temperature and immersion time was $75^0$Brix, $47.7^0$C and 120 minutes with constant salt concentration of 5% and solution to sample ratio of 4:1 for beetroot of 3mm thickness. Corresponding to these values of process variables, the value of water loss was 28.78, solute gain 4.42 and weight reduction 24.36 g/100g of initial mass.

## AKNOWLEDGMENT

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(a)                                                 (b)
                          (c)                  (a)                                                 (b)
                                                                (c)
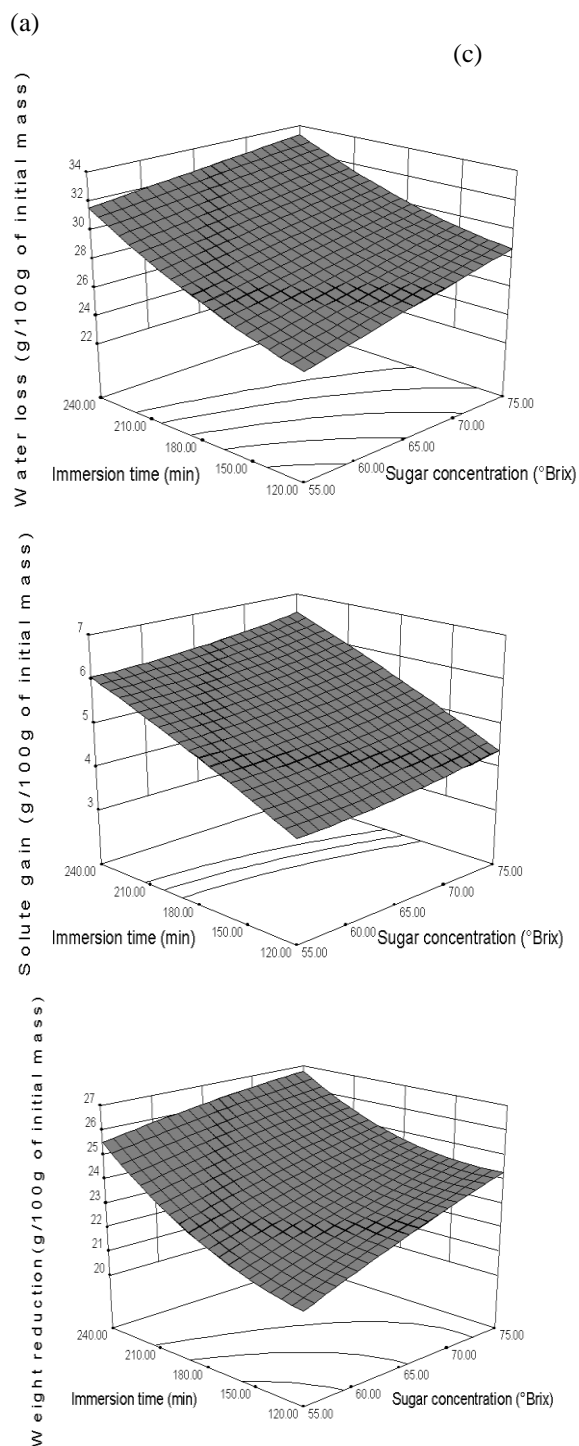


Figure 1:  Combine effect of immersion time and
sugar concentration with salt of 5% on (a) water loss,
(b) solute gain and (c) weight reduction during
              osmotic dehydration
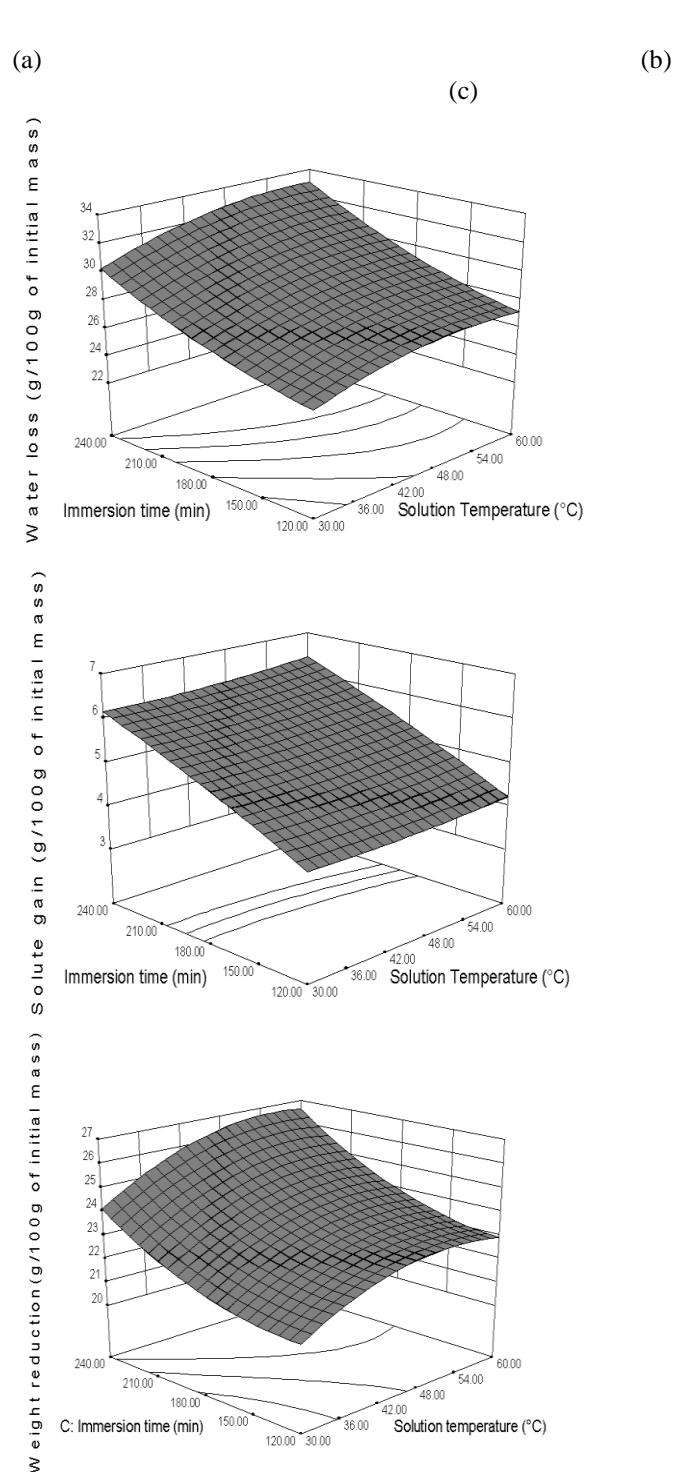
Figure 2:  Combine effect of immersion and solution
              temperature on (a) water loss, (b) solute
              gain and (c) weight reduction during
              osmotic          dehydration.

# Effect of foliar fertilization of boron, zinc and iron on fruit growth and yield of low-chill peach cv. Sharbati

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**Abstract:** This field experiment was carried out at Horticultural Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar (U.K.), India, during two consecutive years 2010 and 2011 on 7 years old peach trees cv. Sharbati. The experiment was designed in RBD to study the effect of foliar spraying of boron, zinc and iron and its combination on fruit growth pattern and yield attributing characters of the low-chill peach. Boric acid (0.1%), zinc sulphate (0.5%) and ferrous sulphate (0.5%) were used as a source of boron, zinc and iron, respectively. All the trees fertilized with recommended dose of NPK (300:500:300 as N, $P_2O_5$ and $K_2O$). The spraying was done twice; during last week of February at after petal fall stage and again at 15 days after the first spraying during both years in three replication. Result proved that foliar spraying of peach trees with 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$ was the promising treatment for improvement of fruit growth, fruit length, fruit diameter, fruit volume, firmness and fruit yield. This treatment was also found best for maximum fruit retention, average fruit weight as well as the fruit yield.

*Index Terms*: Micronutrient, fruit growth pattern, fruit yield, low-chill peach

## I. INTRODUCTION

Peach [*Prunus persica* (L.) Batsch] is one of the most important temperate stone fruit of the world. This fruit belong to the family rosaceae and sub family prunoidae. China is widely held to be the native land of peaches. Peach attain best quality in area where summer warm to hot. A distinct group of cultivar which require low chilling hours for bud brust and growth is known as low chill peach. The cultivation of low-chill peaches confined to subtropical area of north India including U.P. (Meerut, Saharanpur, Muzzafarnagar and Bulandsahar), U.K ( Udhamsingh nagar and Nanital), Punjab and Haryana (Pathak and Pathak, 2001). Presently, Sharbati, Saharanpur Prabhat, Florada prince, Pratap, Shan-e- Punjab and Early grand are popular cultivar in this area (Tiwari, 2004). Foliar fertilization of micronutrients has advantage of low application rates, uniform distribution of fertilizer materials and quick responses to applied nutrients (Umer *et al.,* 1999). Application of micro nutrients through foliage can be from 10 to 20 times as efficient as soil application (Zaman & Schumann, 2006).  Micro-nutrients such as iron, zinc and boron are essential for different biological functions that might be attributed to tree yield and fruit quality (Shoeib, 2003). It is also increased resistance to disease and insect pests and improved drought tolerance *(Tariq et al., 2007).* The essentiality of boron in plants is discovered by Gauch and Dugger (1953). Reduction in fruit set, fruit growth and yield in B deficient plant is reported in pear (Rease, 1989). Boron deficiency in peaches is characterized by a die-back of branches in spring (Woodbridge, 1955). Zn deficiency symptoms such as little leaf or rosette were described for peach (*Prunus percia*). Soil applications are not very effective because the roots of fruit crops occupy deep soil layers and zinc does not easily move in the soil therefore, foliar sprays are more effective (Chandler *et al.,* 1931).  Iron plays an important role in chlorophyll biosynthesis pathway. Thus deficiency of this element reduced the net photosynthesis which causes huge reduction in fruit yield (Chandler *et al.,* 1931). Many reports have been published on effect of micronutrient in case of high-chill peaches. However, there is limited work done on effect of micronutrient spray on subtropical low-chill cultivars. Peaches

have the ability to catch the market when there was no fruit availability in market. Therefore, it is necessary to evaluate the response of micronutrient application on subtropical peach under sub tropical condition.

## II.  MATERIALS AND METHODS

The study was conducted at Horticultural Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar (U.K.), India, during two consecutive years 2010 and 2011 on 7 years old peach trees cv. Sharbati. The plants having uniform vigour and size were selected for the study. The NPK (300:500:300 as N, $P_2O_5$ and $K_2O$) were supplied to the trees as per recommendation given by Tiwari *et al.* (2004). Three micronutrients i.e., boron as $H_3BO_3$, zinc as $ZnSO_4,7H_2O$ and iron as $FeSO_4,7H_2O$ were sprayed alone and in combinations during last week of February, every year i.e., after petal fall stage and again 15 days after the first spraying. The details of the treatment composition were as

$T_1$= 0.1 % $H_3BO_3$,

$T_2$= 0.5 % $ZnSO_4$, $7H_2O$,

$T_3$= 0.5 % $FeSO_4$, $7H_2O$,

$T_4$= 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$,

$T_5$= 0.1 % $H_3BO_3$ + 0.5% $FeSO_4$, $7H_2O$,

$T_6$= 0.5 % $ZnSO_4$, $7H_2O$ + 0.5% $FeSO_4$, $7H_2O$,

$T_7$= 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$,

$T_8$= Water spray (Control).

Treatments were replicated thrice in a randomized block design (RBD), each replicate consisted of two trees.  The observations were recorded on size of fruit (fruit length and diameter) at weekly intervals starting from 1$^{st}$ week of March and 1$^{st}$ week of June every year. The data on average fruit length, diameter, fruit volume, fruit firmness and fruit weight were taken from ten fruits per replication. The statistical analyses of pooled data of both the years were carried out as per the method prescribed by Panse and Sukhatme (1985).

## III.  RESULTS AND DISCUSSION

**Fruit growth pattern**

The fruit growth pattern of the peach cv. Sharbati on the basis of length and diameter is represented as Fig. 1. Initially, the length of the fruit was increased at an increasing rate upto 4$^{th}$ week of March during both the years. Then the rate of increase in fruit length was quite low upto 3$^{rd}$ week of April. Again the rate of increase in fruit length was recorded at increasing rate after the 3$^{rd}$ week of April to 1$^{st}$ week of June. The increase in diameter followed the same trend as in case of fruit length during both the years. The treatment 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$ recorded maximum increase in fruit length and diameter in every week intervals over control. These findings clearly established that the growth pattern of peach followed the double sigmoid growth curve. Double sigmoid growth of low-chill peach was also reported in low-chill peach cv. Shan-e-Punjab (Babu and Yadav, 2002).
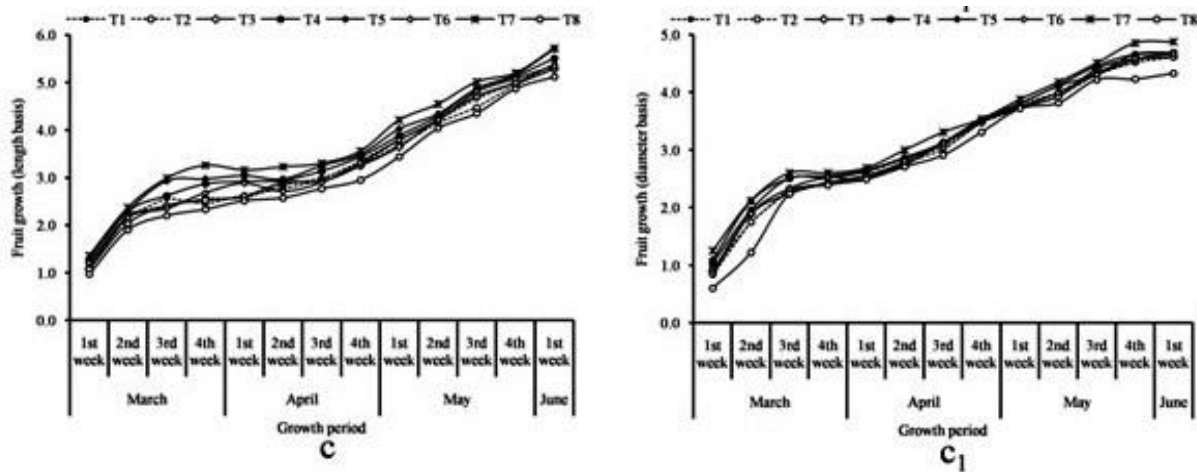
Figure1: Response of foliar fertilization of different micronutrients in growth pattern of low- chill peach cv. Sharbati [fruit length basis c  and diameter basis $c_1$

**Final Fruit length and fruit diameter**

A perusal of data in table:1 clearly indicate that size of fruit (on fruit length and diameter) was significantly influenced by the use of micronutrients spray. Pooled mean value indicated that application of 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$ produced maximum fruit length (5.59cm) and fruit diameter (5.08cm) during both years. All other treatments were also significantly increased fruit length and fruit diameter over control. Role of zinc and boron in increasing the fruit length and diameter is reported in mango cv. dashehari (Singh *et al.*, 1989). The increase in size of fruit as a result of foliar application of micronutrients in present investigation might be because it improved the internal physiology of developing fruit in terms of better supply of water, nutrients, and other compounds vital for their proper growth and development (Dutta and Banik, 2007).

**Fruit weight, volume and fruit firmness**

The maximum fruit weight (51.60g, Table 2), volume ( 44.57ml) and firmness (12.37lb/inch) recorded in the plants which were sprayed with 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$ (Table 1) and the minimum fruit weight and volume was observed in control plants. The increase in fruit weight and volume might be due to increase in cell size and intercellular space (Basker and Davis, 1951). Zinc has been identified as component of almost 60 enzymes and it has a role in synthesis of growth promoter hormone (auxin). Which is directly associated with improvement of Fresh weight of fruits (Shivanandam *et al.,* 2007). A favorable effect of foliar application of boron might be due to its role in cell division, cell elongation, sugar metabolism and accumulation of carbohydrates (Sourour, 2000). Rana and Sharma (1979) obtained increased berry volume with the application of 0.5% ferrous sulphate in grape. It might be increased chlorophyll content in leaf which is associated with high production of photosythate in plant.

**Table 1**: Response of foliar fertilization of micronutrients on final fruit length (cm), final fruit diameter (cm), fruit volume (ml) and fruit firmness (lb inch[-2]) of low-chill peach cv. Sharbati

| Treatments | Final fruit length (cm) | Final fruit diameter (cm) | Fruit volume (ml) | Fruit firmness (lb inch$^{-2}$) |
|---|---|---|---|---|
| $T_1$ | 5.38 | 4.61 | 41.68 | 10.97 |
| $T_2$ | 5.18 | 4.62 | 42.50 | 10.94 |
| $T_3$ | 5.30 | 4.62 | 41.74 | 10.96 |
| $T_4$ | 5.48 | 4.69 | 43.17 | 11.71 |
| $T_5$ | 5.57 | 4.68 | 43.83 | 11.99 |
| $T_6$ | 5.25 | 4.68 | 42.53 | 11.29 |
| $T_7$ | 5.59 | 5.08 | 44.57 | 12.37 |
| $T_8$ | 5.12 | 4.33 | 39.76 | 10.35 |
| CD at 5% | 0.09 | 0.02 | 0.20 | 0.52 |

**Fruit retention**

It is clear from the data presented in Table 2 that the percentage of fruit retention found maximum (74.14%) with treatments 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$. Boron plays important role in pollen germination and pollen tube growth which is associate with better pollination, fertilization and  fruit setting (Thompson and Batjer, 1950). Application of zinc could be promoted the auxin synthesis in the plant system which might delayed the formation of abscission layer during early stages of fruit development (Nason and McElroy, 1963). The increase in the fruit retention by application of micronutrient has also been reported in fruits like almond (Sotomayor and Castro, 1997) and aonla (Shukla, 2011).

**Number of fruits per tree and yield**

Number of fruits per tree and fruit yield during both the year was significantly affected by foliar treatments (Table 2). The maximum number of fruits per tree (492) and fruit yield per tree (25.39kg) were recorded by application of 0.1 % $H_3BO_3$ + 0.5 % $ZnSO_4$, $7H_2O$ + 0.5 % $FeSO_4$, $7H_2O$ and the minimum found in control. The combination of all the applied micronutrients significantly increase the number of fruits per tree and yield of the plants might be due to the beneficial roles of boron in pollination (Lee and Kim, 1991), zinc in growth promoting substances (Shivanandam *et al.,* 2007)  and iron in electron transport chain (Meshcheryakov and Alekhina (1971)). Chaturvedi *et al.* (2005) also suggested application of 0.2 per cent ferrous sulphate and 0.4 per cent zinc sulphate for increasing the fruit yield in strawberry.

**Table 2**: Response of foliar fertilization of micronutrients on fruit retention (%), average fruit weight (g), number of fruits/tree and fruit yield (kg/tree) of low-chill peach cv. Sharbati

| Treatments | Fruit retention (%) | Average fruit weight (g) | Number of fruit/ tree | Fruit yield   (kg /tree) |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| T$_1$ | 57.19 | 45.19 | 396.98 | 17.93 |
| T$_2$ | 57.32 | 45.45 | 414.42 | 18.83 |
| T$_3$ | 60.03 | 47.25 | 412.25 | 19.49 |
| T$_4$ | 65.96 | 48.89 | 477.53 | 23.54 |
| T$_5$ | 71.80 | 49.59 | 485.45 | 24.07 |
| T$_6$ | 50.84 | 45.02 | 468.02 | 21.07 |
| T$_7$ | 74.14 | 51.60 | 492.00 | 25.39 |
| T$_8$ | 42.02 | 43.49 | 385.08 | 16.74 |
| CD at 5% | 5.33 | 0.42 | 6.84 | 0.07 |

## IV. Conclusion

On the basis of results summarized above, it can be concluded that there were a significant variation in growth of fruit and yield of the low-chill peach plants with different micronutrient treatments. Thus, from this study it may be concluded that NPK + 0.1 % H$_3$BO$_3$ + 0.5 % ZnSO$_4$, 7H$_2$O + 0.5 % FeSO$_4$, 7H$_2$O could be considered as a best treatment in low-chill peach cv. Sharbati to improve the yield and quality of the fruits.

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# Facing the Phenomenon of Electricity Interruption at Homes

## (Designing Equipment and Implements working by Charging)

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*Abstract-* The researcher tackles the phenomenon of electricity interruption that is considered one of the most modern phenomena in the summer during the high temperature From this respect, the researcher is interested in cooling air via designing the systems that can be charged by electricity and once the electricity is interrupted, it works for cooling air during the interruption and the most important problems is high temperature

*Index Terms-* Air Cooler, Hydro cooling, Fresh Air Cooling, A portable forced-Air Cooler ,Rechargeable Air Cooer

## I. INTRODUCTION

The Egyptian citizen is annoyed in his life as he is threatened by losing the most important daily service for which he is in a dire need that is facing the crises of the electricity interruption. In addition, it is expected that this crises will increase during summer - when the consumption is increased - for hours during the rush hours.

The Phenomenon of Electricity Interruption is one of the modern phenomenon in the Egyptian society which does not witness since many years. The reasons behind this interruption trace back to the lack of the ability of the stations especially during summer as result of high temperature as well as the over-consumption of the citizens and using the over-consuming systems such as Air-Conditioning and so on.

Moreover, this phenomenon is the result of the problem of lack of energy in general whether Gasoline or Gas or Solar, so we see now the queues of vehicles waiting for fuel's supplying. The problem of Gasoline or solar for vehicles can be beard but the lack of the fuels for Electricity Generation Stations affects the Egyptian Houses as the electricity runs the daily activities of the human being as it supports him with water and cold water as well as cold air in summer during the higher temperature as well as it provided people with the lightness that is necessary for continuing the daily activity and many other requirements. But some can bear the electricity interruption for one hour or more during the high temperature whereas the other does not bear such as the old people or the patients at homes or hospitals who have no ability to bear this problem for long time.

In this respect, the researcher finds that the industrial designer has a vital room in facing this phenomenon as the equipment and implements designing are highly connected to electricity especially the house systems that are used vitally and

can not be discarded as result of the environmental conditions and the high temperature. Thus, the researcher is interested in solving the problem of Air Cooling via designing the systems that can be recharged by electricity and once the electricity is interrupted, it works for air cooling during the electricity interruption .therefore the research is focusing the follow:

1)The problem of the research is represented in Electricity interruption at homes for long time especially during summer as result of the high temperature and the over-consumption of electricity by using the Air-conditioning, so this causes high pressure and overload on the main network of electricity. Consequently, the population faces two problems at homes, first: The loss of lightness and second: The high Temperature.

2) The Objective of this research aims at facing the problems resulting from the electricity interruption especially during summer by designing the equipment and implements that have the ability to solve the problem of high temperature (designing Air Cooler working by electric charger).

3) The Significance of the Research:

   a. The equipment and implements that are working by Charging help peoples to bear the problem of high temperature.
   b. They help also the patients at houses and hospitals to face the crises.
   c. This research opens the door for designers to create other equipment or implements work with electric charge. So the imports of similar air coolers will decrease in case of mass production.

4) The research follows up the descriptive methodology to illustrate the case of the research's problem.

## II. THE PREVIOUS STUDIES

**1)** Hydro-cooling Hydro-cooling provides fast, uniform cooling for some commodities. The commodity as well its packaging materials must be tolerant of wetting, chlorine (used to sanitize the hydro-cooling water) and water beating damage (Mitchell in Kader, 1992). The simplest version of a hydro-cooler is **a**

tank of cold water in which produce is immersed. The type shown below by pic No(1) showers a batch of produce with icy water as the produce moves along a conveyor. A batch-type hydro-cooler can be constructed to hold entire pallet-loads of produce (Thompson in Kader, 2002). Conveyors can be added to help control the time produce stays in contact with the cold water.
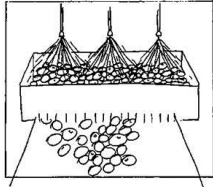


*Pic No(1)show showers a batch of produce with icy water as the produce moves along a conveyor*
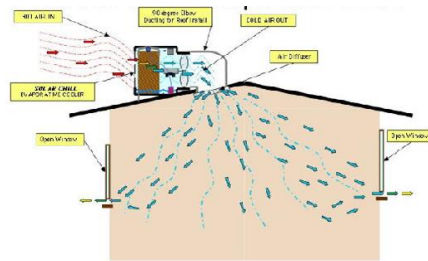


2) The Fresh Air Cooling

System **Evaporative cooling** uses a system of air flow called the **Fresh Air System**. In this system, fresh outside air is brought in through the cooler, where it is cooled and pushed through the building, then exhausted to the outside through screened windows or doors. This type of air circulation differs from traditional air conditioning, which uses re -circulated air, allowing the same inside air to revolve over and over again through the building, and unlike the the Fresh Air System, works best if it is sealed off from all outside air leakages and exchange. This causes stale and toxic air in your home or office! These problems are known as "sick building syndrome".

**The Fresh Air Cooling System,** used by all evaporative coolers, is **beneficial as compared to the re-circulation of the AC units**, because evaporative coolers are designed to supply an entire exchange of all the buildings air every 2 to 3 minutes. Evaporative cooling greatly reduces environmental air-impurities; while AC units will continue to re-use the same polluted air, often causing problems with indoor air quality.

**pic No (2) showing the diagram below to discover how the Fresh Air System works.**
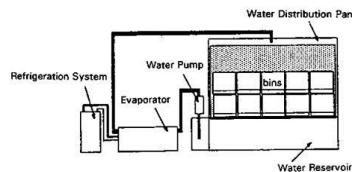
For this system to work well, the windows must be partially opened to allow air to escape, which allows the freshly cooled air to enter. If the windows are closed, the exhaust and intake air will be restricted, and the building will become pressurized and not cool well. The intake of fresh cooled air will be blocked.

Through the use of the **SOLAR CHILL** tm Evaporative Coolers, the diagram below shows how the cooling system works without the use of duct work. It is preferable to eliminate the ductwork and use the building as the ductwork instead. This is more **energy efficient** by reducing the friction to air flow that ductwork causes, and saves you the cost of the ducts!



*pic No (2) showing the diagram to discover how the Fresh Air System works.*

3) A portable forced-air cooler can be constructed using a canvas or polyethylene sheet. The sheet is rolled over the top and down the back of the boxes to the floor, sealing off the unit and forcing air to be pulled through the vents (vent area should be at least 5% of the surface area of the **(carton)** of the cartons stacked against the cooler. This unit is designed to be used inside a refrigerated storage room. The fan unit is shown detached to illustrate how the air should flow within the cooler. For best results and minimum cost of operation, the warm exhaust air from the fan should be directed toward the return air inside the **cold room. pic No (3-a,b) showing the 3** portable forced-air cooler **diagrams**
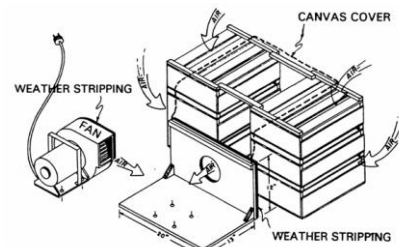


*pic No (3-a) showing the 1 portable forced-air cooler*
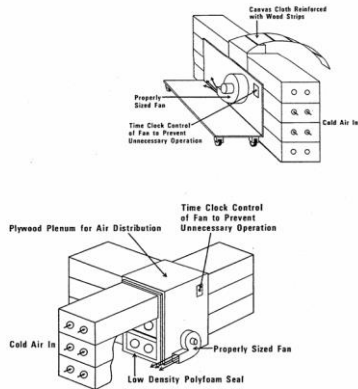
*pic No (3-b) showing the 2 portable forced-air cooler diagrams*

from the previous studies about the three kinds of cooling systems ,the researcher noticed some points of difference and similarity in the way of everyone worked by and between the way of the cooler which the researcher designed but it is considered the first to have an important factor which is this suggested cooler working by charging in order to solve a problem greatly annoyed the Egyptian citizen how to adapt with arising of high temperature in case of the electric current Interruption .

### III. METHODOLOGY

The solution from the Point of view of the researcher

Under the shadow of this crises, the researcher finds that the industrial designer plays a vital role to relieve the dangerous harms to which the citizen is exposing during the electricity interruption due to the high temperature through designing Air cooler working by electric charger in order to be stored in batteries that have the ability to run the cooler during the electricity interruption to solve the problem of the air-conditioning stop. at the beginning the researcher can make a design as it is shown in pic. No. (4).



*Pic. No. (4) Shows the proposed design for the cooler*

The design works with a fan with an electric engine connecter to DC put into a cooling room working for cooling air from inside to outside. The pic. (No 5-a-b) shows the phases of performing the design by using wood firstly.



*(5-a)*



*(5-b)*

*Pic. No. (5-a-b) shows the phases of performing the design by wood.*

After The wooden model, the researcher can perform the design by the materials and the appropriate dimensions as well as the design is provided with lighting units to be used in emergency as it is shown in the Pic. No. 6 – 7.

*Pic. No. (6-a) shows the design in its end form*

*from inside*



*Pic. No. (7-a) shows the design in its end form*

*from the front*



*Pic. No. (6-b) shows the design in its end form*

*from outside*



*Pic. No. (7-b) shows the design in its end form*
*from the top*

After representing prototype design for air cooler from all its possible aspects, the researcher would like to represent pattern to clear the technical details which shows how it works as shown in diagram number (8) .
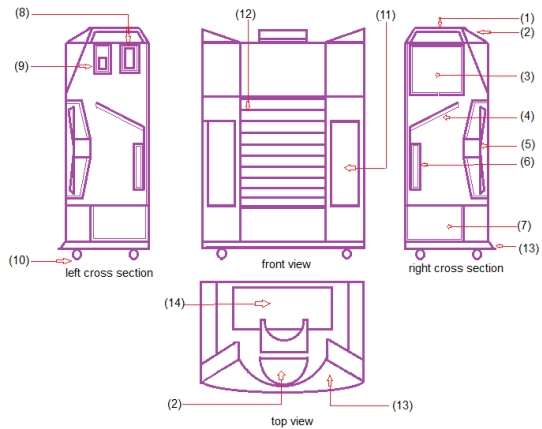


*Pic No (8 ) illustration showing the cooler*

*Technical details*

| | |
|---|---|
| 1-cooler handling place | 9-transformer (220AC-6VDC) |
| 2-panel control | 10-polyamid wheel |
| 3-top drilled ice box | 11- led lamp |
| 4-fabric to wet with fall water | 12-swing PE slides |
| 5-fan and DC motor | 13-artilon frame |
| 6-ice box case | 14-ice box cover |
| 7-cold water box | |
| 8-battery (6V -4.5A) | |

The researcher has designed Pollcy measures (questionnaire form)
To test a random group about ten consumers to determine the air cooler validity for mass production after developing.
From good to excellent were the results which showed how the random consumers accept the cooler and thy recommended with developing and producing the cooler at one of the factories specialized in home electric systems.

## IV. RESULTS AND RECOMMENDATIONS

After examining similar systems ,previous studies  and finishing the prototype  , the results showed that :

1)      The air cooler achieved its purpose and so it makes us able to adapt with high temperature in summer during electric current Interruption.

2)      The design with this system is ready for mass-production after developing it .

After performing the design and his success in achieving the objective, the researcher decides to recommend by the following.

Recommendations:

1)  The researcher recommends designing the tools and systems that are working by electric charger to face the problem.
2)  The researcher recommends with developing and producing the cooler at one of the factories specialized in home electric systems.

# Low-Power Adaptive Viterbi Decoder for TCM Using T-Algorithm

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  *ABSTRACT*: Viterbi Decoder (VD) employed in digital wireless communication plays a dominant role in the overall power consumption of trellis coded modulation (TCM) decoder. Power reduction in VD could be achieved by reducing the number of states. A pre-computation architecture with T-algorithm was implemented for this purpose, and when we compare this result with full Trellis VD, this approach significantly reduces power consumption without degrading decoding speed  much .
Low power design of VD for TCM systems with reliable delay is presented in this paper. This work focuses on the realization of convolutional encoder and adaptive Viterbi decoder (AVD) with a constraint length (K) of 9 and a code rate (k/n) of ½ using field programmable gate array (FPGA) technology. The performance of the  implemented  AVD is analyzed by using ISE 10.1 and  Modelsim simulations.

  **Index Terms:** Viterbi decoder ,convolutional encoder, FPGA.

## I. INTRODUCTION

The reliability and efficiency of data transmission is the most concerning issue  for communication channels in today's digital communications, Error correction technique plays a very important role in communication systems.
Convolutional encoding with viterbi decoding  can be used as a Forward error correction technique and this approach provides good performance with low cost  and is  particularly suited to a channel in which the transmitted signal is corrupted mainly by additive white gaussian noise (AWGN).
Trellis coded modulation (TCM) employs a high-rate convolutional code as they are used in bandwidth-efficient systems. This leads to a high complexity of the Viterbi decoder (VD) for the TCM decoder, even if the constraint length of the convolutional encoder is moderate. Due to the large number of transitions in the trellis diagram power consumption is more in VD.
In order to reduce the power consumption as well as the computational complexity, low-power schemes should be exploited for the VD in a TCM decoder. T-algorithm was shown

to be very efficient in reducing the power consumption. However, searching for the optimal PM in the feedback loop still reduces the decoding speed. To overcome this drawback, two variations of the T-algorithm have been proposed: the relaxed  adaptive VD , which suggests using an estimated optimal PM, instead of finding the real one each cycle and the limited-search parallel state VD based on scarce state transition (SST). Because of some drawbacks in both of them, we proposed an add-compare-select unit (ACSU) architecture based on pre-computation  incorporating T-algorithm for  VDs. This can efficiently  improves VDs  clock speed

## II. CONVOLUTIONAL ENCODING WITH VITERBI DECODING



Figure 1: Convolutional encoder with K= 9 and k/n =½
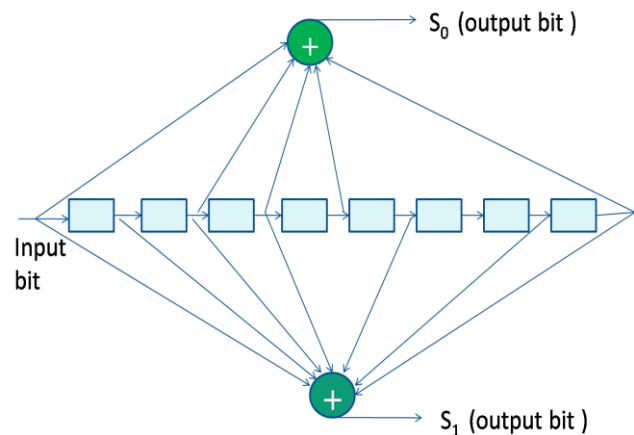
   A convolutional code is a type of error-correcting code which contains memory and the *n* encoder outputs at any given time unit depend not only on the *k* inputs at that time unit but also on m previous input blocks. Convolutional codes are usually characterized by two parameters code rate (k/n) and constraint length (K) and the patterns of *n* modulo-2 adders. The

shift register has a constraint length (K) of 9, equal to the number of stages in the register The encoder has *n* generator polynomials, one for each adder. An input bit is fed into the leftmost register. Using the generator polynomials and the existing values in the remaining registers, the encoder outputs *n* bits. The code rate (k/n) is expressed as a ratio of the number of bits into the Convolutional encoder *k* to the number of channel symbols output by the Convolutional encoder *n* in a given encoder cycle.

Convolutional encoder with constraint length 9 and code rate ½ is shown in the fig 1. For this encoder we perform the decoding process
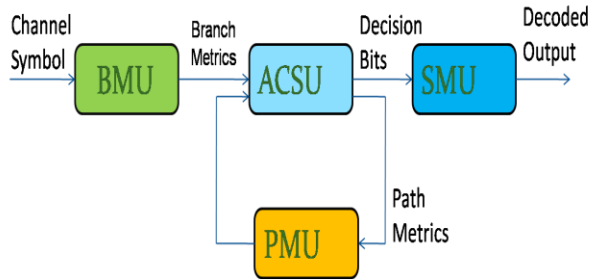


Figure2 : General VD functional diagram.

**Viterbi decoder:**

Viterbi decoder functional block diagram is shown in Fig.2. Branch metrics (BMs) are calculated in the BM unit (BMU) from the received symbols..Then, BMs are fed into the add-compare-select unit (ACSU) that recursively computes the PMs and outputs decision bits for each possible state transition. After that, the decision bits are stored in and retrieved from the SMU in order to decode the source bits along the final survivor path. The PMs of the current iteration are stored in the PM unit (PMU). ACSU

implementation is critical because the feedback loop makes it the bottleneck for high speed applications. Furthermore, as K value   increases, the power consumption and computation complexity increase exponentially. In the T-algorithm, a threshold T is set and the difference between each PM and the optimal one is   calculated. So T-algorithm requires extra computation in the ACSU loop for calculating the optimal PM (minimum value of all PMs)and puncturing states.

## III.   PRE-COMPUTATION ALGORITHM

VD for a convolutional code with a constraint length K contains $2^{k-1}$ states and consider each state receives p candidate paths. First, we expand PMs at the current time slot n (PMs(n)) as a function of   PMs(n-1) to form a look-ahead computation of the

optimal PM - $PM_{opt}(n)$ . The Branch metric can be calculated by two types: Hamming distance and Euclidean distance If  the branch metrics are calculated based on the Euclidean distance, $PM_{opt}(n)$ is the minimum
 value of  PMs(n) obtained as

$PM_{opt}(n)$

$= \min \ \{ PM_0(n) , PM_1(n) ,\ldots\ldots PM_{2^k-1}(n) \}$

$= \min \{ \min [ PM_{0,0} (n-1)+ BM_{0,0} (n),$
$\qquad\qquad PM_{0,1} (n-1)+ BM_{0,1} (n) ,\ldots\ldots$
$\qquad\qquad PM_{0,P}(n-1)+ BM_{0,P} (n)] ,$
$\qquad\quad \min [ PM_{1,0} (n-1)+ BM_{1,0} (n),$
$\qquad\qquad PM_{1,1} (n-1)+ BM_{1,1} (n) ,\ldots\ldots$
$\qquad\qquad PM_{1,P}(n-1)+ BM_{1,P} (n)] ,$
$\qquad\qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots$
$\qquad\quad \min [ PM_{2^k-1,0} (n-1)+ BM_{2^k-1,0} (n),$
$\qquad\qquad PM_{2^k-1,1} (n-1)+ BM_{2^k-1,1} (n) \ldots.$
$\qquad\qquad PM_{2^k-1,P}(n-1)+ BM_{2^k-1,P} (n)] \}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ ( 1)

For a VD  usually the trellis butterflies have a symmetric structure. To reduce the computational overhead caused by look-ahead computation we group the states into several clusters. The states can be grouped into m clusters, where all the clusters have the same number of states and all the states in the same cluster will be extended by the same BMs, The  min(BMs) for each cluster can be easily obtained from the BMU or TMU (In a TCM decoder, BMU is replaced by transition metrics unit (TMU), which is more complex than the BMU) and the min(PMs) at time n-1 in each cluster can be  precalculated  at the same time when the ACSU is updating the new  PMs for time n.

The precomputation scheme can be extended to q  steps, where q<n  ( q being any positive integer) Hence, $PM_{opt}(n)$  can be calculated directly from  PMs(n-q)in q cycles.

The above algorithm  (1) when implemented in form of clusters can  be rewritten as

$PM_{opt}(n) = \min \{ \min(PMs(n-1) \text{ in cluster } 1)$
$\qquad\qquad\qquad + \min(BMs(n) \text{ for cluster } 1),$
$\qquad\qquad \min(PMs(n-1) \text{ in cluster } 2)$
$\qquad\qquad\qquad + \min(BMs(n) \text{ for cluster } 2),$
$\qquad\qquad\qquad \ldots\ldots\ldots\ldots\ldots\ldots$
$\qquad\qquad \min(PMs(n-1) \text{ in cluster } m)$
$\qquad\qquad\qquad + \min(BMs(n) \text{ for cluster } m) \}$

$\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (2)

Choosing Precomputation Steps :
In a TCM system, the convolutional code usually has a coding rate of   R/R+1 and the logic delay of  the ACSU is  $T_{ACSU}= T_{adder} +T_{p\text{-}in\text{-}comp}$ .If  T-algorithm is employed in the VD, the iteration bound is slightly longer than $T_{ACSU}$ because there will

be another two-input comparator in the loop to compare the new PMs with a threshold value obtained from the optimal PM and a preset T and is given by

$$T_{bound} = T_{adder} + T_{p\text{-in-comp}} + T_{2\text{-in-comp}} , \qquad (3)$$

where $T_{adder}$ is the logic delay of the adder to compute PMs of each candidate path that reaches the same state and $T_{p\text{-in-comp}}$ is the logic delay of a p-input comparator (where $p = 2^R$) to determine the survivor path for each state.

**q**-step precomputation can be pipelined into q stages, where the logic delay of each stage is continuously reduced as q increases. As a result, the decoding speed of the low-power VD is greatly improved. However, after reaching a certain number of steps, $q_b$ further precomputation would not result in additional benefits because of the inherent iteration bound of the ACSU loop.

We limit the comparison to be among only p or 2p metrics, to achieve the iteration bound expressed in (3), for the precomputation in each pipelining stage and assume that each stage reduces the number of the metrics to 1/p (or $2^{-R}$) of its input metrics. The smallest number of precomputation steps ($q_b$) meeting the theoretical iteration bound should satisfy

$$[(2]^{\uparrow R})^{\wedge} q_b \geq 2^{k-1}. \qquad (4)$$

Therefore $q_b \geq \dfrac{k-1}{R}$ and we express this as

$$q_b = \left\lceil \frac{k-1}{R} \right\rceil$$

where [.] denotes ceiling function.

Computational overhead is an important factor that should be carefully evaluated. If there are m remaining metrics after comparison in a stage, the computational overhead from this stage is at least m addition operations. For a code with a constraint length k and q precomputation steps, the number of metrics will reduce at a ratio of $2^{\frac{k-1}{q}}$ and the overall computational overhead is $N_{overhead}$ . (5)

The estimated computational overhead increases exponentially to q. In a real design, the overhead increases even faster. Therefore, a small number of precomputational steps is preferred even though the iteration bound may not be fully satisfied. One- or two-step precomputation is a good choice in most cases. For TCM systems, where high-rate convolutional codes are always employed, two steps of precomputation could achieve the iteration bound and also it reduces the computational overhead .

IV.   Low- Power Viterbi decoder design

For  4-D 8PSK TCM system  with code rate ½, since the precomputation algorithm always finds the accurate optimal

PM, its BER  performance is almost same as that of the conventional T-algorithm .

### *ACSU DESIGN :*

Convolutional encoder  with *Rate ½  and length 9* is shown in fig(1). For convenience of discussion, we define the left-most register in Fig. 1 as the most-significant-bit (MSB) and the right-most register as the least-significant-bit (LSB).The 256 states and PMs are labeled from 0 to 255. The two-step pre-computation  in the ACSU feedback loop is expressed as

$PM_{opt}(n) =$

Min [ min {
   min (cluster 0 (n-2)+ min (BMG0(n-1)),
   min (cluster 1 (n-2)+ min (BMG1(n-1)),
   min (cluster 2 (n-2)+ min (BMG3 (n-1)),
   min (cluster 3 (n-2)+ min (BMG2(n-1))    }
      +min(even BMs(n)),
     min {
   min (cluster 0 (n-2)+ min (BMG1(n-1)),
   min (cluster 1 (n-2)+ min (BMG0(n-1)),
   min (cluster 2 (n-2)+ min (BMG2 (n-1)),
   min (cluster 3 (n-2)+ min (BMG3(n-1))    }
      +min(odd  BMs(n))      ]
Where
Cluster 0 = {$PM_m$ |   0≤m≤255,  m mod 4 =0 };
Cluster 1= {  $PM_m$ |   0≤m≤255, m mod 4 =2};
Cluster 2= {  $PM_m$ |   0≤m≤255, m mod 4 =1 };
Cluster 3= {  $PM_m$ |   0≤m≤255, m mod 4 =3 };
BMG0= {  $BM_m$ |   0≤m≤15, m mod 4 =0 };
BMG1= {  $BM_m$ |   0≤m≤15, m mod 4 =2};
BMG2= {  $BM_m$ |   0≤m≤15, m mod 4 =1 };
BMG3= {  $BM_m$ |   0≤m≤15, m mod 4 =3};
The functional block diagram of the VD with two-step precomputation T-algorithm  is shown in Fig. 3. The minimum value of each BM group (BMG) can be calculated in BMU or TMU and then passed to the "Threshold Generator" unit (TGU) to calculate ($PM_{opt}$+T). ($PM_{opt}$+T)and the new PMs are then compared in the "Purge Unit"(PU). The architecture of the TGU is shown in Fig. 4,
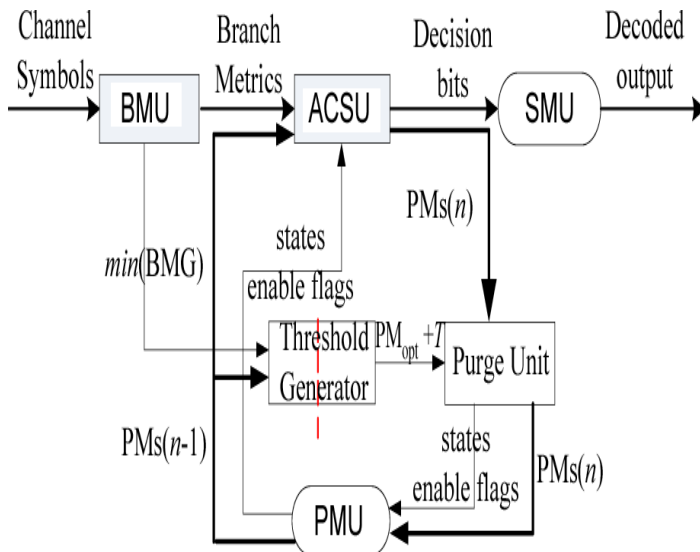
Figure 3 : 2-step pre-computation T –algorithm for VD

### SMU Design:

There are two different types of SMU in the literature:  trace back (TB) schemes and register exchange (RE) schemes. In the regular VD without any low-power schemes, SMU always outputs the decoded data from a fixed state if RE scheme is used, or traces back the survivor path from the fixed state if TB scheme is used. For VD incorporated with T-algorithm, no state is guaranteed to be active at all clock cycles. Thus it is impossible to appoint a fixed state for either outputting the decoded bit (RE scheme) or starting the trace-back process (TB scheme). In the conventional implementation of T-algorithm  , the decoder can use the optimal state( state with $PM_{opt}$)  which is always enabled, to output or trace back data. As the estimated $PM_{opt}$  is calculated from PMs at the previous time slot, it is difficult to find the index of the optimal state in the process of searching for the $PM_{opt}$ . A 256 –to- 8 priority encoder can be used for this purpose. The output of the priority encoder would be the unpurged state with the lowest index. Assuming the purged states have the flag "0" and other states are assigned the flag "1". Implementation of such direct 256-to-8 is not trivial ,so we employ four 4-to-2 priority encoders for the 256 -to -8 priority encoder. This is shown in Fig. 5. and it is simpler  also.
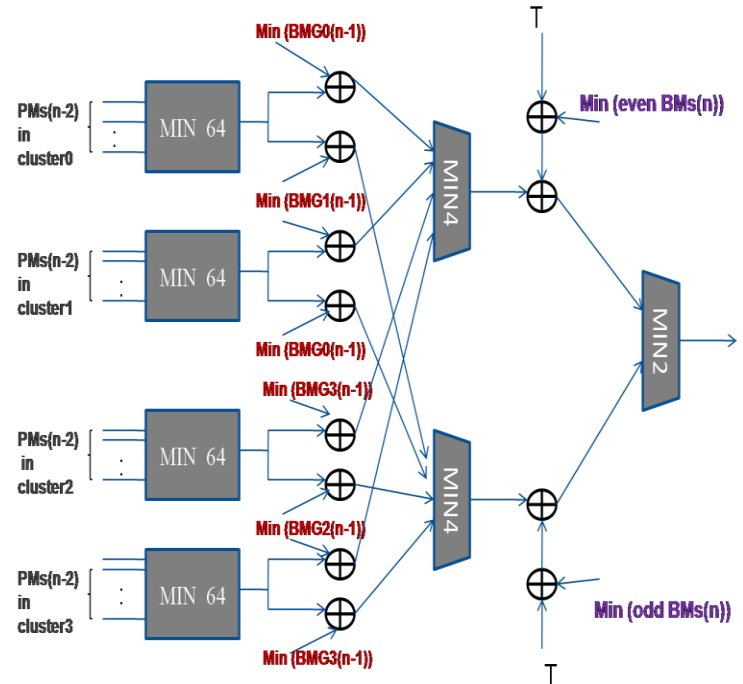


Figure 4:  Threshold Generator  unit architecture
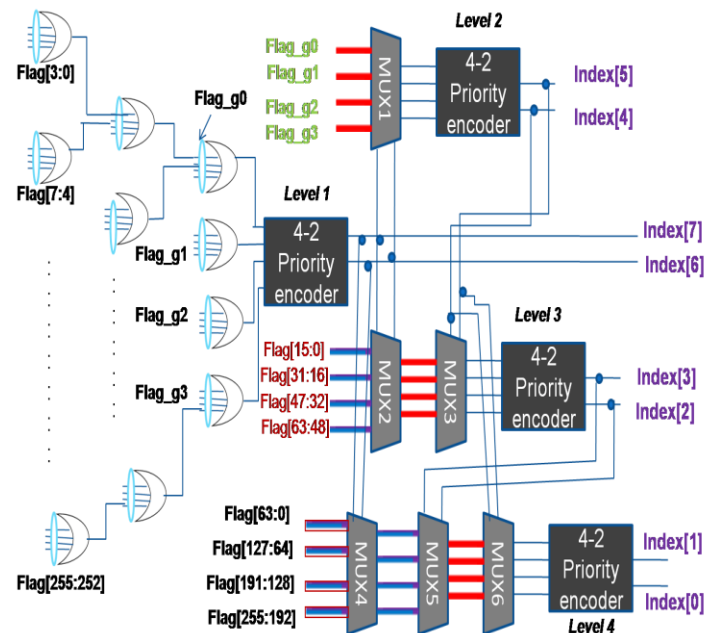


Figure 5: 256 -to -8 priority encoder architecture.

**PROCESS ELEMENT TECHNIQUE :**

Different protocols use different convolutional code and varied applications have different requirement for throughput, area and power. So design of reusable Viterbi decoder is important, too. In present project, a reusable Viterbi decoder was carried out. This decoder adopted the Process Element (PE) technique, which made it easy to adjust the throughput of the decoder by increasing or decreasing the number of PE. By the method of Same Address Write Back (SAWB), we reduced the number of registers to half in contrast with the method of ping-pong.

This decoder supported punctured convolution code and was data-driven, which means the circuit was able to work under different data rate and avoid those invalid operations. The core parameters, such as the generation words of convolution code, the number of PE, the depth of TBU and maybe the radix of butterfly, are all configurable. By assembling different numbers of PE, we can get the state-serial, part parallel or full parallel structure of Viterbi decoder. And because the PMU is scattered into each PE, this structure is more area efficient.
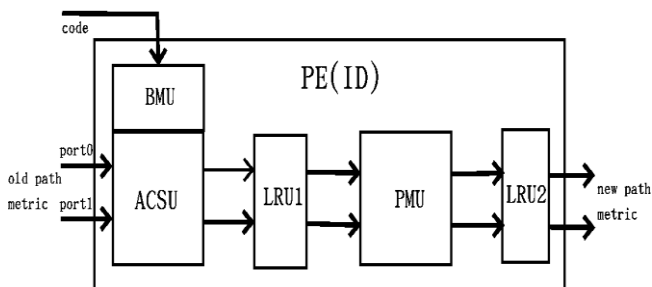


Figure 6:  Structure of process element.

**5. SYNTHESIS AND SIMULATION RESULT:**

Viterbi decoder with rate ½ and K=9 is realized by FPGA device xcv3200e-8fg1156 . The device utilization summary, logic utilization and distribution report is shown in Table I. The precomputation VD reduced the power consumption by nearly 70% with minimum decoding speed.The VD design is simulated by Model Sim and Xilinx ISE 10.1.

Table I :  Device Utilization Summary (estimated values)

| Logic Utilization | Used | Available | Utilization |
|---|---|---|---|
| Number of Slices | 4106 | 32448 | 12% |
| Number of Slice Flip Flops | 2880 | 64896 | 4% |
| Number of 4 input LUTs | 7356 | 64896 | 11% |
| Number of bonded IOBs | 19 | 804 | 2% |
| Number of BRAMs | 16 | 208 | 7% |
| Number of GCLKs | 1 | 4 | 25% |

## V.  CONCLUSION

The precomputation architecture that incorporates T-algorithm efficiently reduces the power consumption of VDs without  reducing the decoding speed appreciably. This algorithm is suitable for TCM systems which always employ high-rate convolutional codes. Both the ACSU and SMU are modified to correctly decode the signal. Compared with the full-trellis VD without a low-power scheme, the precomputation VD could has low power consumption with reliable decoding speed. A reusable Viterbi decoder was carried out by adopting the Process Element technique.

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# Jute Fiber-PP Bio-Composite: State Of Art, Low Investment, In-House and Manual Preparation of Injection Moldable Bio-Composite Granules

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**Abstract:-** This paper briefs on manual fabrication process, to prepare injection moldable granules of jute-pp (NF-PP) bio composite, with different loading of jute reinforcement up to 30 % by weight(Jute or NF ratio 10, 20, 30, by wt%), without using parallel twin screw extruder. Low investment process for jute/NF composition up to 30% by wt of jute/NF in bio composite.  External hot mixing of jute/NF and PP is accomplished in a pan, with incremental heat and control. Modified manual injection molding machine is used as extruder for in-house granule preparation.  Even flax, hemp, sisal and any NF with PP can be prepared for test and development locally.

**Index Terms**: Jute, PP, Injection Moldable, Low Investment, Manual Preparation.

## I. INTRODUCTION

Materials from renewable resources – are called biomaterials or 'green' materials – are currently gaining in importance worldwide. The natural fiber reinforced plastics are the bio-composites in demand for replacement in aero and auto industries. Injection mold ability is significant due to Low cost and high production, Interchangeability, Weight reduction, Metal part replacement & compatibility, abundant availability, easy to transport, and PP composition possibility. The bio composites are biodegradable and non-toxic. Jute products merge with the soil, provides nourishment to the soil. Being made of cellulose, on combustion, jute does not generate toxic gases. Molded bio composites provide good dimensional stability and harmlessness.  And technically jute has high specific properties, low density. Jute is less abrasive to the processing equipment.

## II. EXPERIMENTAL SET UP

The experimental set up is aimed to produce moldable bio composite granules manually to help produce in house which is an alternate to huge investment setups. This state of art experimental continuous and fragmented processes set up that will help researchers to carry out their work with least investment, and also flexibility in preparation of required bio composite compositions. The entire process is sub divided into smaller processes, suitable to use available equipment with technical modifications as needed.

The experimental procedure involves Hot mixing of fiber and pp, flake formation, flake cutting, converting flakes into jute-pp composite bar, cutting of bar into granules. The granules can now be sent to injection molding machine for molding. Some photographs of molded parts are shown.

## 2.1 Materials

### 2.1.1. PP Matrix

Polypropylene is commonly made from the monomer propylene by polymerization; the result is an iso-tactic polymer, in which all the methyl groups are on the same side of the chain. Isotactic polypropylene has good mechanical properties as well as low density. It is a non-polar material. The crystalline iso-tactic polypropylene is insoluble in all common solvents at room temperature, it starts swelling and is finally dissolved by specific solvents only at temperatures generally higher than 100°C. Its tensile strength, surface hardness and stiffness are higher than that of polyethylene.

CH2—CH—CH2—CH--CH2—CH--CH2-- CH
                    CH3          CH3          CH3          CH3
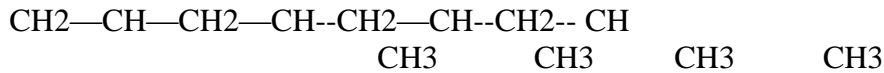
Figure: 1 Chemical structure of iso-tactic polypropylene
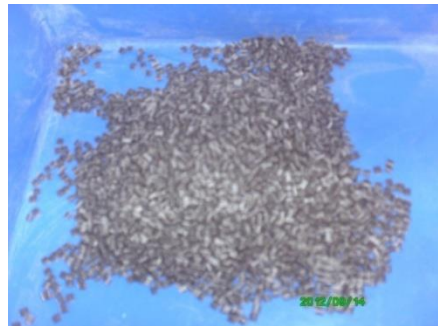


Figure: 1 Polypropylene Granule

### 2.1.2 Jute fiber

The biodegradable and low priced jute products merge with the soil after using and provide nourishment to the soil. Being made of cellulose, jute does not generate toxic gases on combustion. Due to jute's low density combined with relatively stiff and strong behavior, the specific properties of jute fiber can compare to those of glass and some other fibers. Recent reports indicate that plant based natural fibers can very well be used as reinforcement in polymer composites, replacing to some extent more expensive and non renewable synthetic fibers such as Glass. The maximum tensile, impact and flexural strengths for natural fiber reinforced plastic (NFRP) composites reported so far are 104.0 MN/m2 (Jute - Epoxy), 22.0 kJ/m2 (Jute - Polyester) and 64.0 MN/m2 (Banana - Polyester) respectively.

### 2.1.3 Jute fiber length

The fiber length plays an important role in the mechanical performance of fiber reinforced composites. The Table:1 as shown below summarizes the average fiber lengths and diameters derived from compound granules and plates.

TABLE: 1

| Samples | Fiber Length  (µm) | Diameter (µm) | Ratio of F.L/D |
|---------|--------------------|---------------|----------------|
| Granules | 243 – 162 | 23 - 15 | 10.6 |
| Plates | 244 – 154 | 22 - 12 | 11.1 |

Table 1: shows Average fiber length, diameter, and length/diameter ratio.

### 2.2 State of art manual moldable granule preparation

In the manual process of bio-composite granule preparation Jute fiber reinforced polypropylene composites were prepared under various processing parameters using hot mixing by manual and modified injection molding technique  for extruding long  bar of composites to make granules. The goal of this work is to design a manual process to ease and accelerate the in house development and research of bio composite and at very low investment. This process is sub divided into six steps.

### 2.2.1   Step-I:   Treatment of jute fiber and dehumidification

The focus of the paper is to design a process to prepare moldable quality jute-PP bio composite granules for low quantity productions. The fibers are treated for chemical effects.  3% NAOH treated jute is directly used. The treated jute is now de-Humidified. The fibers are treated in hot air oven, at 70°C, for 24 Hrs, to remove water contents.

### 2.2.2   Step-II:   Sizing of jute fibers

The fibers are cut to required size, and separated to individual fibers. Hammer milling is used to separate individual fibers and to achieve size and are shown in the following Figure: 2



Figure: 2 Jute fibers cut to size.

### 2.2.3   Step-III:   Hot mixing method

In this step, the treated and dehumidified and sized jute fibers are mixed with hot PP. This process is shown pictorially in figure: 3 below. All the required quantities and planned mix ratios, and in batches, are kept ready in separate trays. Take complete batch quantity PP in the vessel, (the quantity may depends on vessel quantity). As the material starts melting start adding Jute pp and keep stirring and blending, the jute shall be added according to the requirement in small quantities and blended properly.

This step requires skill, technique and understanding of material behavior. Mixing of hot pp, burn control of jute, and complete pp-film wrap around jute fiber are obtained in one go, but it attracts simultaneous action. Temperature control and blending action go hand in hand so that no pp vapors are produced and blending is not stopped till the composite solidifies.  PP must melt, jute fibers should not burn and complete wrap of pp,

are the conditions to be monitored, this can be achieved by constant observation, blending and temperature control simultaneously.



Figure: 3 manual hot mixing of jute with pp

### 2.2.4   Step-IV: cutting to flakes

After complete blending, the mixed compound is allowed to cool and cut manually by scissor. The bio-composite flakes are ready and are shown in the Figure: 4 below, the bio-composite flakes can also be used directly for injection molding.



Figure: 4 Jute-PP Bio composite flakes

### 2.2.5   Step-V:  Extrusion of the jute-PP mix

The bio-composite flakes produced by hot mixing method are extruded in the modified manual and hand injection molding machine.

The modifications done on the manual injection molding machine are - the pressure push flow control wedge, filter mesh of the manual injection machine are removed. The nozzle is redesigned to have single aperture of 5mm diameter to extrude one long bar of 5mm diameter. One long bar can be drawn in one shot, and it is of 50 grams of composite material. Thus the manual extruder works to produce long bars of composite.

Figure: 5 Modified manual injection molding m/c



Figure: 6   Extruded bar before cutting to pellet size

### 2.2.6   Step-VI:   cutting to Pellet size granules

The long bars of 5mm obtained from the modified manual extruder are now manually cut to the size 5mm or 6 mm and these are called pellets of jute-pp. These pellets can now be molded in the injection molding machine of any type manual, hydraulic or automatic. The bio composite material needs more area of cross section in gates of the moulds to facilitate the flow of molten material into the mould. Metal flow behavior of the bio composite varies with percentage mix of bio material.



Figure: 7 Extruded bars and bio composite granules

### III.  MOULDABILITY OF GRANULES

Granules, as well as bio composite flakes also can be used in the injection molding machine. Following are the photographs of the injection mould prepared by different compositions of bio composites prepared by this state of art manual method as shown in Figure: 8.



Figure: 8 Bio composite molded Auto wind shield part .

### IV.  CONCLUSIONS

- Uniform mix of fiber is possible.
- Fiber bunches can be avoided.
- Burning of fibers can be controlled.
- Higher ratio mixing is difficult.
- Attracts moderate risk, skill and energy.
- Most suitable for R&D and study projects.

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# Use Audio-Visual Data in the Qualitative Research Work

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Ethnographic research and participatory research are the major research methods used in the social science. The said methods are popular in the situation where human emotions and feelings are involved.   The popular justification is emotions could not be expressed in numbers. Hence the researcher participates in the community/group and makes observations and often conducts interviews. All the data is maintained in the written form i.e. dairy or notes. Latter on these notes are converted into research article or dissertation. All the documentation is in the form of words, written words. The strong question is ''Can words be sufficient to express the human emotions or feelings?" the answer could be both yes and no. If you have creative writing skills you can. But the impact or the interpretation will be always subjective. More ever one has to spent more time in developing his creative writing skills to achieve certain levels.

Broadly it will be accepted by every one that human feelings and emotions are difficult to express in words. Words written on the paper could not be substituted for human emotions. But a video recording of the same could communicate a lot. Video recording will communicate the actual situation of the subject. Video is nothing but an image recorded in a sequence. It is a popular saying that "Humans lie, images don't…. Even if the quality of the video is poor, visuals communicate. Visuals give the essence of realty. Its  is because of this reason the film makers spend huge money to develop sets, location, and make-up to give the realistic feeling to the audience.

Now a day's smart phones are becoming popular among the youth. These phones are embedded with cameras. Camera system in the mobile phone has become so much popular that we can't imagine a mobile phone without a camera. Some of the smart phones are know for the good quality of camera, indeed that are very costly. The popular camera system records videos and photos both. Almost every one is having a mobile phone, and research scholars definitely have one. Research scholars conducting field visits definitely have a mobile because in current scenario it helps. In the modern world mobile is an essential thing to survive.  According to latest findings by TRAI, there are 867.80 million mobile phones at the end of March 2013, registering a monthly growth of 0.71%.[15] If mobiles are so commonly assessable then why not use it as a tool for data collection. One could easily record the reality around and also record the interviews. The quality of the video recorded in the mobile will not be of a good quality but it will be authentic documentation. Such kind of documentation will help the researcher to even analyse the data. The data is recorded in the digital format hence it could be stored properly for the long duration and reference could be taken any time.  We could list down the benefits of video documentation for the purpose of research, following is the list.

1) **Easy to use:**   Mobile is commonly used by the people. The interface for recording the video is very simple and accessible.

2) **Could be stored for longer duration:** The digital format recording could be transferred to the computer any time. The videos could be also uploaded on the social networking websites. Hence storage and transfer of data is easy.

3) **Cheap tool to use:** No additional expenditure as the camera system is the part of mobiles today.

4) **Authentic Record:** Actual images always communicate more and people tent to believe images then the words. Authenticity becomes an embedded component of video. The scope of copying or plagiarism also becomes limited.

5) **Research presentation could be in Audio-video format:**  One could develop a small documentary film or develop a visual presentation to communicate the research findings. Video editing could be done easily in the computers. One may not achieve the professional quality but reasonable quality could be achieved with the help of software's like Windows Movie Maker, etc.

6) **More access and spared amongst the people:**  The reading is becoming less and less poplar[16]. People rarely read now days. But younger generation is watching lots of videos on social networking sites and is also reacting to it. Video has become the language of the younger generation[17]. Hence video should be given a status a research tools in academics.

It's high time for to include video as a tool for data collection with reference to qualitative research. Video documentation becomes a very effective too when combined with ethnography methods of research. Academicians are more found of books and written materials. The dissertations are also written, people prefer to write more and more and increase the pages. The question remains who

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[15]http://www.telecomtiger.com/PolicyNRegulation_fullstory.aspx?passfrom=PolicyNRegulation&storyid=17660&section=S174
[16] http://www.studymode.com/subjects/research-papers-of-newspaper-reading-habits-page1.html
[17] *cn.nielsen.com/.../Nielsen-**Social**-**Media**-Report_FINAL_090911.pdf*

will read those pages? Visuals is the languages of the new generation and academics should adopt it.     Like pens, cameras are becoming popular for recording data.  New tools are available for research and we should be open to use it. Indeed there are limitations to the use of video as a tool of research, but every tool has them. Nothing is foolproof and in social sciences, it's not possible. The need of the time is to include the new technologies and improve the quality and authenticity or work. Young Research scholars should be given liberty to use the tools which they are comfortable with, writing and note taking  is surely not welcomed.

**Biography of Author**:
Mr. Rohit Pawar, Asst. Professor, Dept. of Communication Studies University of Pune, Pune -7. Has been teaching subject related to Video-Production, in the said department from the past 8 years. Have produced couple of documentary films in the past few years.   Also currently working on the Phd. dissertation related to children and TV.

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# Dental Lasers - A Review

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***Abstract-*** Theodore Maiman in 1960 introduced the first solid state ruby LASER. Since then LASERs have come a long way with numerous applications in the field of medicine and dentistry. In dentistry LASERs are now in vogue and are now becoming a part of the dentist's armamentarium for endodontic , restorative , periodontal and implant therapies. This paper gives an insight to the basics of LASER physics, various types of LASERs, their interactions with biologic tissues and their uses in Periodontics.

***Index Terms***- LASER

## I. INTRODUCTION

LASER is an acronym for **L**ight **A**mplification by **S**timulated **E**mission of **R**adiation.

**Light** is a form of **electromagnetic energy** that behaves like a particle and wave. Its basic unit is **photon.** LASER light energy has following characteristics

a) Energy emitted is a light of one color (Monochromatic) thus of a single wavelength.
b) Each wavelength is identical in physical size and shape (Coherent).
c) Photons can be Collimated into an intensely focused energy beam which interacts with the target tissue.
d) Efficiency.

Measurements that define LASER light (Wave of photons) are
i) Velocity, which is speed of light
ii) Amplitude, which is total height of wave oscillation from top of peak to the bottom on a vertical axis. It indicates intensity in wave, larger the amplitude greater the amount of useful work that can be performed.
iii) Wavelength, which is the distance between any two corresponding points on the wave on horizontal axis. It is measured in meters [microns ($10^{-6}$m) or nanometers ($10^{-9}$m)]. Frequency is the number of wave oscillation per second.

It is inversely proportional to wavelength. Shorter the wavelength, higher the frequency.

Amplitude and frequency are inversely proportional to wavelength.

**Amplification** is part of a process that occurs inside the LASER. The inner part of LASER or the components of LASER are as follows:

a) Optical cavity, which is the center of the device. Core of the cavity comprised of chemical elements, molecules or compounds is called active medium. It can be a gas, a crystal or a solid-state semiconductor.

b) Two mirrors, one at each end of optical cavity, placed parallel to each other. One mirror is reflective, which allow photons to be reflected back and forth to allow further stimulated emission. The successive passes through the active medium increase the power of the photon beam. This is the process of amplification. The other mirror is partially transmissive thus allowing light of sufficient energy to exit the optical cavity.

c) Excitation sources either a flash lamp strobe device or an electrical coil, which provides energy into active medium.
d) Cooling system
e) Focusing lenses
f) Other controls

## II. STIMULATED EMISSION

When electrical energy is directed, the active medium converts this electrical energy into light energy. A quantum, the smallest unit of energy (of excitation source) is absorbed by the electrons of an atom or molecule (of active medium), causing a brief excitation; then a quantum is released, a process called **spontaneous emission.** According to Albert Einstein's theory an additional quantum of energy traveling in the field of exited atom that has the same excitation energy level would result in release of two quanta, a phenomenon termed **stimulated emission.**

## III. RADIATION

Radiation refers to the light waves produced by LASER as a specific form of electromagnetic energy.

Ionizing radiations are those with very short wavelengths below 300nm. They are high frequency and have a large photon momentum. It can deeply penetrate biologic tissues.
Non ionizing radiations are those with wavelengths larger than 300nm. They have lesser frequency and less photon energy. They cause excitation and heating of tissues with which they interact. All dental LASERs are nonionizing.

## IV. TYPES OF LASERs

1. Hard tissue- LASERs for hard tissue procedures show good absorption by hydroxyapatite and water making it more efficient in ablating enamel and dentine. It causes water to evaporate into steam in tissues and result in micro explosions of hard tissue. Thus, thermal effects are due to micro explosions. (1,2)
   a) Er:YAG

b) Er,Cr:YSGG: There is absence of melting, charring and carbonization (char formation)

c) Nd:YAP (Wavelength 1340) It has absorption coefficient in water approximately 20 times greater than Nd: YAG.

2. Soft tissue- LASERs for soft tissue are smaller and less expensive. They considerably have greater applications.

a) Argon (488nm,514nm wavelength, fiber diameter 300µm,0.05 sec pulse duration, 0.2 second between pulses)

b) CO2 (5-15 w) It may be absorbed by water component of dental hard tissue which could lead to thermal damage therefore contact with these tissues must be avoided. It leaves a char layer on root surface.

c) Nd:YAG (1064nm wavelength, 0.2- 1.2mm diameter tips, 3 w power,20 pulses per second) Nd:YAG penetrates water to a depth of 60mm before it is attenuated to 10% of its original strength. Energy is scattered rather than absorbed. If pigmented scattering is twice as great as absorption. Therefore ideal for ablation of hemorrhagic tissue. It penetrates soft tissues to a depth of 2 plus or minus 1. It leaves a char layer on root surface.

d) Diode(800nm to 830nm,980nm wavelength, fiber diameter 300µm,2-10 w power)

e) Erbium LASERs in contact mode can be used to cut soft tissue with hemostasis, and then tooth should be protected.

## V.    LASER DELIVERY SYSTEMS

1. Argon, Diode Nd: YAG (With shorter emission wavelength) - Small flexible quartz optical fibers. For Nd:YAG sapphire and ceramic tips have been developed for contact use(3)

2. Er,Cr:YSGG and Er:YAG ( Larger wavelengths) - Special and costly fiber optic delivery system with accompanying helium neon LASER as an aiming beam since wavelength is invisible with peripheral cooling air and water spray for hand piece.

3. CO$_2$ LASER (Largest wavelength) - Hollow wave-guide that allows beam to be delivered through a flexible tube (4). The smallest diameter of beam (focal point) is nearest the end of hand piece tip beyond which it diverges. This is 3-5mm from target tissue. Divergence of beam beyond focal point results in rapid loss of power density and protects underlying tissue causing protein denaturation and coagulation. Blood vessels up to a diameter of 0.5mm are sealed (5).

## VI.    LASER EMISSION MODES

1. Continuous mode – Beam is emitted at only one (W) power level for as long as the operator depresses the foot switch.

Examples

a) Diode (used in contact mode with water)

b) CO$_2$ ( used in no contact mode)

2. Gated pulsed mode- There are periodic alterations of LASER energy, much like a  blinking light E.g. Diode (Used in contact mode).

All surgical devices that operate in continuous wave have gated pulsed feature.

3. Free running pulsed mode (True pulsed mode) larger peak energies of LASER light are emitted for a short time span usually in microseconds followed by a relatively long time in which the LASER is off. (Can be used for thin     tissue)

E.g.

a)Neodymium:Yttrium, Aluminum,Garnet (Nd:YAG) (contact mode, 20 pulses per second)

b) Cr: YAG

c) Er:Cr:YSGG

## VII.    ERGONOMIC FEATURES OF LASERS

1. Portable
2. Ease of use
3. Few cords or cables

**Fiber tip**:

A typical soft tissue LASER has a fiber within a hand piece. The end of the fiber may need to be cleaned and stripped to expose the inner core of the fiber to prepare it for clinical use. The fiber management should be efficient and easy and unidose fiber tips(disposable tips) make an efficient setup and conventional delivery system.

The smaller the fiber diameter and higher the power density the more efficient the LASER will cut soft tissue. A unique aspect of working with a dental LASER is that it acts only at the end of the tip. There is no side cutting effect. LASER energy flows freely from the fiber tip of a diode LASER unless the end of the fiber has been initiated or carbonized concentrating the energy at the tip of the fiber. When used in a contact mode a coating of carbonized tissue forms at the tip of the fiber. When this occurs the carbonized tissue absorbs the LASER energy and there is a significant increase in thermal energy delivered to the tissues. As this increased thermal energy is absorbed at the surface of tissue, there is a significant decrease in soft tissue penetration.

Noninitiated fiber tip allows the LASER energy to escape the fiber end freely and flood the irradiated tissue with LASER energy. It can be used to desensitize apthous ulcers.

Calibration of the LASER fiber is critical for successful treatment of periodontal pockets. LASER fiber is adjusted in length to correspond to the periodontal probe charting. The calibration for initial therapy is the depth of the treatment site minus 1mm. This will prevent the fiber from touching epithelial attachment at the bottom of pocket.

## VIII.    ADVANTAGES OF LASERS

1. Increased coagulation that yields a dry field

2. Better visualization
3. Tissue surface sterilization
4. Reduction in bacterial counts
5. Decreased swelling, edema and scarring
6. Decreased pain
7. Faster healing
8. Increased patient acceptance

**Periodontal procedures that are carried out using LASERs:**

Removal of calculus, for root etching, cavity preparation, caries removal, bacterial reduction in sulcus and or pocket, gingivectomy, gingivoplasty, de-epithelialization of reflected flaps, removal of granulation tissue, second stage exposure of dental implants, lesion ablation, incisional and excisional biopsies of both benign and malignant lesions, irradiation of apthous ulcers, coagulation of free gingival graft donor site, Depigmentation, assess tooth mobility (6), and measure blood flow(7).


IX. LASER-TISSUE INTERACTIONS

It depends on LASER wavelength, emission mode, on optical properties of the tissues such as pigmentation, mineral content, water content, and heat capacity.

1. Wavelength decides the degree to which LASER energy is absorbed by the target tissue.
Example:
a) Argon (486nm,514nm)
   Well absorbed by pigmented tissues.
b) CO2 (10,600 nm)
   High absorption in water
   Far infrared

As soft tissue is 75% to 90% of water, 98% of energy is converted to heat and absorbed at surface with very little scatter or penetration (5)
c) Nd:YAG (1064 nm)
Low absorption in water.
Near infrared Absorbed by pigmented tissues.
d) Nd:YAP(1340nm)
Absorption coefficient in water approximately 20 times greater than Nd:YAG.(8)
e) Diode (800-950nm)
Low absorption in water Absorbed by pigmented tissues
f) Er,Cr:YSGG (2780 nm)
Highly absorbed in water and hydroxyapatite.
g) Er:YAG (2940nm)
Highly absorbed in water and hydroxyapatite.


2. The primary interaction of a LASER with target tissue is photo thermal. LASER energy is absorbed by the target tissue and significantly elevates the temperature of the tissues. ( 9,10).
a) 37 $^o$C to 50 $^o$C - the tissue temperature is elevated (Hyperthermia)
b) 60 $^o$C - the tissue whitens or blanches, which can be seen when an egg white albumin changes from clear to milky during cooking. Proteins begin to denature without vaporization of underlying tissue.
Used in surgical removal of diseased granulation tissue.

c) 70 $^o$C- produces desirable effect of hemostasis by contraction of wall of the vessel.
Used for coagulation.
d) 70 $^o$C to 80 $^o$C - the soft tissue edges can be welded together with uniform heating.
e)100 $^o$C to 150 $^o$C - when temperature exceeds 100 $^o$C intracellular water boils and vaporization of water within tissues occurs causing soft tissue ablation. The solid and liquid components turn into vapor in the form of smoke or steam. Rise in intracellular temperature and pressure leading to cellular rupture as well as release of vapor and cellular debris is termed as 'LASER plume'.

Excision of soft tissue commences at this temperature. In hard tissues ablation does not occur at this temperature, but the water component is vaporized and resulting jet of steam expands and then explodes the surrounding matter into small particles. This mixture of steam and solid is suctioned away. This microexplosion is termed **Spallation**.

f) More than 200 $^o$C, the tissue is dehydrated and then burned in the presence of air. Carbonization occurs with risk of soft tissue damage. It can be because of high power setting or slow movement of fiber tip across tissue surface.

Exposure of bone to heating at levels equal or more than 47 $^o$C is reported to induce cellular damage leading to osseous resorption. Temperature levels of equal to or more than 60 $^o$C result in tissue necrosis. With the possible exception of two wavelengths (Er: YAG and Er,Cr:YSGG) the effect of most dental LASERs on bone is generally detrimental. According to study by Fontana et al (11) temperature changes for different LASERs are as follows:

a) Diode LASER (810nm wavelength, time -9 seconds, power of 800mw, and 1.2 W and 300 μm optical fiber size) the temperature change in bone is 10$^o$C and 11$^o$C.
b) Diode LASER With time of 03 seconds and 600 mw setting there is no bone damage.
c) CO2 LASER the temperature change in bone is 1.4$^o$C to 2.1$^o$C
Nd: YAG LASER the temperature changes in bone are 8.0 degree to 11.1$^o$C
Er: YAG LASER (At pulse energy of 100mJ/ pulse and 10 Hz) there is no melting or carbonization.
Er,Cr:YSGG LASER ( 5 W and 8 Hz) there is no change in calcium phosphate ratio. No evidence of charring or melting, hence good or osteotomy procedure. (12)

For root surface, Er:YAG LASER would appear to be instrument of choice for effective removal of calculus, for root etching and for creation of a biocompatible surface for cell or tissue reattachment.


X. PRECAUTIONS DURING LASER SURGERY

1. CO$_2$ LASER beam may be reflected from shiny metal surfaces that may cause inadvertent injury to adjacent tissues. Protective eyewear specific to block wavelength of LASER is used (13).
2. Patients eyes, throat and delicate oral tissues outside the surgical site should be protected from accidental beam impact through use of safety glasses and wet towels or gauze packs. (14)
3. Adequate high speed evacuation should be used to capture LASER plume which is biohazard.

4. Hard tissue should be protected while doing soft tissue surgery such as flat bladed instrument or silver foil between gingiva and teeth. (15)

## XI. Wound healing

Comparative studies have indicated that $CO_2$ LASER induced wounds healed significantly faster than those created by Nd:YAG LASER, but both heal slower than conventional wound.

Accelerated healing has been reported but generally involves use of low level energy from Helium-Neon diode (Non periodontal applications).

Crespi et al showed indirect evidence of accelerated healing when $CO_2$ LASER is used in defocused mode. (16)

## XII. Conclusion

LASERs are thus a captivating technology and one of the best inventions of the twentieth century. The application of LASERs in Peridontology will definitely alter the clinical practice with numerous uses in the nonsurgical as well as surgical aspects of therapy.

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# Touch the Future

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*Abstract-* The purpose of this paper is to understand about WINDOWS 8 and have knowledge regarding the new features which are introduced by Microsoft in new versions of Windows. Windows 8 introduces significant changes to the operating system's platform, primarily focused towards improving its user experience. It takes advantage of new and emerging technologies.

**DEVELOPER:** Microsoft Corporation
**KERNEL TYPE:** Hybrid

## I. HARDWARE REQUIREMENTS

The minimum system requirements for Windows 8 are slightly higher than those of Windows 7 and differs from the other versions of Windows. The CPU must support the Physical Address Extension (PAE), NX bit, and SSE2. Windows Store apps require a screen resolution of 1024×768 or higher to run. Windows 8 requires the following hardware, at a minimum:

CPU: 1 GHz (with NX, PAE, and SSE2 support)
RAM: 1 GB (2 GB for 64-bit versions)
Hard Drive: 16 GB free space (20 GB free for 64-bit versions)
Graphics: A GPU that supports a least DirectX 9 with a WDDM driver
Processor: 1 gigahertz (GHz) or faster with support for PAE, NX, and SSE2

## II. SOFTWARE COMPLEXITY

There are three desktop editions of Windows 8 which present in two sub-editions: 32-bit and 64-bit.The 32-bit sub-edition runs on CPUs compatible with x86 architecture 3rd generation (known as IA-32) or newer, and can run 32-bit and 16-bit applications, although 16-bit support must be enabled first.16-bit applications are developed for CPUs compatible with x86 2nd generation.32-bit versions of Windows 8 support up to 4 GB of RAM.

The 64-bit sub-edition runs on CPUs compatible with x86 8th generation (known as x86-64, or x64) or newer, and can run 32-bit and 64-bit programs. 32-bit programs and operating system are restricted to supporting only 4 gigabytes of memory while 64-bit systems can theoretically support 2048 gigabytes of memory. 64-bit operating systems require a different set of device drivers than those of 32-bit operating systems.

## III. WINDOWS 8 EDITIONS

(A) Windows : Windows 8 is the basic edition of Windows for the IA-32 and x64 architectures. Windows 8 also refer to this edition as "Core". This edition contains features aimed at the home market segment and provides all of the basic new Windows 8 features including the Start screen with semantic zoom, live tiles, Windows Store, Internet Explorer 10, connected standby, Microsoft account integration, the Windows desktop and more.

(B)Windows 8 Pro : Pro is the edition of Windows 8 for the PC enthusiast and business/technical professionals. Windows 8 Pro is comparable to Windows 7 Professional and Ultimate and is targeted towards enthusiasts and business users. It includes all the features of Windows 8. Additional features include the ability to receive Remote Desktop connections, the ability to participate in a Windows Server domain, Encrypting File System, Hyper-V, and Virtual Hard Disk Booting, Group Policy as well as BitLocker and BitLocker To Go. Windows Media Center functionality will be available only for Windows 8 Pro as a separate software package.The 64-bit version of Windows 8 Pro supports up to 512 GB while the 64-bit version of Windows 8 (standard) supports up to 128 GB.Windows 8 Pro supports a maximum of 2 physical CPUs and the standard version of Windows 8 just one. In total, up to 32 logical processors are supported in 32-bit versions of Windows 8, while up to 256 logical processors are supported in 64-bit versions. It has almost all the features of Windows 8.

(C) Windows 8 Enterprise : (The Enterprise) Windows 8 Pro has geared towards enterprise customers with Software Assurance agreements. Windows 8 Enterprise provides all the features in Windows 8 Pro , with additional features to assist with IT organization . This edition was released on August 16, 2012.It boasts Remote Desktop capacities, letting you see and control other computers (and letting them control yours in turn) for giving demonstrations or remotely troubleshooting a problem.

(D) Windows RT : Windows RT previously known as Windows on ARM or WOA, is an edition of Windows 8 made specifically for ARM devices. Windows RT is meant for tablets. It will offer probably better battery life and will be much simpler to use. Windows RT is only available to hardware makers for preinstallation and only runs the software included with it or downloaded from the Windows Store. Windows RT is only available pre-installed on ARM-based devices such as tablet PCs. It includes touch-optimized desktop versions of the basic set of Office 2013 applications to users.Windows RT only runs third-party software bought from Windows Store. Desktop software that run on previous versions of Windows cannot be run on Windows RT.Windows RT has the same user interface, application programming interface and update mechanism.Unlike

Windows Vista and Windows 7, there are no Starter, Home Basic, Home Premium, or Ultimate editions.

Windows 8 Pro and Windows 8 are the only two editions available for sale directly to the consumer. Windows 8 Enterprise is the edition intended for large organizations.All three editions of Windows 8 already mentioned will be available in either 32-bit or 64-bit versions.

## IV.   UPGRADING COMPATIBILTY

It is possible to upgrade from an IA-32 version of Windows 7 to an IA-32 version of Windows 8. An x64 version of Windows 7 can only be upgraded to an x64 version of Windows 8. It is possible to upgrade Windows XP SP3 or Windows Vista to Windows 8 Pro. The retail package entitled Windows 8 Pro Upgrade is restricted to upgrading a computer with licensed Windows XP SP3, Windows Vista or Windows 7. There is no upgrade path for Windows RT, as it is the only version of Windows that currently supports the ARM architecture.

## V.   WINDOWS 8 UPDATES

There is no service pack available for Windows 8. Instead of releasing a Windows 8 SP1 as Microsoft did with previous versions of Windows. Microsoft will release large, regular updates to Windows 8, incrementing the version number each time.Now we have   Windows 8.1 (originally codenamed Windows Blue ) after Windows 8 . This update will be free to existing Windows 8 users and  will bring feature changes, as well as fixes, to the operating system.Windows 8.1 was launched at the Microsoft Build Developer Conference in San Francisco and when available the final version will be available as a free downloadable Windows 8 update.

## VI.   PRICING OF WINDOWS 8 VERSIONS

Windows 8 Professional Upgrade - $69.99

Windows 8 Pro Pack – Product Key Card (no media) - $69.99
Windows 8 (Full Version) – OEM $99.99
Windows 8 Pro (Full Version) – OEM $139.99
The both OEM products are available in both 32-bits and 64-bits.

## VII.   FEATURES OF WINDOWS 8

(A) <u>The Windows 8 Desktop</u> : The Start screen of Windows 8 is very innovative and dynamic.We still have the familiar desktop, where you can do everything that you're used to doing with Windows.As soon as you turn on the PC  you are shown with a screen and that screen is known as THE LOCK SCREEN. Now, here you have no indication of what to do next.So, to remove this screen we can press any key or can press anywhere. After this we are shown with another screen after the lock screen swipes away.Another screen is known as the Login Screen. This is known as the login screen because here we need to give our password or kind of prove our identity to the computer before using it.

The first thing you see upon logging into Windows 8 is tile based interface or Metero UI. At first glance, the UI seems to go intuitively with touchscreen devices. The grid layout seems to facilitate such interactions. You can customize your grid by adding and arranging   the applications.The coolest thing of Windows 8 that allows you to personalize your desktop with the organization of the apps.It is able display real-time information through them.We can see that how the tiles update information.Live tiles on your Start screen animate with the latest information. Status updates, weather forecasts, Tweets, and more—you'll see live updates before you open a single app.In one glance over your tiles, you can have access to all that you need to be notified and take action on those which are urgent.The desktop you're used to—with its familiar folders and icons—is still here and better than ever, with a new taskbar and streamlined file management.

(B) <u>Changing the tiles size</u> : The application tiles are shown on the desktop. And we can change there size according to our comfort and requirement.Just right click on the particular tile you want resize and than appears a box at the bottom of the screen which has certain options. And from all those options one will be Larger/Smaller which helps us to change the size of the tile.
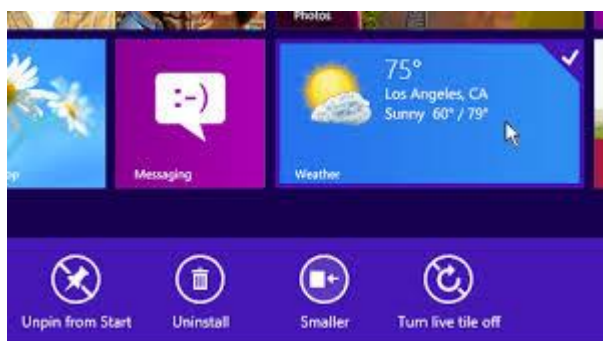
Here, the tile which is pointed is the larger one and we can change its size to smaller one by clicking on the smaller option. The messaging application shown here is of smaller size and after the change the weather application will too change into the smaller size.

(C) <u>Search Function</u> : The search function has also improved in Windows 8.You can also search within apps that utilize Windows 8′s search function.If you take the mouse to the right-top corner or at the botton-right corner thensearch pane pops out. And the search pane that pops out on the right of your desktop will contain the list of apps which you can conduct the search in. For instance, if you're looking for the emails sent by a particular contact, typing that name and clicking on the email app would allow you to search from within.
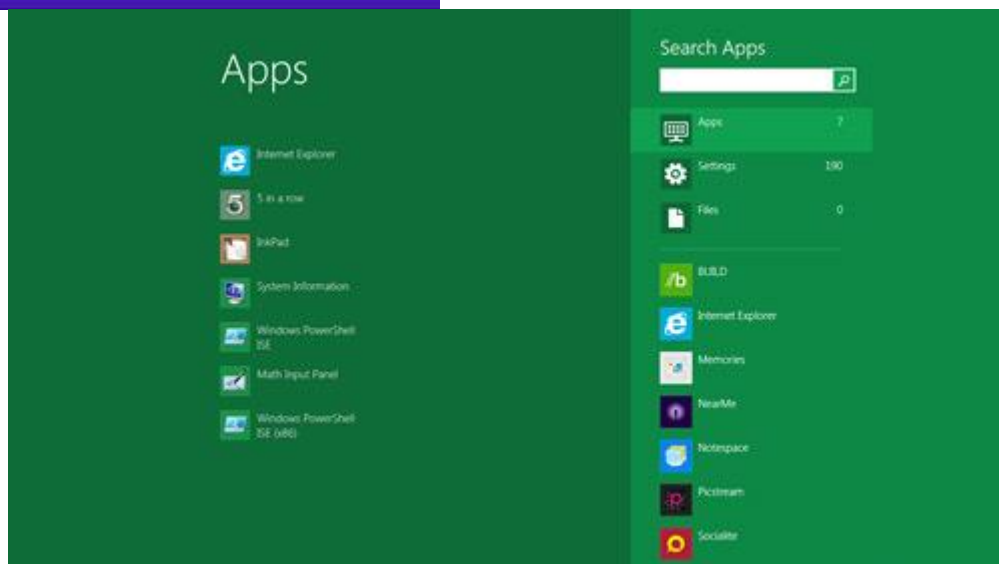
Here, the box below the search apps shows the space where we write the name of the application we are searching for.

(D) Charms : Charms is a new implementation of the traditional Windows start bar. Charms can also be used to quickly configure settings for individual apps. On an ordinary non-touch PC, charms are accessed by dragging the mouse to the bottom-left corner of the screen, to the same spot as the old Windows start button. On a tablet, you swipe from the right side of the screen to bring up charms.You can also use shortcut key for the charm box to appear on screen and the short cut key is windows key plus the letter C( ■ + C).This way charm box can appear by using the keyboard. The charms sidebar offers five sets of options, supporting both app-specific settings and system settings such as volume and brightness. The options include Start, Search, Share, Devices, and Settings.

•Start option - The Start option returns the user to the home screen. You can always get back to the Start screen by using the Start charm ( ■ ).
•Search option - The search button helps us to search for the required applications.We search across apps, files, and the web.

•Share option - The share option helps us to share the apps.Under the share option, the users can see social network sharing apps.You can Share with your friends instantly. When you're in a specific app, you can use the Share charm ( ■ +H) to share files, photos, or webpages with people you know. Select the item you want to share, open the charms, and then tap or click Share.

•Devices option -The devices option present a list of connected devices. You'll mainly use the Devices charm (Windows logo key+K) to set up printers and print documents, but you can also use it to sync info with your phone and stream video to your wireless TV. Open the charms and then tap or click Devices to see all the devices you've connected to your PC at any time.
•Settings option - The settings option helps us to change the settings of the PC. The volume,brightness, connection of PC to internet and all other things are done by using the settings option present in the Charm Box.



Here, the box which has been circled is known as Charm Box. On the top is search option then Share,Third is Start option,then devices and lastly settings option is present.

(E) Picture Password : We all use password to protect our PC i.e. for the security of our system. We are always told that the password should be a good one so that it cannot be gussed by anyone and any other person cannot access your system. So, in Windows 8 we have the concept of picture password. As the name suggests the we will be having a picture and according to out wish we can choose three points on the picture and everytime when you login to your computer you need to tell those points with the help of cursor, then only you can have access to the system.Even if you forget a single point then too you cannot have access to the PC.

Let us suppose that we have the above picture so we need to locate three points by tapping or clicking with the help of mouse and tell those points to the system like we do while we are typing in the password.

(F) <u>Switch apps</u> : If we have opened up many applications and all of them are running at the same time and we wish to move from one application to the other application then this feature is also present in Windows 8. We just need to take our sursor to the top-left corner of the screen and then click. Then we will see the other application which was opened after the one which we were using before.



Here, on the left side in the figure we can see a black box contaning three different boxes. Now, these three different boxes are  three different applications which are running at that particular moment. So, we can change by clicking on the top-left corner of the screen until the application which we want comes on the screen.

(G) <u>Shut down, lock your PC or sign out</u> : When you're done using your PC for a while, you can sign out, lock it, put it to sleep, or shut it down.In Windows 8, there's really no need to shut down your PC completely. Instead, you can put it to sleep.

This uses very little power, your PC starts up faster, and you're instantly back to where you left off. You don't have to worry that your battery will be drained because Windows automatically saves all your work and turns off the PC if the battery is too low.

To shut down your PC -
•Close any desktop apps you have open.
•Swipe in from the right edge of the screen, and then tap Settings.
•Tap or click Power, and then tap or click Shut down.



To lock your PC-
Locking your PC is a good option if you'll be back soon. You'll have to just enter your password when you come back, which helps to  keep your work more secure. The apps you were using will still be running, and everything will be the same the way you left it. Here's how to lock your PC:
•Open Start by swiping in from the right edge of the screen (or if you're using a mouse, pointing to the upper-right corner of the screen and moving the mouse pointer down), and then tapping or clicking Start.

•Tap or click your account picture in the upper-right corner, and then tap or click Lock.

To unlock your PC, just swipe up from the bottom edge of the screen (or press any key if you're using a keyboard) and then sign in.

To sign out your PC -

If someone else will be using your PC after you i.e. if you are sharing your PC, then signing out is a good option which will close all your apps which are running but will not shut down the PC. The other user can sign in into his account. Here , are steps for how to sign out of your PC :
•Open Start by swiping in from the right edge of the screen, and then tapping or clicking Start.
•Tap or click your account picture in the upper-right corner, and then tap or click Sign out.
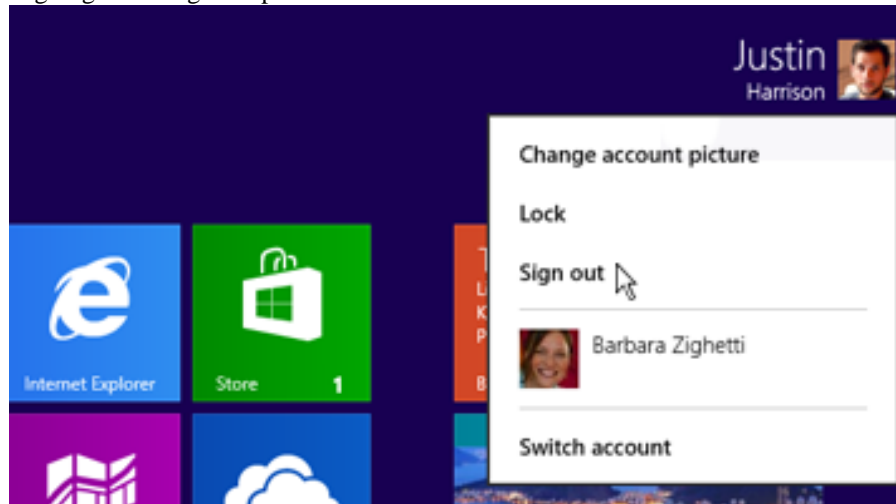


(H) Apps : Windows 8 has many built-in apps.You will see tiles for them on your start screen as you login to your PC. Like,
•People : Helps you to stay connected with everyone and see real-time updates from your email accounts, and Facebook, Twitter, and LinkedIn.
•Mail :It shows you mails and helps you to send messages from your accounts—including Yahoo! Mail and Outlook.com—all in one inbox.
•Photos : It helps you to see and share your photos and videos in one place, whether from Facebook, Flickr, SkyDrive, or another PC.
•Music :We can Listen to free streaming songs and get personalized music recommendations.We can also share our playlists and download songs we love.
•News : Customize your news, and see it in a dramatic, photo-rich format. See breaking updates and stay up to date on what's happening around the world.
•Weather : Shows us weather reports.
•Sports : Gives us all the latest updates regarding sports.

You can also search or browse for apps in Windows Store.



(I) Change start screen colour : We can also change the background and colour of our start screen.

Just swipe in from the right edge of the screen, tap Settings, and then tap Change PC settings.Tap or click Personalize, and then tap or click Start screen.Now, choose the colour according to your liking.
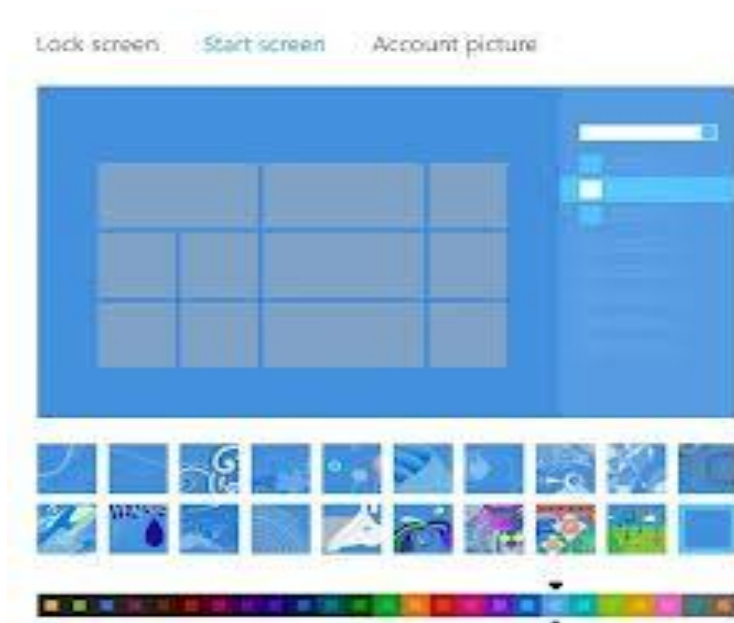
It helps us to change the Lock screen, Start screen and account picture. And the steps to do this are same as for the start screen.

(J) <u>Connect your Microsoft Account</u> : You can choose to sign in to your PC without a Microsoft account, but you need a Microsoft account to fully experience all these benefits.To connect to Microsoft Account -

•Swipe in from the right edge of the screen, tap Settings, and then tap Change PC settings.

•Tap or click Users, tap or click Sign in with a Microsoft account, and then follow the instructions.

•Add an account picture to go along with your sign-in info.



(K) <u>Snapping between apps</u> : In Windows 8, we can snap between two apps and can see the performance of both the apps at the same time. Now, it's easy to run two apps side-by-side.
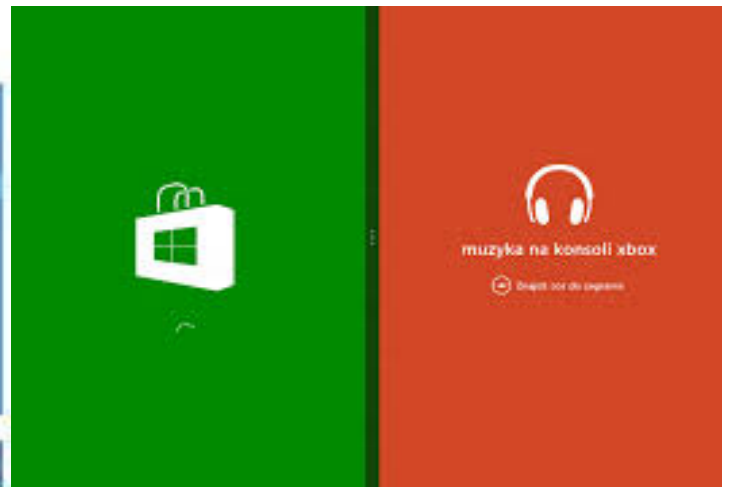
Swipe in from the left edge of the screen. As you do so, the previous app in the back stack will appear as a thumbnail image under your finger. Then, select the app you'd like to snap from the Switcher list and drag its thumbnail to the right. Then side-by-side Snap bar will appear.To snap the app to the left side of the screen, simply release the thumbnail (by raising your finger off the screen). To snap it to the right, drag the thumbnail to the right side of the screen and release it when the side-by-side Snap bar appears on that side of the screen.

(L) Better support for multiple monitors : Windows 8 also brings increased support for multiple monitors.It has capabilities for extending the taskbar across two PCs, without any need for third-party apps. You can also stretch wallpaper across two monitors, or display the Start screen on one PC and the desktop on the other.It's also easy to switch between multiple monitors. The primary monitor has a start button, and the secondary monitor has a switcher button. Clicking or tapping on the switcher button will swap it out for the start button, allowing you to turn the secondary monitor into the primary one.

(M) <u>ISO Support</u> : With Windows 8, native ISO mounting support is included — just double-click and go. Windows 8 can launch ISOs (and VHD files) natively.Double-click on a downloaded or ripped ISO to view its contents; right-click and choose 'Mount' to run it.
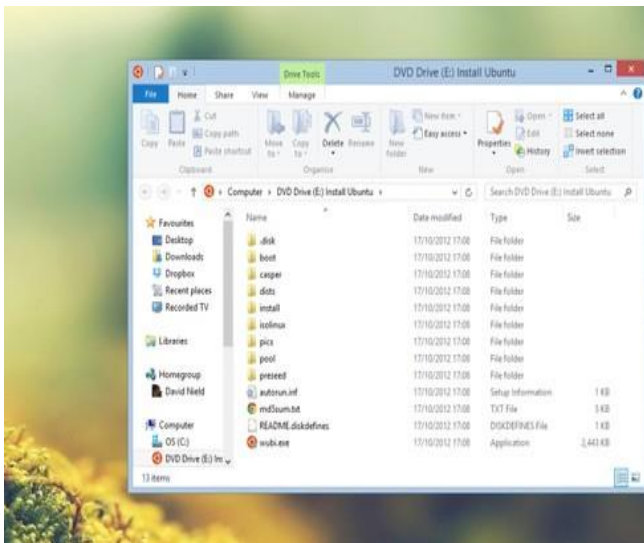
(N) <u>The secret start menu</u> : We have start menu as it was in other versions of windows. To get the start menu:

• Right-click in the lower-left corner to bring up a stripped-down Start menu.

•Moving your mouse cursor down to the bottom-left of the screen and left-clicking switches to the tiled Start page... but if you right-click instead, you'll be met with a menu linking to key areas of the operating system, including Control Panel, the command prompt and the Task Manager.

•
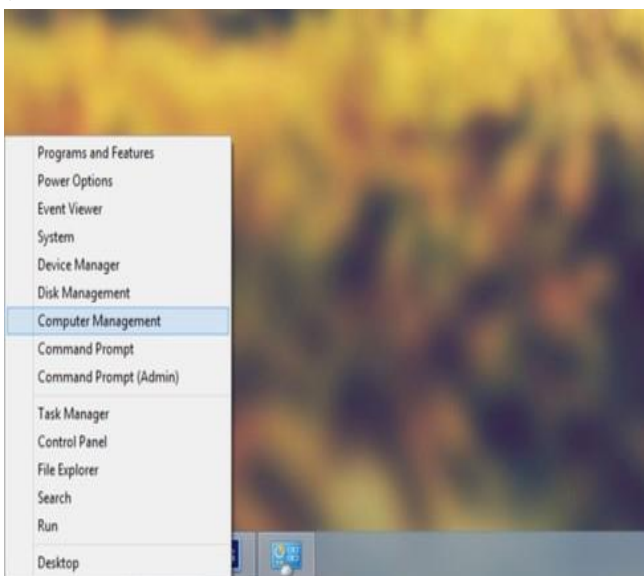


## VIII. WINDOWS 8 SHORTCUT KEYS

| KEYS | DESCRIPTION |
|---|---|
| i. ⊞ + D Desktop | Show |
| ii. ⊞ + C menu | Open charms |

| iii. ⊞ + F Search | Charms menu- |
| iv. ⊞ + H Share | Charms menu- |
| v. ⊞ + K Devices | Charms menu- |
| vi. ⊞ + I Settings | Charms menu- |
| vii. ⊞ + Q installed apps | Search for |
| viii. ⊞ + W settings | Search |
| ix. ⊞ + E Windows Explorer Window | Launch |
| x. ⊞ + L go to lock screen | Lock PC and |
| xi. ⊞ + T icons on Taskbar | Cycle through |
| xii. ⊞ + X Window Settings Menu | Advanced |
| xiii. ⊞ + M window | Minimize all |
| xiv. ⊞ + R dialog box | Open run |
| xv. ⊞ + Up Arrow Current window | Maximize |
| xvi. ⊞ + Down Arrow current window | Minimize |
| xvii. ⊞ + Print Screen and saves | Takes a print |
| xviii. ⊞ + Pause Break System properties | Display |
| xix. ⊞ + F1 windows help and support | Open |
| xx. ⊞ + V through notifications | Cycle |
| xxi. ⊞ + P secondary display modes | Choose |
| xxii. ⊞ + U access centre | Open ease of |
| xxiii. ⊞ + Enter | Open narrator |
| xxiv. ⊞ + + Magnifier | Zoom in using |
| xxv. ⊞ + - using magnifier | Zoom out |
| xxvi. ⊞ + Escape | Exit Magnifier |

## IX. CONCLUSION

Windows 8 marks Microsoft's attempt to reinvent the venerable operating system with giant, touch-friendly tiles replacing traditional desktop icons, and full-screen apps taking the place of resizable windows. However, Microsoft has also

retained the classic Windows desktop, and most programs designed for Windows XP, Vista or 7 will continue to run just as they always have. Certain basic Windows settings are also only accessible only from the desktop. This results in something of a schizophrenic user experience. If you're on a touchscreen device, such as a tablet or Windows 8 laptop, you may find yourself gravitating toward the tiled Windows 8 interface and apps, but you'll be forced back to the desktop any time you need to dig into the Windows file system.

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Also includes net search and many other sites.........



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# An Estimation of Mento-Labial Angle on Standardized Digital Photographs in Gujarati Population- A Cross Sectional Study

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*Abstract-* **Aim:** To estimate the value of mentolabial angle in local Gujarati adults with acceptable facial profile.
**Materials & Methods:** A cross sectional study was carried out to estimate the value of mentolabial angle on standardized digital photographs of Gujarati population (25 males and 25 females) between the age 18-25 years having well-balanced, acceptable and symmetrical face as judged by a group of three senior Orthodontists working in K.M. Shah Dental College and Hospital, SV, Piparia, Waghodia, Vadodara. Assessment of mentolabial angle was done using Dolphin imaging software 10.5.
**Results:** Student's t-test and Pearson's Correlation test were applied.  The measure of mentolabial sulcus angle was found higher in males (129.20° ±9.0°) than in females (125.48° ± 10.2°), stating that the local Gujarati males have more obtuse mentolabial angle than that in their female counterparts, but the difference was not statistically significant (p=0.178). Poor correlation was found between age and mentolabial angle in overall sample as well as in males and females.
**Conclusion:** The measure for mentolabial sulcus angle in Gujarati males having normal occlusion and pleasing profile is 129.20° ± 9.0° and that in Gujarati females is 125.48° ± 10.2°. Gujarati males show higher values i.e. more obtuse mentolabial angle than females, but it is not statistically significant.

*Index Terms*- Mentolabial angle, Gujarati Adults, digital photographs

## I. Introduction

It has long been established that self-esteem is strongly influenced by facial appearance[1]. Facial appearance also influences the overall physical appearance of an individual. Though the perception of an attractive face is largely subjective, with age, gender, race, ethnicity, culture and personality influencing average facial traits; it cannot be overlooked.[2, 3]

Various methods have been used to evaluate facial characteristics, such as anthropometry, [4] photogrammetry, [5, 6] computer imaging[7] and cephalometry.[8, 9, 10] Interestingly, facial features are usually studied in profile. Lip and chin form an important component of the oro-facial soft tissue profile.

Over the years, several lines and angles have been used to evaluate soft tissue facial aesthetics. Different areas of face play their role in improving facial acceptance. One of such areas is mentolabial sulcus which is studied by measuring the Mentolabial angle (Li-ILs-Pog') by joining three soft tissue points viz. Li (labrale inferior), ILs (Inferior labial sulcus) and Pog' (soft tissue Pogonion).  The morphology of this sulcus and measure of this angle is influenced both by the position of the lower lip and chin along with the inclination of mandibular incisor teeth. An acute mentolabial angle may be a reflection of the Dento-alveolar protrusion or an over-grown chin.

William Arnett and Robert Bergman in 1993[11] presented an organized and comprehensive clinical facial analysis and discussed the soft tissue changes associated with orthodontic and surgical treatments of malocclusion. Douglas Nguyen and Patrick Turley in 1998[12] found that Caucasian males who were depicted in the fashion magazines during the twentieth century have mentolabial angle 128.5° with SD of 11.29°.  Studies to estimate the Mentolabial angle have also been reported in populations like Croatia[13], Iraq[14], Saudi Arabia[15] and Lambada population of Andhra Pradesh India.[16]

Facial traits vary among various races across the world and in India there are many ethnic   races.  To the best of our knowledge, any such study on Gujarati population has not been reported anywhere in the literature. Hence there is a need to evaluate the measure of mentolabial angle in local Gujarati population to optimize their facial attractiveness.  The mentolabial angle is an important criteria for orthodontic diagnosis and treatment planning. This study will estimate an acceptable value of mentolabial angle in Gujarati population. This estimate of mentolabial angle would serve as a guide for aesthetic treatment goals for both orthodontists and oral and maxillofacial surgeons.

## II. Aim of the Study

Estimation of mentolabial angle in adult Gujarati males and females using standardized digital photographs.

## III. Objectives of the Study

1. To estimate the mentolabial angle from the digital profile photographs of Gujarati Adult males and females having normal occlusion and acceptable facial appearance.
2. To compare the measures of mentolabial angle between Gujarati males and females.

## IV. MATERIALS AND METHODS

The study was conducted in the Department of Orthodontics, K.M. Shah Dental College and Hospital. Participants were selected from the students and interns of K.M. Shah Dental College and S.B.K.S medical college, SV, Piparia, Waghodia, Vadodara. A total of 50 participants (25 males and 25 females) were selected on criteria mentioned below:

- All the participants included in the study should be in the age range of 18 to 25 years.
- They should be of Gujarati origin for the last two generations.
  - Individuals with well-balanced acceptable symmetrical face (As judged by a group of three Orthodontists)
- Individuals showing normal occlusion of permanent teeth.
- No history of previous orthodontic or facial trauma or facial surgical treatment.

The following equipments were used in the study: Nikon (D3100) Digital SLR camera of focal length 18-55mms, Tripod, Scale, Computer and Dolphin imaging solution 10.5version software.

## V. STANDARDIZATION OF PHOTOGRAPHS

As per the design, inclusion and exclusion criteria right lateral profile photographs of the samples were taken. Since it is a photographic study the photographs were standardized in the following way[17]:

1. All the photographs were taken by the principal investigator only.
2. The extra-oral photographs were taken with a suitable fixed distance between the participant and camera which was of 110cms.
3. All photographs were taken with the help of a tripod stand.
4. All the photographs were taken by keeping the line from the outer canthus of the eye to the superior attachment of the ear parallel to the horizontal plane.
5. All the photographs were taken in portrait mode without zoom.
6. Right facial profile photographs of subjects with relaxed oro-facial muscles were taken.

Once the digital image were obtained with the Nikon (D3100) digital SLR camera they were transferred to the computer installed with the software dolphin imaging solution 10.5 version. The digital images were calibrated for elimination of magnification of digital photograph accordingly by placing grids and additionally by DPI calibration in Dolphin Imagine 10.5 version software.

After calibration of image, the angular measurement of mentolabial angle was measured with the help of the dolphin imaging solutions.

The following landmarks[18] were digitized on the photographs:

- Labrale inferior (Li): The median point on the lower margin of the lower membranous lip.
- Inferior labial sulcus (ILs): The point of greatest concavity in the midline of the lower lip between Li and soft tissue pogonion. Also known as labiomental sulcus (si).
- Soft tissue pogonion (Pog'): The most prominent or anterior point on the chin in the midsagittal plane.

**Fig-1 Shows capturing of subject's photograph and its digitization for measuring mentolabial angle**
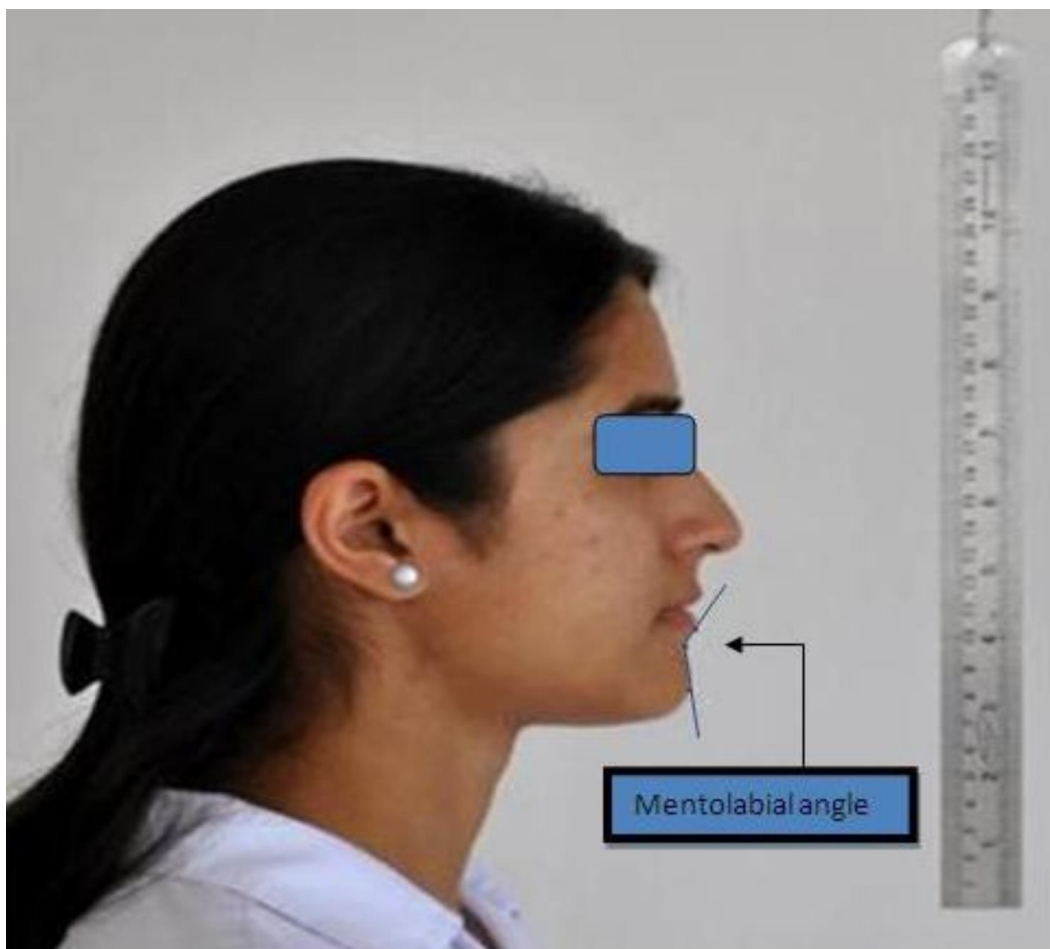


Mentolabial angle

females and 21.52° ±2.5° years for males. The mean value of mentolabial angle was found to be 129.2° ± 9.03° in males and 125.48° ± 10.2° in females.

## VI. OBSERVATIONS AND RESULTS

Table 1 and Chart-1 shows the mean values for age and mentolabial angle in all the participants. The mean age of participants in the study was found to be 21.0° ±2.45° for

| TABLE 1 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **MEAN AND SD VALUES FOR AGE AND MENTOLABIAL ANGLE IN MALES AND FEMALES** | | | | | | | |
| | | AGE IN YEARS | | | MENTOLABIAL ANGLE IN DEGREES | | |
| Sex | n | Mean | SD | C.V % | Mean | SD | C.V % |
| Male | 25 | 21.52 | 2.50 | 11.63% | 129.2° | 9.03 | 6.9874 |
| Female | 25 | 21 | 2.45 | 11.66% | 125.48° | 10.2 | 8.1211 |

## CHART-1   SHOWS MEAN MENTOLABIAL ANGLE OF THE PARTICIPANTS
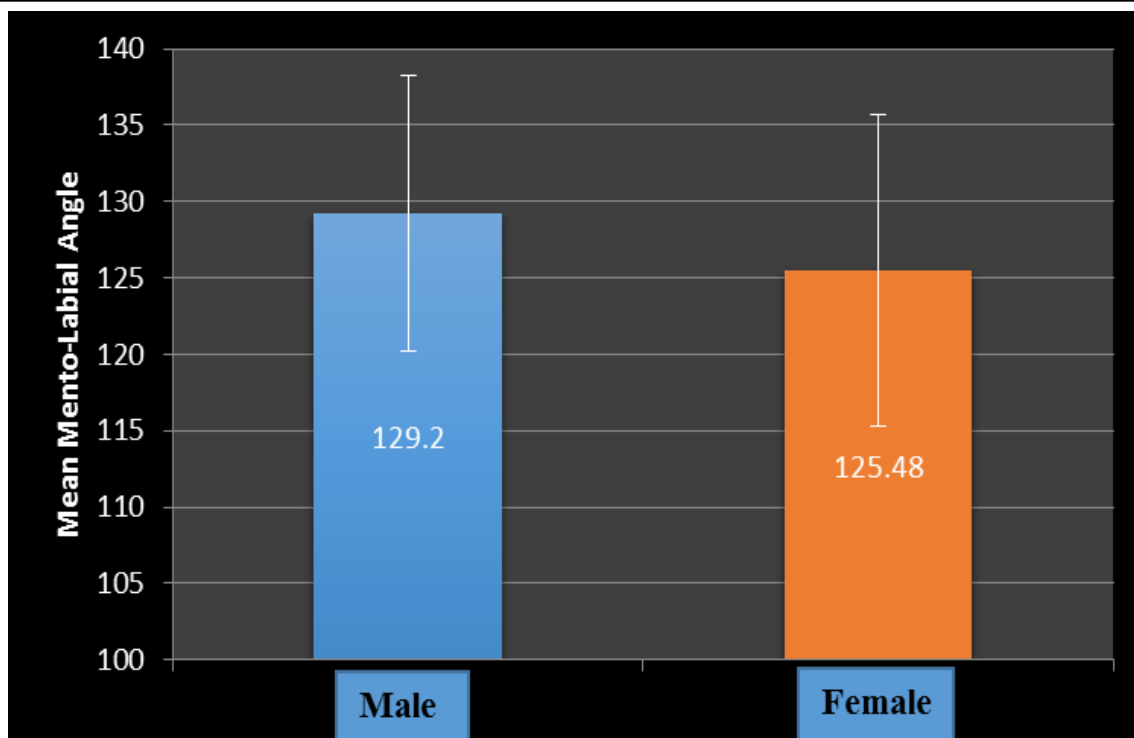


In present study Mentolabial sulcus angle is recorded for 25 Males and 25 Females, the angle is found to be slightly higher in males than that in females at both the ends that is minimum starting measure and maximum ending measure as shown in Chart 2.

## CHART-2   CORRELATION OF MENTOLABIAL SULCUS ANGLE IN MALES AND FEMALES
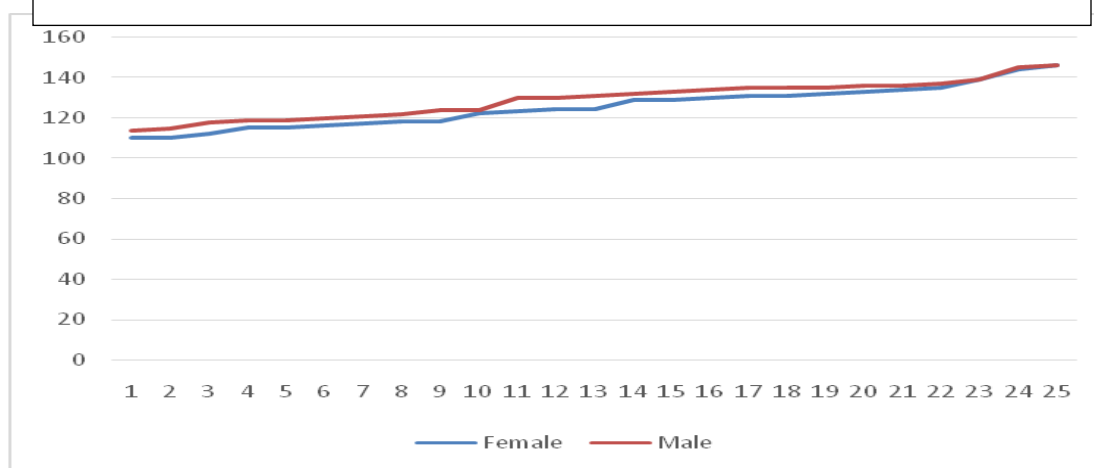


Table 2 shows student's t -test amongst mentolabial angle between male and female participants. Here Parameters show no difference between male and female. (p = 0.178)

| TABLE 2 | | | | | |
|---|---|---|---|---|---|
| CORRELATION OF MENTOLABIAL ANGLE BETWEEN MALES AND FEMALES | | | | | |
| MALES (n = 25) | | FEMALES (n = 25) | | t-test | p-value |
| Mean | SD | Mean | SD | | |
| 129.2° | 9.03° | 125.48° | 10.2° | 1.366 | 0.178 |

Table 3 shows correlation values amongst age and mentolabial angle in males and females. Here Parameters age v/s mentolabial angle show poor correlation at probability with p-value 0.615 in males and negative correlation in females with p-value 0.950, so it can be concluded that correlations are statistically insignificant.

| TABLE 3 | | | |
|---|---|---|---|
| CORRELATION BETWEEN AGE AND MENTOLABIAL ANGLE IN MALES AND FEMALES | | | |
| Sex | n | Pearson Correlation | P-value |
| Male | 25 | 0.106 | 0.615 |
| Female | 25 | -0.013 | 0.950 |

## VII. DISCUSSION

At the end of present study it is concluded that the measure for Mentolabial sulcus angle in Gujarati males having normal occlusion and pleasing profile is $129.20° \pm 9.0°$ while for females it is $125.48° \pm 10.2°$. Males have slightly higher values than female but there is no statistical significant difference between them.

However as per Anic-Milosevic S, Lapter-Varga M, Slaj M[13] - Croatia, Europe, the value for this angle for males is 129.26° while for females it is 134.50°. (Females have slightly higher values than males), as per Saba H Al-Zubaidi[14] – Mosul – Iraq, the value for this angle for males is 133.40° while for females it is 139.20° (Females have slightly higher values than males), as per Hayder Abdallah Hasmin[15] – Saudi Arabia, the value for this angle for males is 120° while for females it is 124.30° (Females have slightly higher values than males). The same results were found in Lambada population of Andhrapradesh[16] where females showed slightly higher values of mentolabial angle than males. It means in all these studies males had deeper mentolabial angles than their female counterparts whereas in the present study on Gujarati adults, the males showed shallower mentolabial angle than females.

To establish the norms for this angle for Gujarati males and females it is desirable that the study can further be expanded with a larger sample size. Further to find out to what extent this angle influences and has its role in acceptance of facial profile, large scaled full-fledged study or dissertation or special research work is required to be done taking the samples of individuals falling in different occlusal categories with and without pleasing and acceptable facial profiles.

## VIII. SUMMARY AND CONCLUSIONS

1. Measure for Mentolabial sulcus angle in Gujarati males having normal occlusion and pleasing profile is $129.20° \pm 9.0°$.
2. Measure for Mentolabial sulcus angle in Gujarati females having normal occlusion and pleasing profile is $125.48° \pm 10.2°$.
3. Gujarati males have slightly higher values of Mentolabial angle than females, but it is not statistically significant.

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# Design of Micro-grid System Based on Renewable Power Generation Units

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*Abstract-* Micro-grid system is currently a conceptual solution to fulfill the commitment of reliable power delivery for future power systems. Renewable power sources such as wind and hydro offer the best potential for emission free power for future micro-grid systems. This paper presents a micro-grid system based on wind and hydro power sources and addresses issues related to operation, control, and stability of the system. The micro-grid system investigated in this paper represents a case study in Newfoundland, Canada. It consists of a small hydro generation unit and a wind farm that contains nine variable- speed, double-fed induction generator based wind turbines. Using Matlab/Simulink, the system is modeled and simulated to identify the technical issues involved in the operation of a micro-grid system based on renewable power generation units. The operational modes, technical challenges and a brief outline of conceptual approaches to addressing some of the technical issues are presented for further investigation.

*Index Terms*- Renewable power generation, Distributed generation, Micro-grid, Simulation

## I. NOMENCLATURE

CERTS = Consortium for electric reliability techno- logy solutions
FC = Fuel cell
HGU = Hydro generation unit
MG = Micro-grid
MCFC = Molten carbonate fuel cell
NEDO = New energy and industrial technology development organization
NPEP = Newfoundland power energy plan
PV = Photovoltaic
PCC = Point of common coupling
PAFC = Phosphoric acid fuel cell
SOFC = Solid oxide fuel cell
WT = Wind turbine
WPGS = Wind power generation system

## II. INTRODUCTION

The demand for more power combined with interest in clean technologies has driven researchers to develop distributed power generation systems using renewable energy sources [1-3]. On the other hand, the integration of a large number of distributed gener- ations into distribution network is restricted due to the capacity limitation of the distribution networks and their unidirectional power flow behaviour [2, 4, 5]. Such barriers have motivated researchers to find an alternative conceptual solution to enhance the distributed generation integration into the distribution networks. An alternative approach called "Micro-grid" was proposed in 2001 as a means of integrating more distributed generations into the distribution networks [5].

Distributed generation in micro-grid operation provides benefits to the utility operators, distributed generation owners and consumers in terms of reliable power supply, transmission loss compensation, reduction in transmission system expansion and enhancement of renewable power penetration.

A review of the existing literature reveals that the first micro-grid architecture was proposed by R. H. Lasseter [5, 6], and called CERTS micro-grid. The CERTS micro-grid generally assumes converter-interfaced distributed generation units based on both renewable and non-renewable power sources. Barnes et al [8] also proposed a micro-grid system under the frame of the European project "Micro-grids". The European micro-grid architecture con- sists of two PV generators, one wind turbine, battery storage, controllable loads and a controlled interconnection for the local low voltage grid. The NEDO in Japan proposed three micro-grid projects in 2003 [9, 10]. The first NEDO micro-grid (1.7MW) system comprises different kinds of fuel cells such as MCFC, PAFC, SOFC, and photovoltaic (PV) system and battery stor- age.The second NEDO micro-grid (610kW) configuration consists of PV, WT, biomass and battery storage. The third NEDO micro- grid (750kW) system consists of PV, WT, MCFC, biogas and battery bank, which has very low percentage (13 percent) of renewable energy generation. Micro-grid research in Canada has started in universities with the cooperation of the CANMET energy technology center at Varennes [9]. This research group has identi- fied industry cases, such as the isolated Ramea wind-diesel micro- grid system, and the Fortis Alberta grid-tied micro-grid system for investigation. Canada's micro-grid research and development also evolved to develop a test bed for industrial-grade prototype testing and performance evaluation [9]. A study of micro-grid dynamic behavior, along with the control of the micro-generation units is performed by F. Kateraie [7]. This micro-grid system is based on the benchmark system of the IEEE Standard 399-1997 [11], which consists of three generation units comprising a diesel generator or a gas turbine generator, an electronically interfaced distributed generation and a fixed speed wind power generator. Research on micro-grid systems

is also found in literature, where the generation units and loads combination are arbitrarily assumed [12-16].

The diverse micro-generation units in a micro-grid system and the desire to integrate more clean power in future power network has led to a focus on a micro-grid system based on renewable power generation units in this research. As a whole, the characteristics of a micro-gri system depend on the size and nature of the micro- generation units in the micro-grid, as well as the site, and the availability of the primary energy resources on the site, especially for renewable power sources. Therefore, taking an existing real system is the better approach to investigate the micro-grid system issues rather than assuming or taking a hypothetical system. The objective of this research is to investigate the system behavior and technical issues of a micro-grid system contains renewable power generation units in Newfoundland.

Considering these reasons, the technical challenges and methods for addressing them for the system shown in Figure 1 have not been investigated yet. This paper investigates the technical challenges as- sociated with the wind farm and hydro generation based micro-grid system. In order to classify the technical challenges for the micro- grid system under investigation, three operational modes (Figure2) are considered: (a) grid connected system, (b) isolated system with wind power generation, and (c) isolated system without wind power generation.
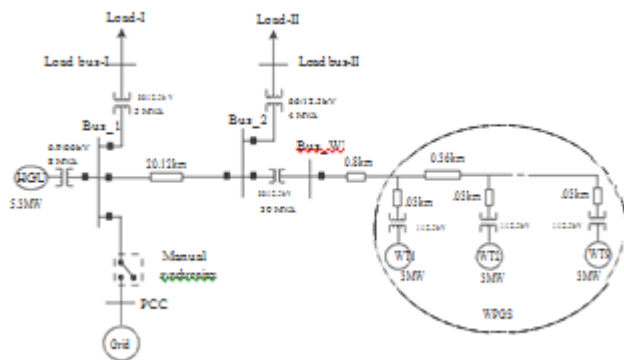


**Fig. 1 The micro-grid system currently under investigation**
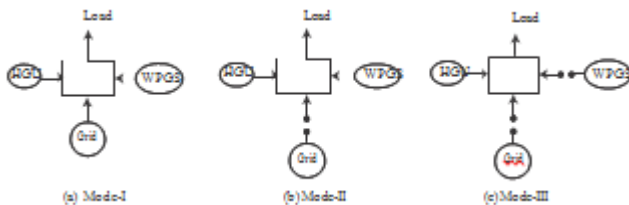


**Fig. 2 Micro-grid operational modes**

### III.  THE MICRO -GRID SYSTEM

The schematic of the micro-grid system shown in Figure 1 consists of a HGU, a WPGS, and two load areas represented as Load-I (3.94 MW, .9 MVar) and Load-II (2.82 MW, 0.84 MVar). The two load areas are connected through a 20.12 km transmission line and the two generating systems are connected

through a 21 km transmission line. The wind turbines are connected to bus 2 using its own transmission lines and a 12.5/66kV, 30 MVA power transformer. Load bus-II is connected to bus 2 and the power is delivered to the load using a 66/12.5kV, 4 MVA power transformer. Load bus-I is connected to bus 1 and the power is delivered to the load using a 66/12.5kV, 5 MVA power transformer. The HGU is connected to bus 1 using a 6.9/66kV, 8MVA power transformer. A conventional synchronous generator, equipped with IEEE standard excitation and governor system, is used for the HGU. A 66kV,1000 MVA grid is connected to bus 1. Both power generation systems operate in grid connected mode. The automatic isolated operation of the HGU is not the current practice of the utility owner, and the WPGS is not allowed to operate in isolated mode. In the event that the grid power is lost due to faults or scheduled maintenance, a black out would result until the HGU comes in operation. Even with the HGU in operation, some load shedding may be necessary since the HGU would not be able to meet the load demand. Therefore, the consequences of the grid outage are the key drivers which dictate the operational modes of the micro- grid system.

### IV.  OPERATIONAL MODES OF THE MICRO - GRID SYSTEM

Technical issues such as control, power balance strategies, oper- ation, protection and storage techniques differ from one micro-grid to another. The main reasons are the integration of high number of distributed power generation units near to the electrical loads, the nature and size of the micro-generation units, and availability of primary energy sources for renewable power generation units.

### V.  MODELING AND SIMULATION

The components of the identified system are modeled using MATLAB/SIMULINK software tool. The HGU model is the com- bination of the model of synchronous generator, hydro turbine and turbine governor system, and excitation system. The synchronous machine electrical system is modeled in a d-q rotor reference frame with the dynamics of stator, rotor and damper windings [17]. The synchronous machine parameters are obtained from Newfoundland Power, Canada and from [18]. Hydro turbine and turbine governor system model is given in [19]. The parameters for the hydro turbine and penstock are obtained from Newfoundland Power, Canada. The WPGS model consists of dynamic model of nine variable- speed doubly-fed induction generator based wind turbines. Vestas-90 wind turbine parameters are used in the developed wind turbine rotor model [20]. The induction machine electrical system is modeled in a d-q synchronously rotating reference frame [17]. Generator parameters are obtained from [20, 21].

The utility grid is represented by an equivalent model of 66kV three phase voltage source with the short-circuit capacity of 1000 MVA and the reactance to resistance ratio of 22.2 [11].

A constant impedance load model is used in the system. The parameter information about the line, transformer and load are obtained from the utility company, Newfoundland Power.

Simulations for three operational modes (Fig. 2) are performed and the simulation results are presented in the following sections. The measurements presented in the simulation results are in per unit, while the base power is 27 MVA. The simulation was performed for a 60 seconds interval. The wind speed model [22] is used as the wind profile for the wind turbine rotor. WPGS with no output power represents the lack of sufficient wind velocity to generate electric power. The grid is isolated from the system at t=5 seconds because of a fault or regular maintenance in the transmission systems. The fault in the grid transmission systems (unintentional islanding) or their regular maintenance (intentional islanding) is simulated using a three phase circuit breaker with specific time settings.

**A. Mode-I: Grid connected mode**

The simulation results for Mode-I are represented in Figures 3(a- d), while WPGS and HGU are connected to the grid. No initial transient indicates the steady-state operation of the system in grid connected mode. Figure 3(a) shows the wind speed profile provided into the wind turbine rotor. Figure 3(c) and 3(b) show the generated power by the HGU, and by the WPGS, while nine wind turbines are in operation. The output of the WPGS varies due to the wind speed variation. Figure 3(d) represents the voltage at bus 1 which is in its rated value. These results indicate that the operation of the HGU and WPGS in grid connected mode is dictated by the grid with the expected system voltages and frequency set by the grid.
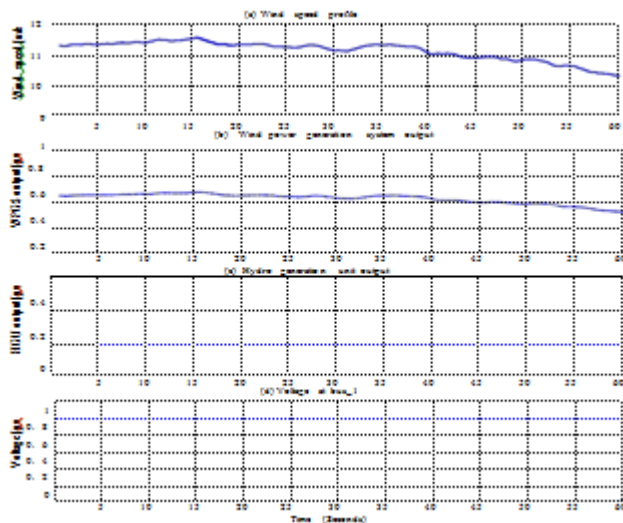


**Fig. 3 (a) Wind speed profile, (b) WPGS output power, (c) HGU output power, (d) Voltage at bus 1**

**B. Mode-II:** Isolated system with wind power generation

The system operation follows the Mode-I until t=5 seconds.

After t=5 seconds, the grid is isolated from the system. Figure

4(a) shows the micro-grid frequency, which is not in an acceptable range for the micro-grid operation. This indicates that

the power generation and consumption is not balanced in the micro-grid system. Figure 4(b) and 4(c) show the power contribution by the two generation units into the micro-gird, while assuming only one wind turbine is in operation in the WPGS after t=5 seconds. As HGU is the firm power generation system, it is decided to operate the HGU during the entire operation. However, the operation of WPGS with one or more wind turbines is decided based on load demand. Voltage at bus 1 is shown in Figure-4(d) which decreases after grid disconnection. This indicates the lack of sufficient reactive power in the micro-grid system, which was actually supplied by the grid in the grid connected mode. More than one wind turbine operating in the WPGS will deliver more active power in the micro-grid system than the load demand. In such case, the reactive power demand will also increase in the micro-grid system which results in more reduction in voltage level at different locations in the micro-grid system.

**C. Mode-III:** Isolated system without wind power generation

The system operation follows the Mode-I until t=5 seconds. However, at t=5 seconds, the grid is isolated from the system.
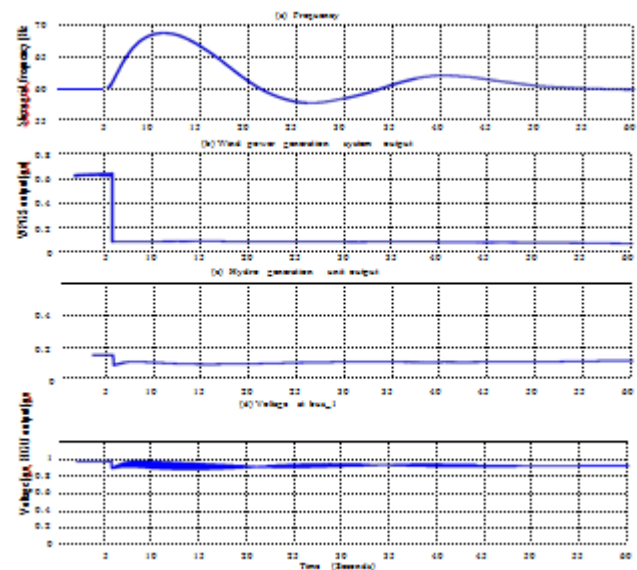


**Fig. 4. (a) Micro-grid frequency (Hz), (b) WPGS output power, (c) HGU output power, (d) Voltage at bus 1**

Concurrently, the WPGS has no output power as there is insufficient wind resource to produce electricity. This mode of operation is simulated, and the results are shown in Figure 5(a-d). Figure 5(a) shows the micro-grid frequency, which is not tolerable by the system. This also indicates that the power generation and consumption in micro-grid system is not balanced. Figure 5(c) shows the HGU output power and the zero output power from the WPGS is shown in Figure 5(b). The voltage level at bus 1 is shown in Figure 5(d) which is much lower than its rated value.

This indicates the requirement for reactive power in the micro-grid system. As the WPGS is not able to deliver power (Fig. 5(b)) after t=5 seconds due to the lack of sufficient wind,

the requirement of additional power from a reliable storage system is essential.

Based on simulation results, the issues related to micro-grid operation of the system under investigation can be summarized as:

• Active power imbalance and/or variation occurs in isolated micro-grid mode when wind power is available. A control scheme is required to maintain active power balance by storing or dumping surplus power. Motor-pump sets can be used to pump water using surplus power. However, a dump load is required to achieve better accuracy in power-frequency balance.

• Active power imbalance will occur between generation units and loads when wind power is not available in isolated micro- grid mode. A suitable storage system along with a control scheme is required to maintain power-frequency balance.

• Reactive power is required during isolated micro-grid operation to maintain the expected voltage level at different buses in the micro-grid system. The reactive power demand can be provided by STATCOM during isolated system with wind power generation and by storage unit during isolated system without wind power generation.

In addition, a control coordinator and monitoring system is re- quired for the micro-grid operation. A load flow based micro-grid monitoring and control coordinator scheme can be chosen for the proposed micro-grid system operation.
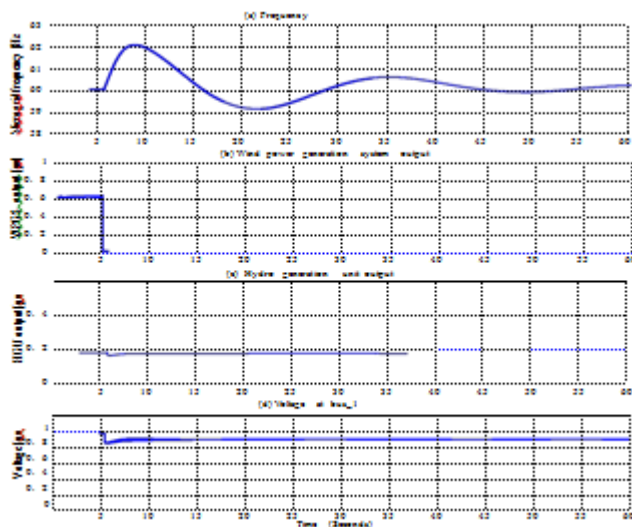


**Fig. 5.   (a) Micro-grid frequency (Hz), (b) WPGS output power, (c) HGU output power, (d) Voltage at bus 1**

## VI.   CONCLUSIONS

Micro-grid operation of a system based on renewable power generation units is presented in this paper. The system behavior and technical issues involved with three operational modes in micro-grid scheme are identified and discussed. The investigation is performed based on simulation results using Matlab/Simulink software package. Simulation results indicate that dump load and suitable storage system along with proper control scheme are additionally required for the operation of the study system in a micro-grid scheme. A control coordinator and

monitoring system is also required to monitor micro-grid system state and decide the necessary control action for an operational mode. The required control schemes development for the proposed micro-grid system is currently under investigation by the authors.

## VII.   ACKNOWLEDGEMENT

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# U-Commerce, the Technology with Broad Imagination: Exploring the Emerging Field of Wireless Communication

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***Abstract-*** As the technology shifts from traditional to electronic, electronic to mobile the way of commerce is also changed. But apart from all of these technologies and advancement we look another emerging field of wireless communication during this research, called U-Commerce.

U-commerce transforms the traditional commerce either geographic or electronic or mobile to a world of unique networks having universal devices. Through this users can do "business anywhere, anytime"; using a wide range of devices to invoke personalized services.

During this research, we look into the basic construct or building blocks of U-commerce and what are the obstacles faced in its implementations. Also perform a detailed analysis of the research questions and identified the top factors under consideration by several stakeholders while adopting this newly invented technology within its business.

***Index Terms***- U-commerce, m-commerce, e-commerce, Ubiquity, Universality

## I. INTRODUCTION

Commerce means buying and selling or the exchange on a large scale and includes transportation from one place to another. Until now we know some of the following types of commerce.

- ✓ E - Commerce: - Most popular, doing transaction on Internet
- ✓ M - Commerce: - Business transactions through mobile
- ✓ V - Commerce: - Using voice commands to do transactions
- ✓ P - Commerce: - Proximity commerce using Bluetooth or infrared technology

### A. Need of New Technologies

Newer technologies, empowered customers, and highly competitive marketplace make it imperative for businesses to invest in ways of improving the overall business performance. [1]

"The Internet has introduced a significant wave of change. Our communication patterns have changed. We have become dependent on email. We interact with firms via Web sites.

The next wave-introduced through wireless technology-is about to change our lives even more. The increase in transmission capacity of wireless devices lays the foundation for communication unrestricted by physical locations. [1] We can surf the Internet decoupled from landline computers.

In addition, we can do it any time, blurring the borderlines of business and private space. In the future, we will experience another wave of change-a world that provides the ultimate form of ubiquitous networks and universal devices, a world that presents an alternative view of space and time."

We are now shifted to do business in virtual space rather only proving ourselves in geographical space.

### B. Purpose of Study

Research has been conducted in order to critically evaluate and examine that how many individuals or businesses are in favor of adopting this new technology for doing their business.

The purpose of this study is also to observe and analyze the factors identified by several stakeholders to better understand the value of U-commerce in the near future.

Specifically, this study highlights the important factors that ensure to be implemented or fulfill while adopting U-Commerce business to increase customer satisfaction, secure and trusted mode of transactions and to develop loyalty for the company even as well.

### C. Subject of Study

A total of 50 senior level managers and technical leads in the field of marketing, HR, MIS served as subjects for this research. These are selected randomly not only from Pakistan but also from Dubai, Qatar, Sweden, and Australia even as well.

### D. Organization of Paper

The structure of this research has been designed in such a way that in next section we are going to understand the background of study followed by U-Commerce constructs and principle in section 3. In section 4 we compare the U-Commerce with other commerce technologies. Later on we can see some possible applications of it in section 5. In section 6, we perform a detail analysis of our research based on factors. The study based conclusion is described in following section and finally a brief recommendation about future work.

## II. BACKGROUND OF STUDY

The advancement of new technologies such as radio frequency identification (RFID) and sensor networks has initiated a trend towards ubiquitous computing, which is also called "anytime, anywhere" computing. [3][4]

In a ubiquitous computing environment, computing devices, applications, networks, and data will be fully integrated and merged. Almost any physical item can be embedded with computing power to establish a unique and verifiable identity, store a wealth of information, collect observations from the physical world, and sense changes in the environment. [3][4][5]

Ubiquitous computing has enabled a new paradigm of commerce which goes above and beyond any traditional commerce. This type of commerce is called "Ubiquitous/Universal Commerce", or simply "U-commerce", and is considered to be the ultimate form of commerce. U-commerce refers to the ability to interact and transact with anything and anyone, anytime and anywhere. [5][6]

Therefore, u-commerce is pervasive – as it will become a part of everyday life and will be so prevalent that most people would not even notice its presence. [11] U-commerce is going to be the next wave in commerce – i.e., after e- and m-commerce.

Personalization is the key in u-commerce. Technologies used in u-commerce, such as RFID and sensor networks, have the ability to identify, track, and trace objects automatically. The use of such technologies has made it technically possible for service providers and merchants to deliver personalized products to their customers based on customers' preferences, and geographical locations. [11][12]

U-commerce can provide a higher degree of personalization, which can provide additional benefits and value to customers. Despite the promising future of u-commerce and the tremendous benefits it can bring to customers, customers' privacy concerns appear to be the biggest obstacle and social issue. In order to enjoy the benefits of personalization in u-commerce, customers usually need to give up some of their personal information to the service providers or merchants. [12][13] The advancement of technologies embedded and used in the u-commerce environment raises concerns of customers because their personal information not only can be constantly accessed and continuously tracked, but also can be easily disseminated and possibly used in ways unknown to them. [13]

**E**lectronic commerce has hit the business world like a tsunami over the past several years, first with a wave of excitement around business-to-consumer (B2C), and then business-to-business (B2B) and person-to-person (P2P). [14] All of these channels, in fact, already exist. But an explosion of new commerce channels and devices is creating something totally new – an environment where buyers and sellers will literally be able to conduct commerce anytime, anywhere and any way they like. And for both buyers and sellers, this new environment provides more choice, more convenience, and more control over how they do business with one another. We call this integrating phenomenon "u-commerce" or universal, ubiquitous commerce. [14][15] It is about the integration of more value-added information into each transaction, in ways that benefit both consumers and businesses.

The idea has been prevalent since the first time people started thinking about conducting innovative forms of commerce other than g-commerce. As such, u-commerce can be viewed as the conceptual extension of g-, e- and m-commerce. [16] However, its purpose is not to serve as a substitute for any one of them; rather different forms of commerce will coexist. U-commerce simply represents the final (and still emerging)

destination of commerce—initiated by e- and propagated by m-commerce. Its purpose is to lay the groundwork for structuring future information systems and providing a discussion forum for trends in the field of IS. [14][16]



**Figure 9: U-Commerce Path**

## III. WHAT IS U-COMMERCE?

U-commerce transforms the traditional commerce either geographic or electronic or mobile to a world of unique networks having a wide range of devices to invoke personalized services. An experimental set-up is chosen that examines how U-commerce fit into our traditional understanding of IS and under what conditions does u-commerce technology impact perceptions of usefulness, and performance?

### A. The U-construct

When we compared U-Commerce to e-commerce and m-commerce, it reveals five characteristics that make it distinct:
✓ *Portability*

It comprises the physical aspects of mobile devices—one is able to readily carry them. Among the five characteristics, portability has a unique standing.
✓ *Reach ability*

It covers the idea that a person can be in touch and reached by other people 24 hours a day, 7 days a week— In an e-commerce, reach ability is limited to the computer level, or rather the plug-in level. [13]
✓ *Accessibility*

A user can access the mobile network at any time from any location—assuming adequate mobile network coverage. Future mobile technologies will allow users to stay connected permanently. [13][16]
✓ *Localization*

It is the ability to locate the position of a mobile user. As such, localization is the key to providing geographically specific value-added services (so-called location-based services) [13] [16]

### B. Vision and Managing Principle

U-commerce is a managing principle. As technology rapidly drives the convergence of many different spaces – information, financial services, communications – U-commerce can help us think more expansively. It's a vision that compels us to transcend borders – and build links. And it reminds us that technology is

valuable and it makes sense to the user – interesting and productive – and presents a clear business case.

### C. U-Commerce Barriers
✓ *Standards*

It means that the application or technology must follow the proper standards. Such as the Open System Interconnection (OSI) model describes how applications and components would communicate with others, or how Transmission Control Protocol/Internet Protocol (TCP/IP), a subset of OSI model, describes the modern Internet standards.

✓ *Security*

As money and information are transmitted across more devices, channels, the security of the transaction becomes more critical. [14] We must extend the same kind of security that exists in the physical world to virtual transactions and to ensure the privacy of users.

✓ *Systems*

Systems used to calculate and distribute value across the chain of users involved in transactions, so are the systems to seamlessly integrate the information across the various transaction components.

✓ *Simplicity*

The most difficult challenge is to integrate technology with simplicity. Without it failure in the consumer environment is almost guaranteed.
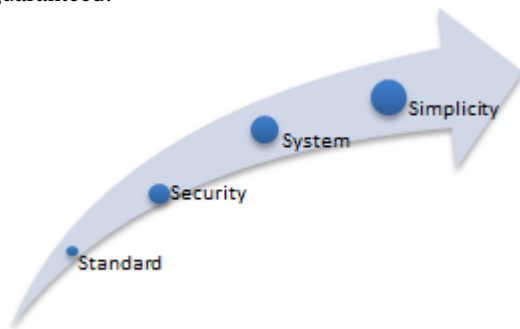


**Figure 10: U-commerce Barriers**

### D. The four building blocks of u-commerce
✓ *Ubiquity*

It allows users to access networks from everywhere at any time, and in turn to be reachable at any place and any time.

✓ *Uniqueness*

It allows users to be uniquely identified, not only in terms of their personal identity and associated preferences, but also in terms of their geographical location.

✓ *Universality*

Means mobile devices are universally usable and are multifunctional and used for managing the communication from everywhere.

✓ *Unison*

It means the idea of integrated data across multiple applications, so users have a consistent view on their information irrespective of the device and network used.
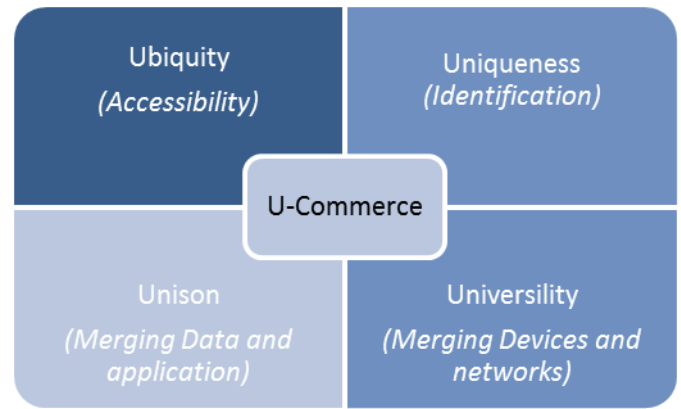


**Figure 11: U-Commerce Building blocks**

## IV. TECHNOLOGY SHIFT FROM E-COMMERCE TO U-COMMERCE?

### A. E-commerce to M-commerce
✓ Portability:

Customer's device can be taken almost anywhere.
✓ Reach ability:

M-commerce service can contact the customer at any time and any place.
✓ Accessibility:

Customer can contact m-commerce service at anytime from anywhere.
✓ Localization:

M-commerce service can locate person and provide value-added services to customer based on geographic location.
✓ Identification:

M-commerce service can identify who customer is.

### B. M-commerce to U-commerce
✓ Ubiquity = reach ability + accessibility + portability

The customer can be reached by and can reach the m-commerce service anywhere, anytime
✓ Uniqueness = localization + identification + portability

The customer's location and identity can be uniquely identified by the m-commerce service
✓ Universality = device + network

Universal usability of mobile technology for customer with multiple functions
✓ Unison = application + data

Data is kept in unison (synchronized) and is usable with multiple applications on multiple devices by customer

## V. DATA ANALYSIS AND FINDINGS

### A. 6.1 Do consumers want u-commerce?

When analyzing the data it comes to know that almost 55% of the sample population is in favor of adopting this newly emerging technology. It means that the people live in the world is always willing to adopt and learn the new technologies, because of its ubiquitous nature and universality. The pie chart shows [figure 4] the overall people interests in it.
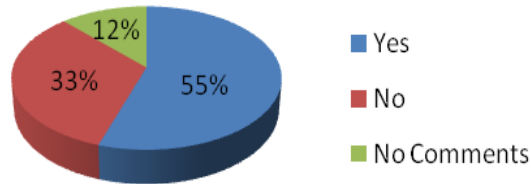
Figure 12: Market Analysis

### B. Factors Based Analysis

All the factors that were found to be important for U-Commerce were not given equal importance by the stakeholders. Some of the factors were given a lot of importance while others were given less importance.

We can see that the most important factors of U-Commerce Implementation are different for stakeholders from difference streams. The following tables show the most important factors/outcomes for stakeholders including business managers, technical persons, marketing, HR and operations.

**Table 1: Top factors identified by business manager based on ratings**

| Top factors identified as Business Managers | Ratings |
|---|---|
| Ease of availability of Network | |
| Convenience (time and place) | |
| Reliability | |
| IT and data security | |
| Increase in efficiency | |

**Table 2: Top factors identified by technical persons based on ratings**

| Top factors identified as Technical Persons | Ratings |
|---|---|
| Make the work more interesting | |
| Increase in quality of projects | |
| Improving communication between Consumers | |
| Infrastructural readiness | |
| Increase in productivity | |

**Table 3: Top factors identified by marketing stakeholders based on ratings**

| Top factors identified as Marketing Stakeholders | Ratings |
|---|---|
| Increase in efficiency | |
| Improving the project presentation | |
| Increase in quality of projects | |
| IT and data security | |
| Increase in productivity | |

**Table 4: Top factors identified by HR stakeholders based on ratings**

| Top factors identified as HR Stakeholders | Ratings |
|---|---|
| Convenience (time and place) | |
| Upgrading communication technology skills | |
| Improving the project presentation | |
| Financial readiness | |
| Increase in efficiency | |

**Table 5: Top factors identified by operations stakeholders based on ratings**

| Top factors identified as Operations stakeholders | Ratings |
|---|---|
| Ease of learning technology | |
| More focus on real-world tasks and examples | |
| Keeping up with current developments technology | |
| Availability of supportive softwares | |
| Improving communication between Consumers | |

### C. Demographic Analysis of Factors

✓ Analysis by Gender

When analyzing the data by gender, it is found that males are more in favour of adopting this technology than the females. The factors creating the lowest percentage of female are because of trust towards the technology and unawareness about it. This is obvious because of the environment created by technology is virtual and no one can adopt it until it will ensure them the proper security and transfer mechanism of data and information.
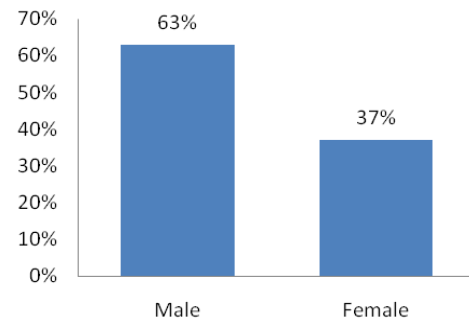


**Figure 14: Gender wise Analysis**

✓ Analysis by Marital Status

A higher degree of negation is found in married people as compared to un-married people on the average. Also threat of data and information theft and family problems are two strong reasons among married people. One of the reasons of this phenomenon may possible; most of the married people belong to higher age group and have issues on both official and personal, while unmarried people are working for stretched hours and willing to take chances in adopting the newest technology.
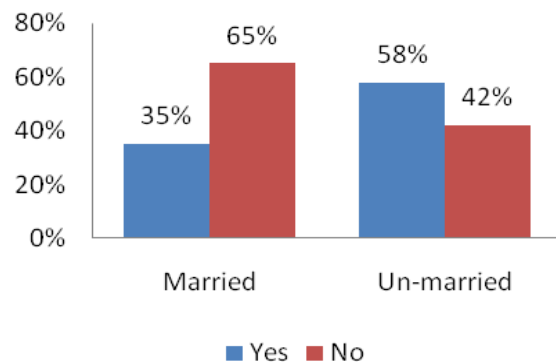


**Figure 13: Marital Status based Analysis**

✓  Analysis by Age

The data is collected from age groups ranging from below 20 years to above 30 years; however, no respondent reported the age above 40, while less percentage of respondents agreed for it. The respondents between 28–30 years are showing very high interest; while the age groups from 21 to 23 years and 24–26 years are reporting the moderate interest, and the obvious reason of this could be role overload and changing technology.
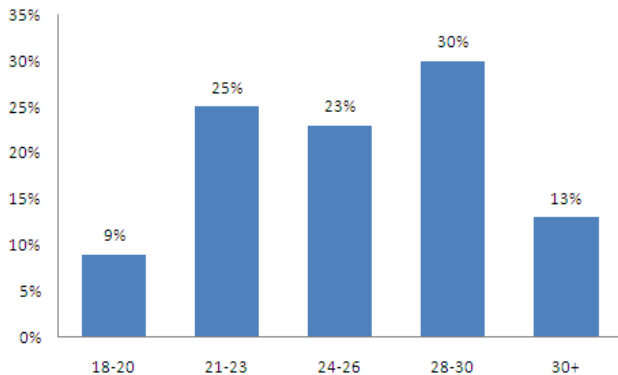


**Figure 15: Age Group Analysis**

## VI.  CONCLUSION

Through this research it has been concluded that U-Commerce is a continuously emerging field of wireless communication in the present age and one of the non-negligible technology in the market place. We have been seen in the whole research, U-Commerce enable users to connect the whole world anytime and from anywhere. There has been mix opinion of stakeholders about this technology but most of them are in favor of it. The major findings are:

✓  U-Commerce technology was perceived to be very useful for location-independent tasks.
✓  None of the technology either wireless or wired, turned out to be superior in terms of perceptions of ease of use. Through U-Commerce we can achieve high performance of non-location-dependent tasks.

In short, we say that U-Commerce is the creation of a marketplace and a landmark of wireless technology, which reaches individuals where they are at using the devices that they want to use, with the networks doing the work.

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# The Relationship between Emotional Intelligence and Leadership Performance in Primary Schools Managers of Isfahan

**Leila Javidparvar, Taghi Agha Hosseini, Rasoul Berjisian**

   **Abstract:**  The objective of the present study is to investigate the relationship between emotional intelligence and leadership performance in primary schools managers of Isfahan. The population of this study is all managers and teachers of state-run and ordinary primary schools in sextuple districts of Isfahan among which 80 managers and 160 teachers were selected using stratified sampling proportional to the population size and according to variables of gender and the location of the service area. The research method is applied in terms of objective and it is a filed study in terms of method of data collection, also it is correlation in terms of methodology. In this study, the Bar – On emotional intelligence questionnaire (1980) and Visca'smanagers' performance questionnaire (1989) were used. These questionnaires enjoyed construct validity. Using Cronbach for emotional intelligence the reliability was 0.93 and for performance 0.98.  The results showed that emotional intelligence and its components as well as manages' performances and their dimensions were above average and statistically significant (p= 0.000). The findings showed that the coefficient of determination between the components of emotional intelligence and performance was significant (R2=0.443 and p= 0.000).
   **Key words**: emotional intelligence, managers' performances, school managers.

## I.   INTRODUCTION

S cience has found the power and influence of emotions in human's mental life and is exploring and explaining the status of emotions in human activities, behavior and movements. In the felid of intelligence study, the studies have journeyed from logical intelligence based on cognition towards emotional intelligence. Emotional intelligence is the subject that tries to explicate and interpret the status of emotions in human capabilities. Scholl managers enjoying emotional intelligence are efficient leaders who realize the objectives with maximum efficiency and staff's satisfaction and commitment. Their approach to control is a kind of self-control based on self-consciousness.

  Studies show that those managers would be successful in the competition who could efficiently and effectively communicate with their human resources. In this regard, emotional intelligence is one of these components which can play significant roles in the relations between manages and staff. Recently, also some experts have found that emotional intelligence is more important than IQ for a manager or leader. Today, emotional intelligence has been explicated as a kind of intelligence which means how much an individual is aware of his emotions and feelings and how he controls and manages them. The point to be noted in line with emotional intelligence is that emotional intelligence skills are not inborn, but they can be acquired. Nowadays, the school management is defined as leadership, guide and a factor of change. The research has been conducted in this regard shows that the management of those schools have been successful whose teachers have the sense of belonging to those schools and their groups, have optimistic attitudes to their job and feel that their jobs are valuable. Those managers and leaders who found the foundations of strong and steadfast organizational cultures spend their time to declare the objectives and tasks of the school while they try to internalize and institutionalize these values in others and regularly warn them regarding the very nature of school's existence and its ideals. Under the leadership of such a leader, both students and teachers would be unanimous that they are parts and parcels of a more general, greater and more valuable task. This issue per se makes their everyday attempts meaningful and considers them as part of an important and special totality. Therefore, under emotional leadership, both students and teachers satisfy and enjoy because they are parts and parcels of an especial group, are in a unique period of time and are in line with advancing and promoting (Owens, 1991).

Efficient leaders are those who achieve the realization of curriculum objectives in a specific time framework in order to be effective for their schools. The reasons of great leaders' efficiency can be related to their strong views and ideas or strategies. However, there is a more important point which notes that great leaders work through their emotions. Nowadays, mere attention to planning and processes no more are sufficient because planning and controlling processes are based on individuals' performances and it should be noted that individuals' knowledge, skills and experiences are effective factors of successfulness in any organization. In recent research it can be observed that the influences of emotional intelligence on individual's successfulness, managers' performances and organizations' efficiency have attracted the attentions if all experts. Recently, leadership and management have been intertwined with emotional intelligence; also studies show that managers' efficiencies are naturally related to their social intelligence (Owens, 2004). Basic components of emotional intelligence have important advantages for content, training-learning process and teaching as well as how to manage and lead the educational organizations. A smart educational organization is aware of facilities and advantages of emotional intelligence in realizing educational objectives (Agha Hosseini. 2010). In fact, emotional intelligence is the determining factor of managers' successfulness and their lacking in success. In this regard, Goleman believes that the most important factor of managers' successfulness is not their IQ but their emotional intelligence has a greater role. Awareness of the importance and value of emotional intelligence results in improvement and development of organizational relations which this issue alongside IQ and managers' professional skills bring successfulness to schools.

Emotional intelligence is a basic ability for learning and a key feature for efficient leadership. Managing emotions by skills of controlling motions has relationship with managing through emotions. Managing emotions practically is related to how individuals behave with each other; therefore, in educational organizations managers roles are considered important. This skill helps individuals in self-regulation, being responsible to others, respecting others' views and articulating feelings. Managing emotions is a skill which approves the importance of leadership status in determining educational tasks, performing educational process sufficiently and self-esteem. Management through emotions is the ability of recognizing the emotional strengths of the organization's members for forming groups and making decision efficiently. The educational organization enjoying emotional intelligence causes job satisfaction and retention of teachers; therefore, the existence of emotional intelligence in individuals' relations leads to members' learning (Agha Hosseini, 2010).

So far, teaching emotional and social skills has been considered very less than cognitive and technical skills by designers and planners of curriculum. These skills which include retention of motivation in unpleasant situations, maintenance of self-confidence, successfulness in stressful working environments, appropriate response to different social situations, resolution of conflicts and aggressions, and etc. to fill the existing gap in line with training social and emotional skills in students, curriculum designers and planners should move in the framework of emotional intelligence and recognize its influences to be able to develop and produce effective curricula for this domain. Accordingly, curriculum designers and planners, educational designers, educational managers, in-service experts, HR managers and school managers can use the results of the present study to enjoy efficacy and have effective performances. The results obtained from this study in the fields of emotional intelligence add to the body of knowledge of views and ideas regarding emotional intelligence and leadership management. Knowing this issue that emotional intelligence enjoys influences on the performance of leadership principles can have a great  influence on how to choose educational managers.

Goleman, while doing his studies as an advisor, found that in all organizational levels, emotional intelligence is twice as important as having technical skills and IQ. Other studies indicate that emotional intelligence has a more important and greater in high levels of an organization. When Goleman investigated this issue, he reached these results that in high levels of an organization, those who have better performance than inadequate individuals, approximately 90 percent of the differences in their characteristics instead of cognitive abilities, refer to emotional intelligence (Rahim& Minors, 2003).

In fact, 80% of individuals' successfulness in work environment is dependent on emotional intelligence and only 20% of it is dependent on IQ; in other words, most of those who have better performances, enjoy high emotional intelligence. The reason why most of individuals who have lower performances is not because of the fact that they have less technical skills than others, but in most of the cases, these individuals have less

interpersonal skills, their work relationships are weak, are authoritarian and ambitious, or have some discords with the high level management. It is not surprising that if one claims that the influence of emotional intelligence increase as managers promote in the organizational hierarchy because the importance of organizational relations increases (Johnson &Indvik, 1999).

According to some studies, rational intelligence influences on performance and successfulness at least 10% (especially in the domain of management); but indeed the research by Robert Emmerling and Daniel Goleman (2002) states that for an individual's scientific work and performance, rational intelligence is a more predictive than emotional intelligence. However, when this question raises that "can a person be the best in his work or be a proficient manager?" here emotional intelligence is a better criterion and probably rational intelligence has an insufficient answer for this question. Goleman also in his recent book, *working with emotional intelligence* (1998), concentrate on the need for emotional intelligence in work environment, i.e. an environment in which reason is highly paid attention (Mori, 1998).

However, the higher one promotes along levels, the more important emotional intelligence than rational intelligence. Emotional intelligence is highly applicable in all organizational levels. But, in managerial levels, it has a vital importance. Emotional intelligence identifies and separates the best from the weakest insenior leadership positions up to 58% of accuracy because the conditions which are created in the top of organizational hierarchy spreads more rapidly. It is because of the fact that everyone looks his senior manager. The subordinate individuals learn their emotional behaviors from their managers. Even if a manager is not in sight (like the manager who works behind closed doors in higher classes) his views influence on subordinates. This is why that emotional intelligence enjoys a great importance for a competent leader (Goleman et al. 2002).

Most of the scholars working within emotional intelligence believe that in order to keep balance in behaviors, enjoy a better performance in the society or in an organization, or even within a family and married life, individuals should have IQ and EQ and use them appropriately. Emotional intelligence includes knowledge about emotions and how these emotions interact with IQ. It means that the individual who wants be successful in his life and be one of the super ordinate ones, he should be aware of his own feelings and those of others and use them logically (Kiersead, 1999).

In his study, Vakili (2006) investigates the influence of teaching some of the components of emotional intelligence on job satisfaction and employees' productivity. Controlling the variables of age, education and occupational group, the researcher selected 72 individuals from the employees. After administering the emotional intelligence questionnaire, 40 individuals having emotional intelligence below the average of society, were selected randomly into two control group and education group. After decreasing the number of participants and matching this number, 14 participants remained in each group. During 10 One-week intervals sessions, some components of emotional intelligence were taught. The results showed that education has had significant influences on promoting employees' productivity and its components as well as  improving the assessment of employees from the point of managers and its components except the work quantity and risk appetite in long-term.

Hassan Zadeh and Sadati (2010) investigate managers' emotional intelligence and its relationship with their anthropological characteristics. In this study, emotional intelligence of 140 managers of different educational courses in district 1 of Sari was investigated and the results are as follows: (1) there is no significant difference between managers' emotional intelligence in different educational grades (primary, middle, high school); (2) there is no significant difference between managers' emotional intelligence and different management experiences; (3) Women's emotional intelligence is more than men's; (4) professional managers' emotional intelligence is more than non-specialist managers'.

In a research paper about the school managers of Florida, Synder&Aanderson (1989), for the managers who have high performance, find features such as high emotional intelligence; accountability; firm decision making; commitment to the school mission; attention to the needs of students, teachers and other staff; efforts to establish good human relations; having emotional intelligence; collecting Information for decision making; adaptability; motivation; development-oriented orientation toward growing staff and students; delegation of authority; proper communication; organizational sensitivity; and ability to express themselves.

Stough-Lee (2003) conducted a study on 94 specialists in hiring employees titled as "The relationship between emotional intelligence, general intelligence, personality traits, workplace values and performance". In this study, Swinburne University Emotional Intelligence Test (SUEIT)was used for assessing the participant's emotional intelligence. The results indicated that emotional intelligence are predicts job performance more precisely than personality traits and IQ. Furthermore, both emotional management and emotional control have a positive correlation with staff's performance (teamwork, Motivating and developing others). Direct cognitive emotions are directly related to business performance (business development and trade works to improve personal business). Understanding customers' emotions are effectively related to a kind of establishing communication (servicing clients) with them.

Gardber (2003) conducted a study on 303 senior managers using SUEIT, whose obtained results indicated that emotional intelligence has a significant correlation with all parts of evolutionary leadership including emotional consciousness and emotional management. In addition, it is the best predicative of successfulness in this method of leadership.

Stone et al. (2004) in Canada conducted a study on 464 primary and high school managers and deputies (187 males and 277 females). The obtained results indicated that efficient managers are those whose behaviors are more flexible and who understand and apply their own emotions in solving problems and winning new achievements. In general, however emotional intelligence is an important factor in predicting the success rate in school managers; some of emotional intelligence components such as social self-consciousness, self-esteem, interpersonal relations, adaptability, ability to solve problems and control emotions are more predicative than others. Zcelik& Langton (2005) indicated that when staff has positive emotional states in their work place, they will create positive effects in their general performances. These researchers believe that paying attention to staff's needs creates thesense of belonging and commitment to the organization in them. In addition, this study shows that in organizations in which emotional atmosphereis paid attention and staff's needs are fulfilled, strong motivation and commitment to the organization is produced.

Koman& Wolf (2008) in a study titled as "Emotional intelligence competencies in the team and team leader. Amulti − level examination of the impact of emotional intelligence on team performance" concluded that there is a significant correlation between emotional intelligence of team leaders and group emotional norms. Furthermore, the findings showed that organizational leaders in all hierarchical rank fostered and supported emotional intelligence.

Margaret ,Hapkins& Bilimoria (2008) in their research titled as "Women's Leadership Development: Strategic Practices for Women and Organizations", concluded that there is no significant correlation between social and emotional competencies of female and male managers and leaders. Most of successful male and female managers were similar with each other in terms of social and emotional competency. However, gender as a moderating variable was effective between descriptive variables i.e. social and emotional competency and predictive variable i.e. successfulness.

Alston (2009) in his study concluded that among factors of emotional intelligence only emotions and feelings control had a significant correlation with leadership. Standard correlation between emotions and feelings control and leadership performance was 0.525. The results of this study showed the importance of emotional intelligence. Perhaps the reason why the rest of emotional intelligence factors had no significant correlation was high correlation of the component of emotions and feelings control with leadership performance and the existence of a linear correlation between emotional intelligence components with each other.

## II. METHODS

The present research is applied in terms of objective and correlation in terms of data collection. The population of the study includes all managers and teachers of state-run, ordinary primary schools in the sextuple areas of Isfahan, which according to the statistics of year 2011, the number of managers were 432 individuals and teachers were 3507 individuals, while the sample size was80 managers and 160 teachers. In this research, the stratified sampling proportional to the population size and according to variables of gender and the location of the service area was used. Two types of questionnaire (Bar-On emotional intelligence and Visca'smanagers' performance). Emotional intelligence test which has five components of intrapersonal relations, interpersonal

relations, adaptability, stress management and public mood was proposed by Bar-On in 1980. Regarding the validity and reliability of the emotional intelligence proposed by Bar-On, the emotional intelligence is standardized and enjoys construct validity. The Cronbach alpha for whole questionnaire was reported as 0.93.

The managers' performance questionnaire by Visca (1980) is known as the manager's performance evaluation in the present study which includes 71 five-choice questions which covers 5 leadership, educational, human relations, professional and administrational dimensions. It also measures managers' performance in different dimensions on a 5-point Likert scale. This questionnaire is also standard and enjoys validity. The obtained reliability coefficient using Alpha was 0.98 which indicates high reliability of the questionnaire. Descriptive and inferential statistics were used in this study. In descriptive level, frequency distribution, percentage, frequency, mean, median, index, standard deviation and variance were used. And in the inferential level, first the normality of the data using univariate Kolmogorov-Smirnov test was measured and One-sample t-test, t for two independent groups, one-way analysis of variance test, conditioned LSD, simple and multiple regression were used in properly.

### III. FINDINGS

In table1, it is observed that the mean scores of intrapersonal relations component is 3.67 with SD 0.44, the mean scores of interpersonal relations component is 3.96 with SD 0.49, the mean scores s of adaptability component 3.59 with SD 0.48, the mean scores of stress management is 3.4 with SD 0.5, the man scores of public mood is 3.83 with SD 0.53, and the total mean score of emotional intelligence is 3.7 with SD 0.347. Therefore, the mean scores of emotional intelligence and all of its components were above average and the distribution of scores were between minimum 2.17 related to stress management and maximum 4.9 related to intrapersonal relations. Furthermore, range of variations of emotional intelligence and all components was from minimum 1.72 related to emotional intelligence to maximum 2.61 related to adaptability component.

Table1 shows that the mean scores of leadership performance dimension is 3.68 with SD 0.36, the mean scores of educational dimension is 3.61 with SD 0.46, the mean scores of professional dimension is 3.4 with SD 0.73, the mean scores of dimensions of human relations and managers' performance is 3.7 with SD 0.62, the mean scores of administrational dimension is 3.91 with SD 0.56, and the total score is 3.66 with SD 0.37. In addition, the maximum and minimum values scores show that the maximum score is 2.06 related to administrational dimension score and the maximum is 5 related to dimensions of human relations and managers' performance. Therefore, the results show that among the components of performance, the highest mean is related to administrational dimension and the lowest to professional one. The total mean score is also above average.

**Table1: Indices of emotional intelligence and its components**

| | Indices / components | mean | Standard deviation | minimum | maximum | Score range |
|---|---|---|---|---|---|---|
| Emotional intelligence | Intrapersonal relations | 3.69 | 0.44 | 2.97 | 4.9 | 1.93 |
| | Interpersonal relations | 3.96 | 0.49 | 3 | 4.72 | 1.72 |
| | Adaptability | 3.59 | 0.48 | 2.28 | 4.89 | 2.61 |
| | Stress management | 3.4 | 0.5 | 2.17 | 4.42 | 2.25 |
| | Public mood | 3.83 | 0.53 | 2.67 | 5 | 2.33 |
| | Emotional intelligence | 3.7 | 0.347 | 2.79 | 4.69 | 1.9 |
| performance | Leadership | 3.68 | 0.36 | 2.54 | 4.62 | 2.08 |

| | | | | | |
|---|---|---|---|---|---|
| dimension | | | | | |
| Educational dimension | **3.61** | **0.46** | **2.4** | **4.93** | **2.58** |
| Professional dimension | **3.4** | **0.73** | **2.08** | **4.85** | **2.77** |
| Human relations dimension | **3.7** | **0.62** | **2.42** | **5** | **2.58** |
| Administrational dimension | **3.91** | **0.56** | **3.06** | **5** | **2.94** |
| Total performance | **3.66** | **0.37** | **2.75** | **4.61** | **1.86** |

In table2, it is observed that the correlation between emotional intelligence and managers' performance is 0.666 with coefficient of determination 0.443 where is significant at the level $p<0.01$. Therefore, 44.3 percent of variance of scores are related to primary school managers' performance in Isfahan and can be explainable by emotional intelligence scores.

**Table2 indices related to the relationship between emotional intelligence and performance**

| Indices ╱ variables | n | Beta | $R^2$ | df | $t_{ob}$ | P |
|---|---|---|---|---|---|---|
| Emotional intelligence and total performance | 80 | 0.666 | 0.443 | 78 | 7.883 | 0.0001 |

R = 0.702          $R^2$ = 0.493          $R^2 adjusted$ = 0.459

**Table3 Regression analysis to predict the performance based on components of emotional intelligence**

| Indices ╱ components | B | SEB | β | T | P |
|---|---|---|---|---|---|
| Fixed value | 1.005 | 0.344 | – | 2.918 | 0.005 |
| Intrapersonal relations | 0.233 | 0.083 | 0.275 | 2.788 | 0.007 |
| Interpersonal relations | 0.015 | 0.076 | 0.02 | 0.196 | 0.85 |
| adaptability | 0.3 | 0.085 | 0.386 | 3.519 | 0.001 |
| Stress management | 0.166 | 0.072 | 0.219 | 2.287 | 0.02 |
| Public mood | 0.056 | 0.074 | 0.079 | 0.756 | 0.45 |

The results of the table3 show that the multivariate correlation between the components of emotional intelligence and leadership performance is 0.72 with coefficient of determination 0.493. This coefficient shows that 49.3 percent of the variations and variance related to the primary school managers' performance scores are explainable by the quintet components i.e. intrapersonal relations, interpersonal relations, adaptability, stress management and public mood. The calculated F value with 5 and 74 degrees of freedom is significant at the level 0.01. Therefore, the obtained values of multivariate correlation and coefficient of determination with 99% confidence can be extended to the population.

## IV.    DISCUSSION AND CONCLUSION

The results showed that the mean scores of emotional intelligence, intrapersonal relations, interpersonal relations, adaptability, stress management, and public mood were above average. These results can be extended to all primary school managers in Isfahan. The results and findings of the present study are consistent with the theories presented by Meir-Saloy, Goleman and Bar-On, while Meir-Saloy believe that the ability of understanding emotions, appropriate and honest as well as flexible and innovative use of emotions in social situations in line with retaining positive motivations have significant role in achieving objectives while give this opportunity to the individual to change negative and harmful emotions to adaptable and harmonic ones. Bar-On states that emotional intelligence grows over time and can be improved by exercise, planning and psychotherapy. He believes that individuals with emotional intelligence higher than average, generally are more successful in fulfilling their needs and bearing environmental stress. In summary, they believe that individuals with high emotional intelligence have successful management, make decisions more appropriately, work with others better and understand them easily. Furthermore, the results of the present study are consistent with those of Vakili (2006), Stone (2004) and Koman& Wolf (2008). In his research, they showed that leaders with high emotional intelligence are more efficient and able to make better decisions.

The results showed that the mean scores of Isfahan' primary school managers' performance is above average. In a research paper about the school managers of Florida, Synder&Aanderson (1989), for the managers who have high performance, find features such as high emotional intelligence; accountability; firm decision making; commitment to the school mission; attention to the needs of students, teachers and other staff; efforts to establish good human relations; having emotional intelligence; collecting Information for decision making; adaptability; motivation; development-oriented orientation toward growing staff and students; delegation of authority; proper communication; organizational sensitivity; and ability to express themselves. The results of the present study are consistent with those of Synder&Aanderson (1989) and Zcelik&Langton (2005).

The obtained analyses indicate that the correlation between emotional intelligence and managers' performance is 0.666 and coefficient of determination is 0.443; therefore, 44.3 percent of scores variance related to Isfahan's primary school managers' performance is described, explainable and explicable by scores of emotional intelligence.

Goleman knows emotional intelligence as a prerequisite of successful leadership and states that for various reasons, individuals with higher emotional intelligence use evolutionary behaviors more likely. The leaders who are self-esteemed can be considered as models for their followers and therefore, promote their followers' respect toward themselves. The managers who enjoy higher emotional intelligence realize their followers' expectations reasonably with the emphasis on recognizing others' emotions and feelings. The main part and parcel of personal considerations is the ability to recognize followers' personal needs and interact with them appropriately. Leaders with high emotional intelligence by positive approval of sympathy and ability to manage relations, show their high personal considerations appropriately. Regarding the correlation between emotional intelligence and outcomes of leadership, the obtained findings are consistent with research conducted by Kiersted (1999), Vakili (2006), Love & Wang (2008),  Yeung et al. (1990), Barling (2002), Stough-Lee (2003), Gardner and Stough (2001), but Stone (2009)  shows in his research that there is no significant correlation between emotional intelligence and high performance, job satisfaction and efficacy.

Regarding the obtained findings, it suggested that;

1. Educational Workshops of emotional intelligence and its components should be held in order to promote managers' emotional intelligence.
2. Short-term training courses should be held in order to make leadership performance known for managers to know better. This issue leads to improving the performance of curricula and promoting the process of teaching-learning.
3. Educational workshops based on scientific content of new theories regarding emotional intelligence and the dimensions of managers' performance should be held in order to be the grounding of building required potentials for choosing managers with high performance.
4. Managers, by writing emotional short sentences on bulletin and using them for expressing feelings, managers encourage individuals to interact appropriately with others' emotions. Also, educational workshops should be held

and designed with the objective of the influences of direct correlation of emotional intelligence and dimensions of managers' performance.

5. Managers should hold sessions and ceremonies in schools in order to encourage teachers' team works, discuss regarding the delegation of authority and the effects of the responsibility of teachers, encourage teachers' innovations and also face them with healthy competition.

6. Managers should always take part in educational workshops and seminars in the region and province and introduce them the honors which they achieve. Also, they should update the teachers' information and knowledge regarding new improvements in curricula and educational planning.

7. By assessing and monitoring precisely the process of education, managers should align school activities with organizational goals, and in line with advancing the learning objectives and performing curricula, fulfill the educational needs.

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# Numerical comparison on Shell side performance of Helixchanger with center tube with different helix angles

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*Abstract-* Computational Fluid Dynamic (CFD) is a useful tool in solving and analyzing problems that involve fluid flows, while shell and tube heat exchanger is the most common type of heat exchanger and widely use in oil refinery and other large chemical processes because it suite for high pressure application. The numerical simulation of Shell & Tube Heat Exchanger with center tube called Helixchanger with center tube with different baffle inclination  is to be done. The processes in solving the simulation consist of modeling and meshing the basic geometry of Helixchanger using the CFD package ICEM CFD. Then, the boundary condition will be set before been simulate in Fluent based on the research papers experimental data. Finally results has been examined in CFD-POST. Parameter that had been used was the same parameter of experimental at constant mass flow rate of hot water and varies with mass flow rate at 50,60,70 & 80 LPM of cold water. Thus, this report presents the simulation of heat transfer & pressure drop in Helixchanger model with different baffle inclination as 20, 25, 30 & 40 degree, which gives insight of all parameters affect on Helixchanger design & it also suggests the optimized helix angle which gives better heat transfer with minimum pressure drop.

*Index Terms*- CFD, Helixchanger, Center tube, Heat transfer coefficient, Pressure drop.

## I. INTRODUCTION

### 1.1 Background of study

Heat exchangers are devices in which heat is transferred from one fluid to another. Heat exchangers are widely used equipment in various industries such as process, power generation, and transportation and refrigeration industry.

In addition to the basic need for transferring heat there are certain additional requirements which tend to be specific to the industry in which they are employed, Mukherji R. et al., 1988. For example, the exchanger used in automotive and aviation industry need to be lightweight. These exchangers as well as those used in commercial and domestic refrigeration tend to use the same types of fluid in many applications. The exchangers used in chemical process industry tend to be used for a wide variety of fluid types with different degree of cleanliness. In contrast, the exchangers used in cryogenic applications invariable handle relatively clean fluids. These and other similar industry  specific requirements have resulted  in development of different types of exchanger  ranging from  the conventional shell and tube heat  exchanger  to other tubular and non tubular exchangers of varying degree of compactness.

Shell and tube heat exchangers (STHXs) are widely used in many industrial areas, such as power plant, chemical engineering, petroleum refining, food processing, and etc. A large percentage of world market for heat exchangers is served by the industry workhorse, the shell-and-tube heat exchanger. According to Master B.I. et al., 2006. more than 35-40 % of heat exchangers are of the shell and tube type due to their robust geometry construction, easy maintenance and possible upgrades. Rugged safe construction, availability in a wide range of materials, mechanical reliability in service, availability of standards for specifications and designs, and long collective operating experience and familiarity with the designs are some of the reasons for its wide usage in industry. Recent developments in other exchanger geometries have penetrated in various industry applications; however, the shell and tube exchanger by far remains the industry choice where reliability and maintainability are vital. Over the years, significant research and development efforts are devoted to better understand the shell-side geometry. A variety of different strategies are available to

process and equipment designers to improve industrial heat transfer.

### 1.1.1 Shell and tube heat exchanger

The basic principle of operation is very simple as flows of two fluids with different temperature brought into close contact but prevented from mixing by a physical barrier. Then the temperature between two fluids tends to equalize by transfer of heat through the tube wall. The fluids can be either liquids or gases on either the shell or the tube side. In order to transfer heat efficiently, a large heat transfer area should be used, leading to the use of many tubes. In this way, waste heat can be put to use. This is an efficient way to conserve energy.

### 1.1.2 Helical Baffle Shell & Tube Heat Exchanger with center tube (Helixchanger)

The concept of helical baffle heat exchangers was developed for the first time in Czechoslovakia. The Helical baffle heat exchanger, also known as Helixchanger, is a superior shell-and-tube exchanger solution that removes many of the inherent deficiencies of conventional segmental-baffle exchangers. Helical baffle heat exchangers have shown very effective performance especially for the cases in which the heat transfer coefficient in shell side is controlled; or less pressure drop and less fouling are expected Kral D et al., 1993. It can also be very effective, where heat exchangers are predicted to be faced with vibration condition. Quadrant shaped baffle segments are arranged at an angle to the tube axis in a sequential pattern that guide the shell side fluid to flow in a helical path over the tube bundle. Helical flow path of the shell-side fluid can also be achieved by a continuous helix shaped baffle running throughout the length of the shell and tube heat exchanger.

Manufacturing of helical baffle is very difficult. In order to avoid manufacturing difficulties of continuous helical baffles in the center region, a center tube has to be installed, Chen G.D. et al., 2011.

The helical flow provides the necessary characteristics to reduce flow dispersion and generate near plug flow conditions. It also ensures a certain amount of cross flow to the tubes to provide high heat transfer coefficient. The shell-side flow configuration offers a very high conversion of pressure drop to heat transfer.

The Helixchanger design provides:-

- Enhanced (Heat transfer performance/ Shell-side pressure drop) ratio.
- Reduced fouling characteristics.
- Effective protection from flow-induced tube vibrations.
- It results in lower capital costs, reduced operating costs, lower maintenance costs and consequently, significant lower total life cycle costs.
- For existing plants, the Helixchanger design helps to increase the capacity while lowering maintenance cost, plot space and energy costs.

It is better to consider the Helixchanger option when investigating the following:-

- Plant upgrade with replacement tube bundles.
- Capacity expansion with limited plot space.
- Reduce fouling problems and frequent downtime
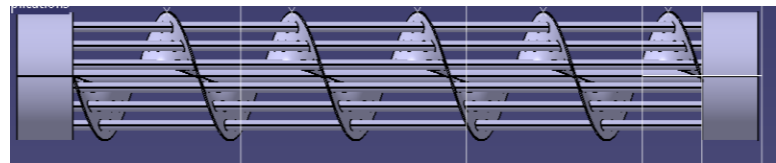


Fig. 1.1: Helical Baffled Shell & Tube Heat Exchanger (Helixchanger)

According to Yong-gang Lei et al. the performance of helixchanger depends on helix angle which determines pressure drop on shell side i.e. pumping power required. The heat transfer per unit pressure drop is a good metric for comparing the performance. As we know heat exchangers are widely used equipments in various mechanical, chemical, power generation and refrigeration industry. The present well established process design trend requiring high degree of heat recovery usually results in installing a larger heat exchanger area. However adding a few more heat exchangers causes an increase in pressure loss together with a greater pumping power requirement.

On the shell side the conventional segmental baffles exhibit rather high-pressure difference to produce sufficiently

high heat transfer rate. Therefore fresh look into the baffle arrangement is needed. So, use of helical shaped baffles is proposed.

The fluid flow pattern, particularly within the shell, may significantly influence the heat exchanger efficiency. The development of shell and tube exchanger centre on better conversion of pressure drop into heat transfer by improving the conventional baffle design.

## 2.Helixchanger & Segmental Heat Exchanger:

Conventional segmental baffles in shell and tube heat exchangers, while having an excellent record of acceptance and functionality, represent some limitations and shortcomings. In particular, shell-side flow path is wasteful which causes excessive pressure loss while recovering less heat transfer. This particular arrangement of baffles also limits maximum thermal effectiveness and encourages dead zones where fouling occurs, Sirous Z. M. et al.,2012.

Time & money spends on heat exchanger cleaning process for better performance. From fig. shown below it is observed that the running time for helical baffle is 3 times more than segmental baffle . It can be found out from mentioned pictures that the fouling for helical baffles is significantly lower and also distribution of fouling is more scattered all over the surface of tubes. On the other hand, fouling for segmental baffles is higher and is more accumulated on local areas. Accumulation of fouling on local areas causes corrosion on the surfaces of tubes and baffles and lowers the operation period of heat exchangers.
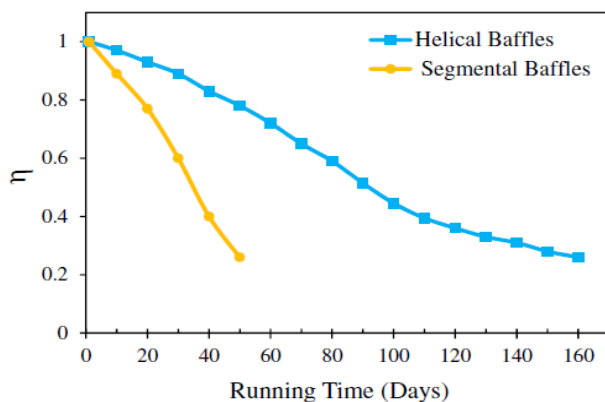


Fig.1.2 Running times of segmental and helical baffles.

## 2.1 Helixchanger with center tube:

Continuous helical baffles are manufactured by linking several sets of continuous helical cycles. One continuous helical cycle is lengthened to one screw pitch along the length (axial) direction and rotated at a $2\pi$ angle along the circumferential direction, and several continuous helical cycles are linked end to end to form continuous helicoids as shown in Fig.2.2.1(a)
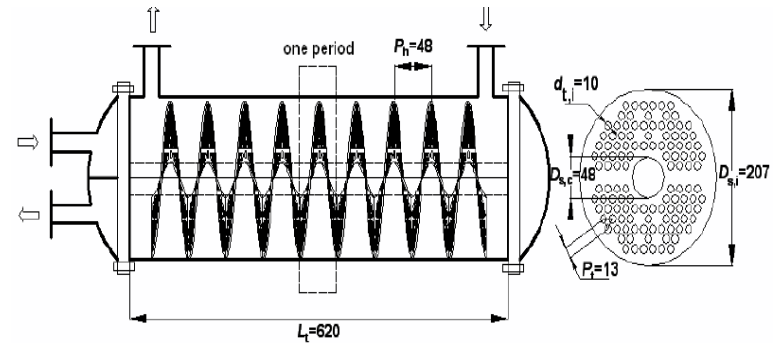


Fig .(a) Structure of simplified model (CH-STHX)
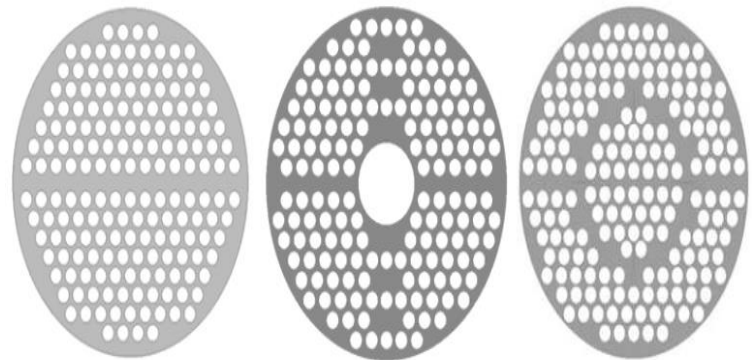


Fig(b) Layout of tubes in different heat exchangers
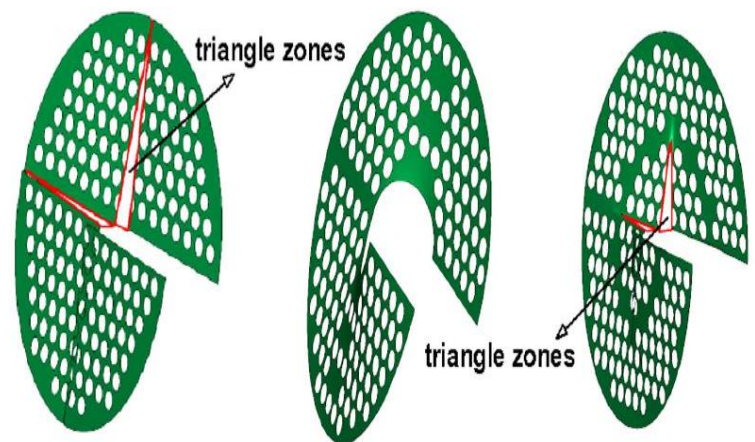


Fig(c) Structure of helical baffles in different heat exchangers
Fig. 1.3 Computational models of shell-and-tube heat exchangers with three different helical baffles (DCH STHX, CH-STHX and CMH-STHX).

Compared with the DCH-STHX, the "triangle zones" in CMH-STHX, which resulted in leakage, have been decreased greatly. the fluid passes though the tube bundles in an approximately helical pattern and there are serious leakages from the "triangle zones." The leaking fluid passes through the shell side without rushing across the tube bundle, which can result in lower heat transfer performance and lower pressure drop. the continuous helical baffles (CH-STHX) form a completely helix flow in the shell side, and there is no leakage. These advantages may contribute to its outstanding performance on heat transfer.

In order to avoid manufacturing difficulties of continuous helical baffles in the center region, a center tube has to be installed.

Table 2.1 Geometrical parameters.

| Sr No. | Parameters | Units | DCH | CMH | CH |
|---|---|---|---|---|---|
|  | Inlet diameter of shell | mm | 200 | 200 | 200 |
|  | Outlet diameter of tube | mm | 12 | 12 | 12 |
|  | Arrangement of tube bundles |  | Square | Square | Square |
|  | Distance between tubes | mm | 20.5 | 20.5 | 20.5 |
|  | Effective length of tubes | mm | 450 | 450 | 450 |
|  | Helical pitch | mm | 32 | 44 | 80 |
|  | Number of baffles |  | 12 | 9 | 5 |
|  | Number of tubes |  | 48 | 48 | 44 |
|  | Diameter of center tube | mm |  |  | 25 |
|  | Minimal flow area | m^2 | 0.0025 | 0.00343 | 0.00546 |

| | | | | | |
|---|---|---|---|---|---|
| Fluid in the shell side |  | oil | oil | oil |
| Mass flow rate | M^3/hr | 10.11 | 10.11 | 10.11 |
| Reynolds number |  | 3776.4 | 2752.5 | 786.7 |
| Inlet temperature | K | 373 | 373 | 373 |
| Outlet temperature | K | 365.7 | 365.9 | 367.8 |
| Tube wall temperature | K | 301.7 | 301.3 | 301.1 |
| Log mean temperature difference | K | 67.5 | 68.1 | 69.3 |
| Pressure drop | KPa | 4.32 | 2.89 | 1.70 |
| Heat transfer rate | KW | 39.1 | 37.8 | 27.9 |
| Heat transfer coefficient | W/m^2 K | 355.1 | 340.9 | 247.2 |
| Nusselt number |  | 33.8 | 32.4 | 23.5 |

**2.2 CFD simulation of Helixchanger:**

To model the full heat exchanger is quite difficult task. A 3D numerical simulation of a whole heat exchanger with middle-overlapped helical baffles is carried out by using commercial codes of GAMBIT 2.3 and FLEUNT 6.3. At first, the computational model and numerical method of the whole heat exchanger with middle-overlapped helical baffles is presented in detail, and parallel computation mode is adopted for the simulation of a whole heat exchanger with six cycles of the middle-overlapped helical baffles of 40° helical angle on a grid system of 13.5-million cells, J.F. Zhang et al., 2009.

The temperature of tube walls are set as constant and their values are taken from the average wall temperature determined in the experiments

After validation its found that the cycle average Nusselt number of different cycle in the heat exchanger & pressure drop within the accuracy allowed in engineering computation hence periodic model for one cycle can be used to investigate the heat transfer and pressure drop characteristics for different heat exchanger to save computational source, J.F. Zhang et al., 2009.
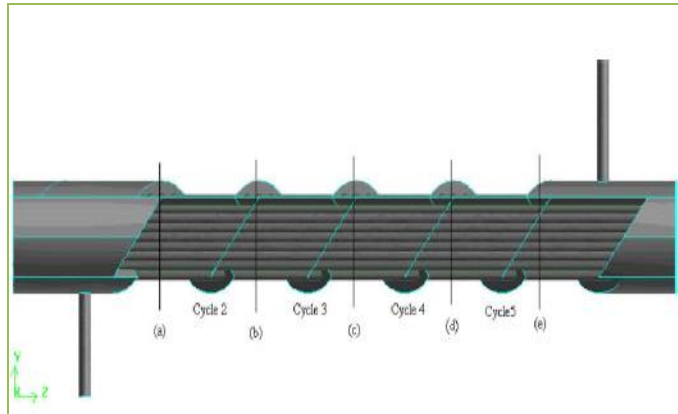


Fig. 1.4 Specifications of specified surfaces and geometric cycle units.

For the case studied the difference between the 2nd cycle and the fifth cycles are both less than 2% for both pressure drop and heat

| Sr No | Helix angle in degree ($\alpha$) | Baffle pitch (mm)= $\pi D_i \tan\alpha$ | No. of baffles |
|---|---|---|---|
| 1 | 20 | 175 | 6 |
| 2 | 25 | 224 | 5 |
| 3 | 30 | 277.5 | 4 |
| 4 | 40 | 403.3 | 3 |

transfer. Thus for the performance simulation of a STHXHB periodic model for one cycle can be used to investigate its performance without inducing large error.

Some researches indicated that the larger the helix angle, the better shell-side comprehensive performance of STHXCH when helix angle is less than 45∘. However, a large helix angle, or in other words a large helix pitch, has some adverse effects: first, the shell-side velocity becomes small under the same mass flow rate, which goes against heat transfer; second, the quantity of helical cycle is small, which means the helix flow is possibly not fully developed until it reaches the shell-side outlet; third, the unsupported span on the tube bundles

is large, which is not favorable for the prevention of fluid-induced vibration in the shell side, Ji shui et al., 2011.

## 3 Governing equations:

Continuity equation

$$\frac{\partial}{\partial x_i}(\rho u_i) = 0$$

Momentum equation

$$\frac{\partial}{\partial x_i}(\rho u_i u_j - \tau_{ij}) = -\frac{\partial p}{\partial x_i}$$

Energy equation

$$\frac{\partial}{\partial x_i}\left(\rho u_i T - k\frac{\partial T}{\partial x_i}\right) = 0$$
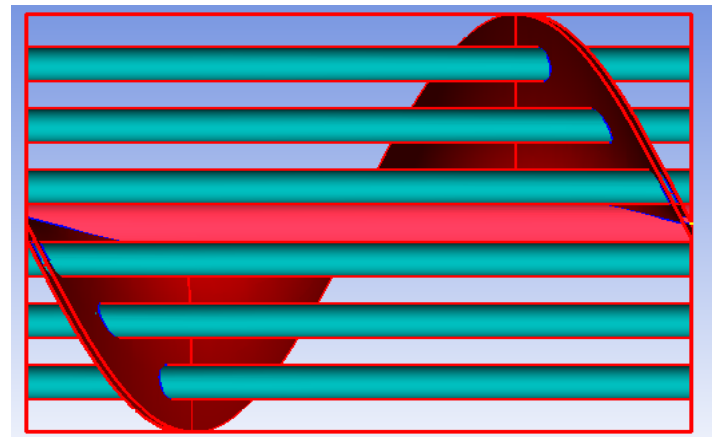


Fig. 1.5 Insight of a one cycle Helixchanger with center tube

Table: Baffle pitch

k-ε realizable turbulence model is applied. The governing equations are iteratively solved by using SIMPLE pressure-velocity coupled algorithm. The convergence criteria for energy variable (T) is < 10^-6. The sum of the normalized absolute residuals in each control volume for other flow variables (such as ui, p) are controlled to be < 10^-3. Each solution takes approximately 4-5 CPU hours to converge on personal computer having 8GB RAM & 2.1 GHZ processor.

**Numerical validation:**

Computational results were compared with the Periodic model with continuous helix, Zhang J.F. et al., 2009 and it is found that the good agreement in trend of shell side heat transfer coefficient versus mass flow rate.

## Computational Results
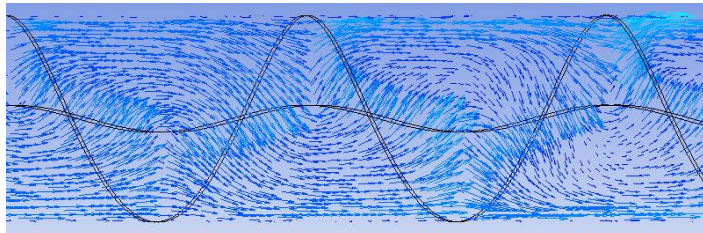


Figure 1.6 Vector plot for Helixchanger with center tube.

The velocity vector distributions & streamlines on the axial sections of shell side fluid are shown in Figure. The shell-side fluids pass through the tube bundles basically in a helical pattern and rush the heat exchange tubes with an inclination angle. On the one hand, helical flow avoids abrupt turns of flow. On the other hand, it changes the cross section shape of tube in flow direction into ellipse. Therefore, it can reduce the pressure drop in shell side and the vibration of tube bundle.

Table: Geometrical parameters
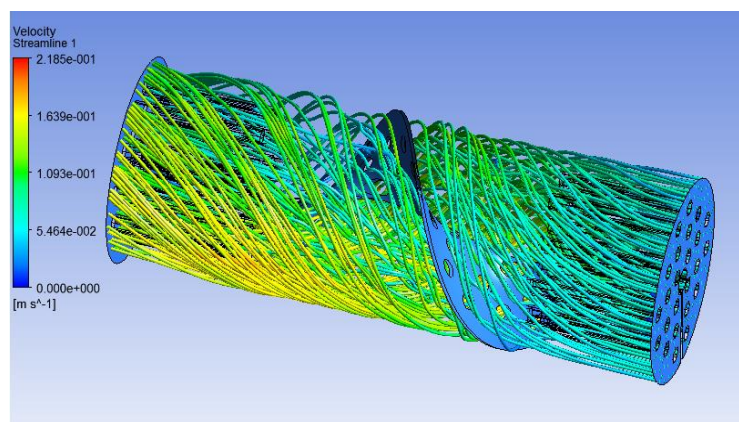


Figure 1.7 Velocity streamlines for Helixchanger with center tube.
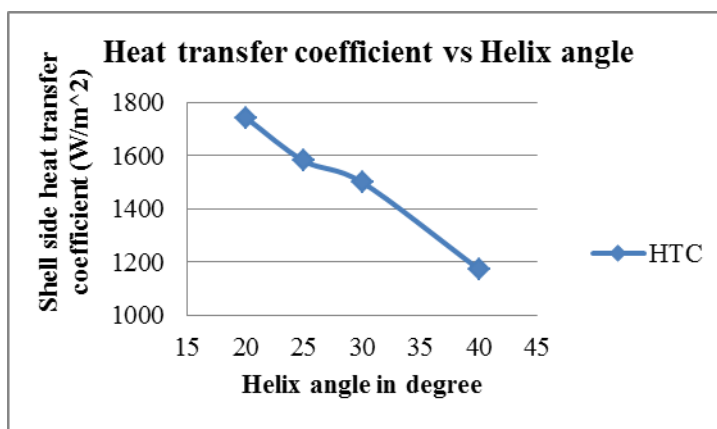


Figure 1.8 Heat transfer coefficient vs Helix angle
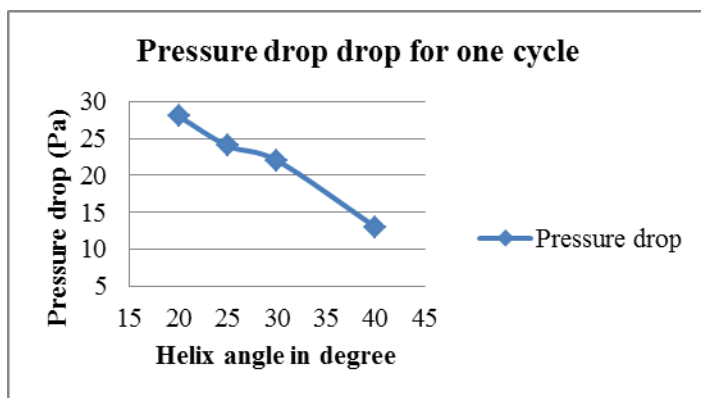


Figure 1.9 Pressure drop for one cycle

| Sr.no | Parameter | Shell side |
|---|---|---|
| 1 | Fluid | Water |
| 2 | Volume flow rate | 50,60,70,80,90 LPM |
| 3 | Mass flow rate | 0.84, 1, 1.17, 1.34, 1.67 kg/s |
| 4 | Shell ID ( $D_i$) | 0.153 m |
| 5 | Shell length | 1.123m |
| 6 | Tube pitch | 0.0225 m (Square) |
| 7 | No of passes | 1 |
| 8 | Tube OD | 0.012 m |
| 9 | Tube thickness | 0.0014 m |
| 10 | Number of Tubes | 24 |
| 11 | Helix angle | 20, 25, 30, 40 degrees |

**Conclusion**

In this paper, numerical simulations of Helixchanger with center tube with different baffle inclination angles are performed to reveal the effects of baffle inclination angle on the heat transfer and pressure drop characteristics. And based on those characteristics to provide an optimal baffle inclination angle for the required range of heat transfer coefficient and available pumping power. The major findings are summarized as follows:

- As helix angle decreases, the baffle pitch decreases and for the same mass flow shell side velocity increases and hence it leads to increase in heat transfer coefficient.

- Shell side pressure drop decreases with increase in helix angle because baffle pitch increases & flow achieves smooth behavior in shell side.

- Ratio HTC/Pressure drop is higher for helix angle >35º but along with this we should take into account achievable HTC (heat transfer coefficient) range by given helix angle as after certain Pressure drop, HTC values becomes flat. Therefore observing only the ratio of HTC/Pressure drop will not be sufficient, along with that we should take into account plot of HTC versus pressure drop per unit length also. So even HTC/Pressure drop is high for $40^0$ helix angle, its HTC is very small compared to other helix angles.

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# Handling Manet Routing Attacks Using Risk Aware Mitigation Mechanism with Extended D-S Theory

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*Abstract-* In MANET (Mobile Ad hoc Networks) is highly vulnerable to attacks in this Routing attacks are most important because they will cause devastating damage to MANET. In order to deal with the routing attacks in the existing system we are using the binary or naive-fuzzy theory of cost sensitive intrusion response system in MANET. But this model cause unexpected network partition and additional damage, It took the subjective knowledge and objective evidence but omitted the logical reasoning part. So in proposed system we are using the risk aware response mechanism based on the quantitative risk estimation and tolerance.

*Index Terms*- Mobile ad hoc networks, intrusion response, risk aware, dempster-shafer theory.

## I. INTRODUCTION

MOBILE Adhoc Networks (MANET) is utilized to set up wireless communication in improvised environments without a predefined infrastructure or centralized administration. Therefore, MANET has been normally deployed in adverse and hostile environments where central authority point is not necessary. Another unique characteristic of MANET is the dynamic nature of its network topology which would be frequently changed due to the unpredictable mobility of nodes. Furthermore, each mobile node in MANET plays a router role while transmitting data over the network. Hence, any compromised nodes under an adversary's control could cause significant damage to the functionality and security of its network since the impact would propagate in performing routing tasks. Several work [1], [2] addressed the intrusion response actions in MANET by isolating uncooperative nodes based on the node reputation derived from their behaviors. Such a simple response against malicious nodes often neglects possible negative side effects involved with the response actions. In MANET scenario, improper countermeasures may cause the unexpected network partition, bringing additional damages to the network infrastructure. To address the above-mentioned critical issues, more flexible and adaptive response should be investigated. The notion of risk can be adopted to support more adaptive responses to routing attacks in MANET [3]. However, risk assessment is still a nontrivial, challenging problem due to its involvements of subjective knowledge, objective evidence, and logical reasoning. Subjective knowledge could be retrieved from previous experience and objective evidence could be obtained from observation while logical reasoning requires a formal foundation. Wang et al. [4] proposed a naı̈ve fuzzy cost-sensitive intrusion response solution for MANET. Their cost model took subjective knowledge and objective evidence into account but omitted a seamless combination of two properties with logical reasoning. In this paper, we seek a way to bridge this gap by using Dempster-Shafer mathematical theory of evidence (D-S theory), which offers an alternative to traditional probability theory for representing uncertainty [5]. D-S theory has been adopted as a valuable tool for evaluating reliability and security in information systems and by other engineering fields [6], [7], where precise measurement is impossible to obtain or expert elicitation is required. D-S theory has several characteristics. First, it enables us to represent both subjective and objective evidences with basic probability assignment and belief function. Second, it supports Dempster's rule of combination (DRC) to combine several evidences together with probable reasoning. However, as identified in [8], [9], [10], [11], Dempster's rule of combination has several limitations, such as treating evidences equally without differentiating each evidence and considering priorities among them. To address these limitations in MANET intrusion response scenario, we introduce a new Dempster's rule of combination with a notion of importance factors (IF) in D-S evidence model. In this paper, we propose a risk-aware response mechanism to systematically cope with routing attacks in MANET, proposing an adaptive time-wise isolation method. Our risk-aware approach is based on the extended D-S evidence model. In order to evaluate our mechanism, we perform a series of simulated experiments with a proactive MANET routing protocol, Optimized Link State Routing Protocol (OLSR) [12]. In addition, we attempt to demonstrate the effectiveness of our solution.

### 1.1 EXISTING SYSTEM

Several work addressed the intrusion response actions in MANET by isolating uncooperative nodes based on the node reputation derived from their behaviors. Such a simple response against malicious nodes often neglects possible negative side effects involved with the response actions. In MANET scenario, improper countermeasures may cause the unexpected network partition, bringing additional damages to the network infrastructure. To address the above-mentioned critical issues, more flexible and adaptive response should be investigated. The notion of risk can be adopted to support more adaptive responses to routing attacks in MANET. Subjective knowledge could be retrieved from previous experience and objective evidence could be obtained from observation while logical reasoning requires a formal foundation. Wang et al. proposed a naıve fuzzy cost-

sensitive intrusion response solution for MANET. Their cost model took subjective knowledge and objective evidence into account but omitted a seamless combination of two properties with logical reasoning.

**DISADVANTAGE OF EXISTING SYSTEM:**

However, risk assessment is still a nontrivial, challenging problem due to its involvements of subjective knowledge, objective evidence, and logical reasoning.

**1.2 PROPOSED SYSTEM:**

We formally propose an extended D-S evidence model with importance factors and articulate expected properties for Dempster's rule of combination with importance factors (DRCIF). Our Dempster's rule of combination with importance factors is no associative and weighted, which has not been addressed in the literature. We propose an adaptive risk-aware response mechanism with the extended D-S evidence model, considering damages caused by both attacks and countermeasures. The addictiveness of our mechanism allows us to systematically cope with MANET routing attacks. We evaluate our response mechanism against representative attack scenarios and experiments. Our results clearly demonstrate the effectiveness and scalability of our risk-aware approach.

## II.   BACKGROUNDS

In this section, we overview the OLSR and routing attacks on OLSR.

### 2.1 OLSR Protocol

The major task of the routing protocol is to discover the topology to ensure that each node can acquire a recent map of the network to construct routes to its destinations. Several efficient routing protocols have been proposed for MANET. These protocols generally fall into one of two major categories: reactive routing protocols and proactive routing protocols. In reactive routing protocols, such as Adhoc On Demand Distance Vector (AODV) protocol, nodes find routes only when they must send data to the destination node whose route is unknown. In contrast, in proactive routing protocols, such as OLSR, nodes obtain routes by periodic exchange of topology information with other nodes and maintain route information all the time. OLSR protocol is a variation of the pure Link-state Routing (LSR) protocol and is designed specifically for MANET. OLSR protocol achieves optimization over LSR through the use of multipoint relay (MPR) to provide an efficient flooding mechanism by reducing the number of transmissions required. Unlike LSR, where every node declares its links and forward messages for their neighbors,only nodes selected as MPR nodes are responsible for advertising, as well as forwarding an MPR selector list advertised by other MPRs.
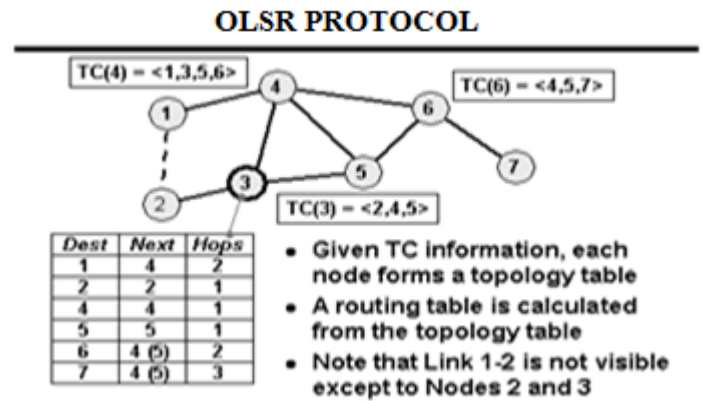


**Fig. 1. OLSR Protocol.**

### 2.2 Routing Attack on OLSR

Based on the behavior of attackers, attacks against MANET can be classified into passive or active attacks. Attacks can be further categorized as either outsider or insider attacks. With respect to the target, attacks could be also divided into data packet or routing packet attacks. In routing packet attacks, attackers could not only prevent existing paths from being used, but also spoof nonexistent paths to lure data packets.

## III.   EXTENDED DEMPSTER-SHAFER THEORY OF EVIDENCE

The Dempster-Shafer mathematical theory of evidence is both a theory of evidence and a theory of probable reasoning. The degree of belief models the evidence, while Dempster's rule of combination is the procedure to aggregate and summarize a corpus of evidences.

**Dempster's rule**

1. **Associative**. For DRC, the order of the information in the aggregated evidences does not impact the result. As shown in [10], a no associative combination rule is necessary for many cases.

2. **No weighted**. DRC implies that we trust all evidences equally [11]. However, in reality, our trust on different evidences may differ. In other words, it means we should consider various factors for each evidence.

### 3.1 Importance Factors and Belief Function

In D-S theory, propositions are represented as subsets of a given set. When a proposition corresponds to a subset of a frame of discernment, it implies that a particular frame discerns the proposition. First, we introduce a notion of importance factors.

*Definition 1.*

Importance factor (IF) is a positive real number associated with the importance of evidence. Ifs are derived from historical observations or expert experiences.

*Definition 2.*

An evidence E is a 2-tuple hm; IFi, where m describes the basic probability assignment [5].Basic probability assignment

function m is defined as follows: m(Φ)=0 and Σm(A)=1 (1) and Σm(A)=1 (2) According to [5], a function Bel:2θ ->[0,1] ,a belief function over θ if it is given by (3) for some basic probability assignment m:2θ->[0,1] Bel(A)=Σm(B) for all A ϵ 2 θ ,Bel(A),describes a measure of the total beliefs committed to the evidence A.Given several belief functions over the same frame of discernment and based on distinct bodies of evidence,Dempster's rule of combination, which is given by (4),enables us to compute the orthogonal sum, which describes the combined evidence.Suppose Bel1 and Bel2 are belief functions over the same frame θ, with basic probability assignments m1 and m2.Then, the function m : 2 θ->[0,1]; defined by m(θ)=0 and m(C)=(ΣAi ∩ Bj =Cmi (Ai) m2 (Bj))/(1-ΣAi∩Bj=Φm1(Ai)m2(Bj)) (4) for all nonempty C ⊆θ,, m(C) is a basic probability assignment which describes the combined evidence.Suppose IF1 and IF2 are importance factors of two independent evidences named E1 and E2, respectively. The combination of these two evidences implies that our total belief to these two evidences is 1, but in the same time, our belief to either of these evidences is less than 1. This is straightforward since if our belief to one evidence is 1, it would mean our belief to the other is 0, which models a meaningless evidence. And we define the importance factors of the combination result equals to (IF1 + IF2)=2.

***Definition 3.***

Extended D-S evidence model with importance factors: Suppose E1=<m1,IF1> and E2 =< m2, IF2> are two independent evidences. Then, the combination of E1 and E2 is E = <m1 Θ m2,(IF2+IF2)/2>, where Θ is Dempster's rule of combination with importance factors.

## 3.2 Expected Properties for Our Dempster's Rule of Combination with Importance Factors

The proposed rule of combination with importance factors should be a superset of Dempster's rule of combination. In this section, we describe four properties that a candidate Dempster's rule of combination with importance factors should follow. Properties 1 and 2 ensure that the combined result is a valid evidence. Property 3 guarantees that the original Dempster's Rule of Combination is a special case of Dempster's Rule of Combination with importance factors,where the combined evidences have the same priority. Property 4 ensures that importance factors of the evidences are also independent from each other. Property 1. No belief ought to be committed to in the result of our combination rule m'(Φ)=0 (5) Property 2. The total belief ought to be equal to 1 in the result of our combination rule Σm'(A)=1 (6) Property 3. If the importance factors of each evidence are equal, our Dempster's rule of combination should be equal to Dempster's rule of combination without importance factors m'(A,IF1,IF)= m(A); if IF1= IF2 (7) for all Aϵθ, where m(A) is the original Dempster'sCombination Rule. Property 4. Importance factors of each evidence must not beexchangeable m'(A1, IF1, IF2) ≠ m'(A,IF2,IF1) if (IF1 ≠ IF2) (8)

## 3.3 Dempster's Rule of Combination with Importance Factors

In this section, we propose a Dempster's rule of combination with importance factors. We prove our combination rule follows the properties defined in the previous section.

*Theorem 1. Dempster's Rule of Combination with Importance Factors:*



**Step1: Evidence Collection** | **Step2: Risk Assessment** | **Step3: Decision Making** | **Step4: Intrusion Response**

**Fig. 2. Risk-aware response mechanism.**

Suppose Bel1 and Bel2 are belief functions over the same frame of discernment, with basic probability assignments m1 and m2. The importance factors of these evidences are IF1 and IF2. Then, the function m defined by Our proposed DRCIF is non associative for multiple evidences. Therefore, for the case in which sequential information is not available for some instances, it is necessary to make the result of combination consistent with multiple evidences. Our combination algorithm supports this requirement and the complexity of our algorithm is O(n), where n is the number of evidences. It indicates that our extended Dempster-Shafer theory demands no extra computational cost compared to a naïve fuzzy-based method. The algorithm for combination of multiple evidences is constructed as follows:

**Algorithm 1. MUL-EDS-CMB**
**INPUT: Evidence pool Ep**

OUTPUT: One evidence
1  $|Ep| =$ sizeof(Ep);
2  **While** $|Ep| > 1$ **do**
3     Pick two evidences with the least $IF$ in Ep, named $E_1$ and $E_2$;
4     Combine these two evidences, $E = \langle m_1 \oplus m_2, (IF_1 + IF_2)/2 \rangle$;
5     Remove $E_1$ and $E_2$ from Ep;
6     Add $E$ to Ep;
7  **end**
8  **return** the evidence in Ep

## IV. RISK-AWARE RESPONSE MECHANISM

In this section, we articulate an adaptive risk-aware response mechanism based on quantitative risk estimation and risk tolerance. Instead of applying simple binary isolation of malicious nodes, our approach adopts an isolation mechanism in a temporal manner based on the risk value. We perform risk assessment with the extended D-S evidence theory.

### 4.1 Overview

Because of the infrastructure-less architecture of MANET, our risk-aware response system is distributed, which means each node in this system makes its own response decisions based on the evidences and its own individual benefits. Therefore, some nodes in MANET may isolate the malicious node, but others may still keep in cooperation with due to high dependency relationships. Our risk aware response mechanism is divided into the following four steps shown in Fig. 3. Evidence collection. In this step, Intrusion Detection System (IDS) gives an attack alert with a confidence value, and then Routing Table Change Detector (RTCD) runs to figure out how many changes on routing table are caused by the attack. Risk assessment. Alert confidence from IDS and the routing table changing information would be further considered as independent evidences for risk calculation and combined with the extended D-S theory. Risk of countermeasures is calculated as well during a risk assessment phase. Based on the risk of attacks and the risk of countermeasures, the entire risk of an attack could be figured out. Decision making. The adaptive decision module provides a flexible response decision-making mechanism, which takes risk estimation and risk tolerance into account. To adjust temporary isolation level, a user can set different thresholds to fulfill her goal.
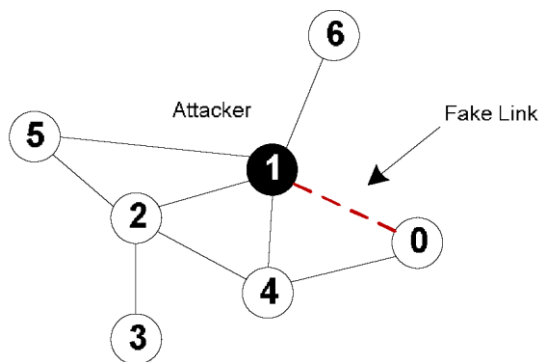


**Fig. 3. Example scenario.**

Intrusion response. With the output from risk assessment and decision-making module, the corresponding response actions, including routing table recovery and node isolation, are carried out to mitigate attack damages in a distributed manner.

### 4.2 Response to Routing Attacks

In our approach, we use two different responses to deal with different attack methods: routing table recovery and node isolation. Routing table recovery includes local routing table recovery and global routing recovery. Local routing recovery is performed by victim nodes that detect the attack and automatically recover its own routing table. Global routing recovery involves with sending recovered routing messages by victim nodes and updating their routing table based on corrected routing information in real time by other nodes in MANET. Routing table recovery is an indispensable response and should serve as the first response method after successful detection of attacks. In proactive routing protocols like OLSR, routing table recovery does not bring any additional overhead since it periodically goes with routing control messages. Also, as long as the detection of attack is positive, this response causes no negative impacts on existing routing operations. Node isolation may be the most intuitive way to prevent further attacks from being launched by malicious nodes in MANET. To perform a node isolation response, the neighbors of the malicious node ignore the malicious node by neither forwarding packets through it nor accepting any packets from it. On the other hand, a binary node isolation response may result in negative impacts to the routing operations, even bringing more routing damages than the attack itself. For example, in Fig, Node 1 behaves like a malicious node. However, if every other node simply isolates Node 1, Node 6 will be disconnected from the network. Therefore, more flexible and fine-grained node isolation mechanism is required. In our risk-aware response mechanism, we adopt two types of time-wise isolation responses: temporary isolation and permanent isolation, which are discussed in Section 4.4.

### 4.3 Risk Assessment

Since the attack response actions may cause more damages than attacks, the risks of both attack and response should be estimated. We classify the security states of MANET into two categories: {Secure, Insecure}. In other words, the frame of discernment would be {_, {Secure}, {Insecure}, {Secure, Insecure}}. Note that {Secure, Insecure} means the security state of MANET could be either secure or insecure, which describes the uncertainty of the security state.

#### 4.3.1. Selection of evidence

Evidence choice approach considers subjective proof from experts' information and objective proof from routing table modification. we have a tendency to propose a unified analysis approach for evaluating the risks of each attack (RiskA) and step (RiskC). Take the arrogance level of alerts from IDS because the subjective information conspicuous one. In terms of objective proof, analyze whole completely different routing table modification cases. There area unit staple items in OLSR routing table (destination, next hop, distance). Thus, routing attack can cause existing routing table entries to be unintelligible, or any item of a routing table entry to be changed. We illustrate the possible cases of routing table change and analyze the degrees of damage in Evidences 2 through 5.

**Evidence 1:** Alert confidence. the boldness of attack detection by the IDS is provided to deal with the likelihood of the attack incidence.

**Evidence 2**: Missing entry. This proof indicates the proportion of missing entries in routing table. Link withholding attack or node isolation step will cause potential deletion of entries from routing table of the node.

**Evidence 3:** ever-changing entry I. This proof represents the proportion of fixing entries within the case of next hop being the malicious node.

**Evidence 4**: ever-changing entry II. This proof shows the proportion of modified entries within the case of various next hops (not the malicious node) and therefore the same distance.

**Evidence 5:** ever-changing entry III. These proof points next hop (not the malicious node) and therefore the different distance. like proof four, each attacks and countermeasures might end in this proof.

### 4.3.2. Combination of evidence

Call the combined evidence for an attack, EA and the combined evidence for a countermeasure, EC. Thus, BelA(Insecure) and BelC(Insecure) represent risks of attack (RiskA) and countermeasure (RiskC), respectively. The combined evidences, EA and EC are defined and the entire risk value derived from RiskA and RiskC

$$EA = E1 \oplus E2 \oplus E3 \oplus E4 \oplus E5,$$
$$EC = E2 \oplus E4 \oplus E5,$$

where $\oplus$ is Dempster's rule of combination with important factors defined in Theorem 1

Risk = RiskA - RiskC = BelA(Insecure) –BelC(Insecure).

### 4.4. Adaptive decision making

The response level is as well divided into multiple bands. each band is said to academic degree isolation degree, that presents a special amount of your time of the isolation action. The response action and band boundaries unit all determined in accordance with risk tolerance and may be changed once risk tolerance threshold changes. the upper risk tolerance threshold (UT) would be associated with permanent isolation response. The lower risk tolerance threshold (LT) would keep each node intact. The band between the upper tolerance threshold and lower tolerance threshold is said to the temporary isolation response, inside that the isolation time (T) changes dynamically supported the assorted response level given by following equation where n is that the vary of bands which i is that the corresponding isolation band.
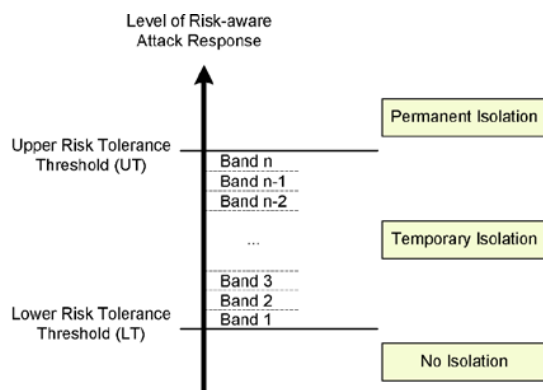


**Fig. 4. Adaptive decision making.**

## V.   RESULT

The performance ends up in these random network topologies of our risk-aware approach with DRCIF, risk-aware approach with DRC and binary isolation approach. In Fig. 5, because the range of nodes will increase, the packet delivery

magnitude relation conjointly will increase as a result of their square measure a lot of route decisions for the packet transmission. Among these 3 response mechanisms, we have a tendency to conjointly notice the packets delivery magnitude relation of our DRCIF risk-aware response is on top of those of the opposite 2 approaches.
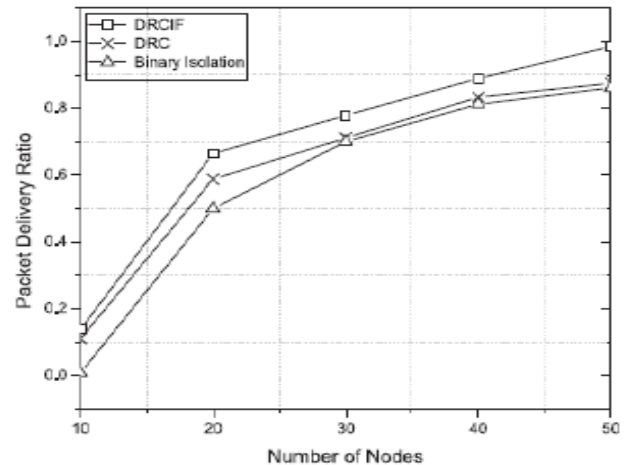


**Fig. 5 Packet delivery ratio**

In Fig. 6, we are able to observe that the routing price of our DRCIF risk-aware response is under those of the opposite 2 approaches. Note that the fluctuations of routing price shown in Fig. three are caused by the random traffic generation and random placement of nodes in our realistic simulation. In our DRCIF risk-aware response, the amount of nodes that isolate the malicious node is a smaller amount than the opposite 2 response mechanisms.
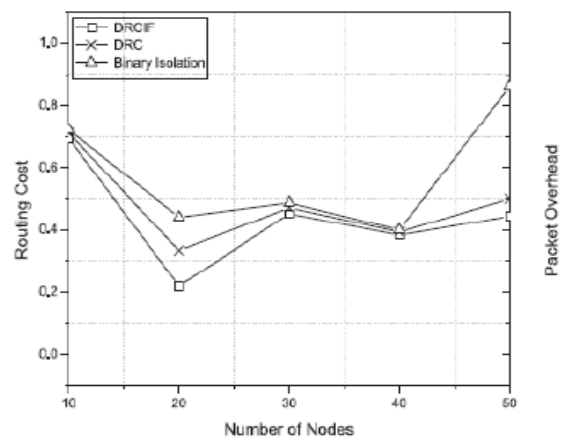


**Fig 6. Routing cost**

In Fig 7 , that's the reason why we can also notice that as the number of nodes increases, the packet overhead and the using our DRCIF risk-aware response are slightly higher than those of the other two response mechanisms.
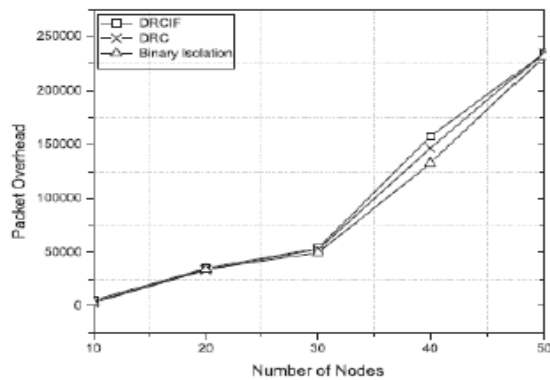
**Fig. 7 Packet Overhead**

In Fig. 8 The mean latency victimization our DRCIF risk-aware response is over those of the opposite 2 response mechanisms, once the amount of nodes is smaller than twenty. However, once the amount of nodes is bigger than twenty, the mean latency victimization our approach is a smaller amount than those of the opposite 2 response mechanisms.
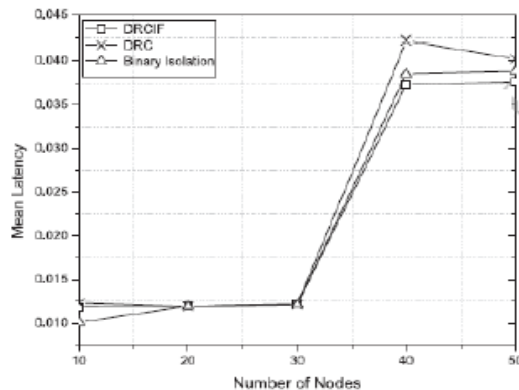


**Fig.8 Mean Latency**

## VI.   CONCLUSION

Handling MANET Routing Attacks Using Risk Aware Mitigation Mechanism with D-S Theory. Especially, our approach considered the potential damages of attacks and countermeasures. So as to live the danger of each attacks and countermeasures, we tend to extended D-S theory of proof with a notion of importance factors. Supported many metrics, we tend to additionally investigated the performance and utility of our approach and also the experiment results clearly incontestable the effectiveness and quantifiable of our risk aware approach. Supported the promising results obtained through these experiments.

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# Network Security

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*Abstract-* Network security has become more important to personal computer users, organizations, and the military. With the advent of the internet, security became a major concern and the history of security allows a better understanding of the emergence of security technology. The internet structure itself allows for many security threats to occur. If the architecture of the internet is modified, it can reduce the possible attacks that can be sent across the network. Knowing the attack methods allows us to emerge with appropriate security. Many businesses secure themselves from the internet by means of firewalls and encryption mechanisms. The businesses create an "intranet" to remain connected to the internet but secured from possible threats. The entire field of network security is vast and in an evolutionary stage. In order to understand the research being performed today, background knowledge of the internet, its vulnerabilities, attack methods through the internet, and security technology is important and therefore they are reviewed.

*Index Terms-* Data Security, Internet Architecture, IPv4, Network Security.

## I. INTRODUCTION

The world is becoming more interconnected due to Internet and new networking technology. There is a large amount of personal, commercial, military, and government information on networking infrastructures worldwide. Network security is becoming of utmost importance because of intellectual property that can be easily acquired through the internet. There can be breach in intellectual property.

There are two types of fundamentally different networks: data networks and synchronous network comprised of switches. The internet is considered a data network. Since the current data network consists of computer-based routers, information can be obtained by special programs, such as "Trojan horses," planted in the routers. The synchronous network that consists of switches does not buffer data and therefore are not threatened by attackers. That is why security is emphasized in data networks, such as the internet, and other networks that link to the internet.

The vast topic of network security is analyzed by researching the following:

1. Internet architecture and vulnerable security aspects of the Internet
2. Types of internet attacks and security methods
3. Security for networks with internet access
4. Current development in network security hardware and software

## II. NETWORK SECURITY

System and network technology is a key technology for a wide variety of applications. Networks and applications need security. Although, network security is a critical requirement, there is a significant lack of security methods that can be implemented easily.

There exists a "communication gap" between the developers of security technology and developers of networks. Network design is a well-developed process that is based on the Open Systems Interface (OSI) model. The protocols of different layers can be easily combined to create stacks which allow modular development. The implementation of individual layers can be changed later without making other adjustments, allowing flexibility in development. In contrast to network design, secure network design is not a well-developed process. There isn't a methodology to manage the complexity of security requirements. Secure network design does not contain the same advantages as network design.

Network security doesn't mean securing both end computers. When transmitting data the communication channel should not be vulnerable to attack. A possible hacker could target the communication channel, obtain the encrypted data, and decrypt it and re-insert a false message. Securing the middle network is just as important as securing the computers and encrypting the message.

When developing a secure network, the following need to be considered [1]:

1. Access– Authorized users are provided the means to communicate to and from a particular network
2. Confidentiality– Information in the network remains private
3. Authentication – Ensure the users of the network are who they say they are
4. Integrity – Ensure the message has not been modified in transit
5. Non-repudiation – Ensure the user does not refute that he used the network

With the understanding of security issues, potential attackers, needed level of security, and factors that make a network vulnerable to attack an effective network security plan is developed [1]. To make the computer less vulnerable to the network there are many products available. These tools are encryption, firewalls, intrusion-detection, and security management and authentication mechanisms. Businesses throughout the world are using a combination of some of these

tools. "Intranets" are both connected to the internet and reasonably protected from it. The internet architecture itself leads to vulnerabilities in the network. Understanding the security issues of the internet greatly helps to develop secure solutions to protect the networks from the internet.

The types of attacks through the internet need to also be studied to be able to detect and guard against them. Intrusion detection systems are established based on the types of attacks most commonly used. Network   intrusions consist of packets that are introduced to cause problems for the following reasons:

- To consume resources uselessly
- To interfere with any system resource's intended function
- To gain system knowledge like passwords, logins that can be exploited in later attacks

### III.   DIFFERENTIATING DATA SECURITY AND NETWORK  SECURITY

Data security is the aspect of security that allows a client's data to be transformed into unintelligible data for transmission. Even if this unintelligible data is intercepted, a key is needed to decode the message. This method of security is effective to a certain degree. Strong cryptography in the past can be easily broken today. Due to advancement of hackers, cryptographic methods have to develop constantly to be one step ahead.

When transferring cipher text over a network, it is helpful to have a secure network. This will allow for the cipher text to be protected, so that it is less likely for many people to even attempt to break the code.  A secure network will also prevent someone from inserting unauthorized   messages into the network. Therefore, hard ciphers are needed as well as attack-hard networks.
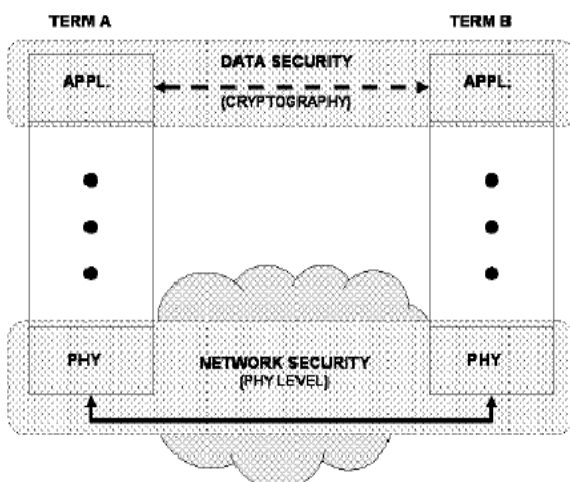


[13] **Figure 16**

The relationship of network security and data security to the OSI model is shown in Figure 1. It can be seen that the cryptography occurs at the application layer; therefore the application writers are aware of its existence. The user can

possibly choose different methods of data security. Network security is mostly contained within the physical layer. Layers above the physical layer are also used to accomplish the network security required. Authentication is performed on a layer above the physical layer. Network security in the physical layer requires failure detection, attack detection mechanisms, and intelligent counter measure strategies [2].

### IV.   INTERNET ARCHITECTURE AND VULNERABLE SECURITY ASPECTS

Fear of security breaches on the Internet is causing organizations to use protected private networks or intranets. The Internet Engineering Task Force (IETF)   has introduced security mechanisms at various layers of the Internet Protocol Suite [4]. These security mechanisms allow for the logical protection of data units that are transferred across the network. The current version and new version of the Internet Protocol are analyzed to determine the security implications. Although security may exist within the protocol, not all attacks are guarded against. These attacks are analyzed to determine other security mechanisms that may be necessary.

The security architecture of the internet protocol known as IP Security is a standardization of internet security. IP security, IP sec, covers the new generation of IP (IPv6) as well as the current version (IPv4). Although new techniques, such as IP sec, have been developed to overcome internet's best-known deficiencies, they seem to be insufficient [5].
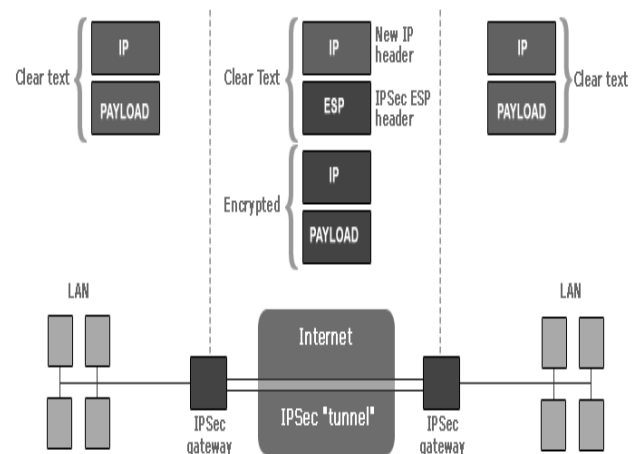


**Figure 2: shows a visual representation of how IPsec is implemented to provide secure communications.**

IP sec is a point-to-point protocol, one side encrypts, the other decrypts and both sides share key or keys. IPsec can be used in two modes, namely transport mode and tunnel modes.

### V.   ATTACKS THROUGH THE CURRENT INTERNET PROTOCOL IPV4

*1. Common Internet Attack Methods*

Common internet attacks methods are broken down into categories. Some attacks gain system knowledge or personal information, such as eaves dropping and phishing. Attacks can also interfere with the system's intended function, such as viruses, worms and trojans. The other form of attack is when the system's resources are consumes uselessly, these can be caused by denial of service (DoS) attack. Other forms of network intrusions also exist, such as land attacks, surf attacks, and teardrop attacks. These attacks are not as well-known as DoS attacks, but they are used in some form or another even if they aren't mentioned by name.

### 1.1 Eavesdropping

Interception of communications by an unauthorized party is called eavesdropping. Passive eavesdropping is when the person only secretly listens to the networked messages. On the other hand, active eaves dropping are when the intruder listens and inserts something into the communication stream. This can lead to the messages being distorted. Sensitive information can be stolen this way [8].

### 1.2 Viruses

Viruses are self-replication programs that use files to infect and propagate [8]. Once a file is opened, the virus will activate within the system.

### 1.3 Worms

A worm is similar to a virus because they both are self-replicating, but the worm does not require a file to allow it to propagate [8]. There are two main types of worms, mass-mailing worms and network- aware worms. Mass mailing worms use email as a means to infect other computers. Network-aware worms are a major problem for the Internet. A network-aware worm selects a target and once the worm accesses the target host, it can infect it by means of a Trojan or otherwise.

### 1.4 Trojans

Trojans appear to be benign programs to the user, but will actually have some malicious purpose. Trojans usually carry some payload such as a virus [8].

### 1.5 Phishing

Phishing is an attempt to obtain confidential information from an individual, group, or organization [9]. Phishers trick users into disclosing personal data, such as credit card numbers, online banking credentials, and other sensitive information.

### 1.6 IP Spoofing Attacks

Spoofing means to have the address of the computer mirror the address of a trusted computer in order to gain access to other computers. The identity of the intruder is hidden by different means making detection and prevention difficult. With the current IP protocol technology, IP- spoofed packets cannot be eliminated [8].

### 1.7 Denial of Service

Denial of Service is an attack when the system receiving too many requests cannot return communication with the requestors [9].The system then consumes resources waiting for the handshake to complete. Eventually, the system cannot respond to any more requests rendering it without service.

### 2. Technology for Internet Security

Internet threats will continue to be a major issue in the global world as long as information is accessible and transferred across the Internet. Different defense and detection mechanisms were developed to deal with these attacks.

### 2.1 Cryptographic systems

Cryptography is a useful and widely used tool in security engineering today. It involved the use of codes and ciphers to transform information into unintelligible data. These unintelligible data is thus transferred in the network safely.

### 2.2 Firewall

A firewall is a typical border control mechanism or perimeter defense. The purpose of a firewall is to block traffic from the outside, but it could also be used to block traffic from the inside. A firewall is the frontline defense mechanism against intruders. It is a system designed to prevent unauthorized access to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both [8].

### 2.3 Intrusion Detection Systems

An Intrusion Detection System (IDS) is an additional protection measure that helps ward off computer intrusions. IDS systems can be software and hardware devices used to detect an attack. IDS products are used to monitor connection in determining whether attacks are been launched. Some IDS systems just monitor and alert of an attack, whereas others try to block the attack.

### 2.4 Anti-Malware Software and Scanners

Viruses, worms and Trojan horses are all examples of malicious software, or Malware for short. Special so-called anti-Malware tools are used to detect them and cure an infected system.

### 2.5 Secure Socket Layer (SSL)

The Secure Socket Layer (SSL) is a suite of protocols that is a standard way to achieve a good level of security between a web browser and a website. SSL is designed to create a secure channel, or tunnel, between a web browser and the web server, so that any information exchanged is protected within the secured tunnel. SSL provides authentication of clients to server through the use of certificates. Clients present a certificate to the server to prove their identity.

## VI. SECURITY ISSUES OF IP PROTOCOL IPV6

IPv6 is the next thing everyone's talking about. From a security point of view, IPv6 is a considerable advancement over the IPv4 internet protocol Despite the IPv6's great security mechanisms; it still continues to be vulnerable to threats. Some areas of the IPv6 protocol still pose a potential security issue. The new internet protocol does not protect against is configure servers, poorly designed applications, or poorly protected sites.

The possible security problems emerge due to the following:
1. Header manipulation issues
2. Flooding issues
3. Mobility issues

Header manipulation issues arise due to the IPsec's embedded functionality [7]. Extension headers deter some common sources of attacks because of header manipulation. The problem is that extension headers need to be processed by all stacks, and this can lead to a long chain of extension headers. The large number of extension headers can overwhelm a certain node and is a form of attack if it is deliberate. Spoofing continues to be a security threat on IPv6 protocol. A type of attack called port scanning occurs when a whole section of a network is scanned to find potential   targets with open services [5]. The address space of the IPv6 protocol is large but the protocol is still not invulnerable to this type of attack. Mobility is a new feature that is incorporated into the internet protocol IPv6. The feature requires special security measures. Network administrators need to be aware of these security needs when using IPv6's mobility feature.

## VII.   SECURITY IN DIFFERENT NETWORKS

The businesses today use combinations of firewalls, encryption, and authentication mechanisms to create "intranets" that are connected to the internet but protected from it at the same time. Intranet is a private computer network that uses internet protocols. Intranets differ from "Extranets" in that the former are generally restricted to employees of the organization while extranets can generally be accessed by customers, suppliers, or other approved parties.

There does not necessarily have to be any access from the organization's internal network to the Internet itself.  When such access is provided it is usually through a gateway with a firewall, along with user authentication, encryption of messages, and often makes use of virtual private networks (VPNs).

Although intranets can be set up quickly to share data in a controlled environment, that data is still at risk unless there is tight security. The disadvantage of a closed intranet is that vital data might not get into the hands of those who need it. Intranets have a place within agencies.  But for broader data sharing, it might be better to keep the networks open, with these safeguards:

1. Firewalls that detect and report intrusion attempts
2. Sophisticated virus checking at the firewall
3. Enforced rules for employee opening of e-Mail attachments
4. Encryption for all connections and data transfers
5. Authentication by synchronized, timed passwords or security certificates

It was mentioned that if the intranet wanted access to the internet, virtual private networks are often used. Intranets that exist across multiple locations generally run over separate leased lines or a newer approach of VPN can be utilized. VPN is a private network that uses a public network (usually the Internet) to connect remote sites or users together. Instead of using a dedicated, real-world connection such as leased line,  a VPN uses "virtual" connections routed through the Internet from the company's private network to the remote site or employee.

## VIII.   CURRENT DEVELOPMENTS IN NETWORK SECURITY

The network security field is continuing down the same route.  The same methodologies are being used with the addition of biometric identification. Biometrics provides a better method of authentication than passwords. This might greatly reduce the unauthorized access of secure systems. The software aspect of network security is very dynamic. Constantly new firewalls and encryption schemes are being implemented. The research being performed assist in understanding current development and projecting the future developments of the field.

### 1. Hardware Developments

Hardware developments are not developing rapidly. Biometric systems and smart cards are the only new hardware technologies that are widely impacting security. The most obvious use of biometrics for network security is for secure workstation logons for a work station connected to a network. Each workstation requires some software support for biometric identification of the user as well as, depending on the biometric being used, some hardware device. The cost of hardware devices is one thing that may lead to the widespread use of voice biometric security identification, especially among companies and organizations on a low budget. Hardware device such as computer mice with built in thumbprint readers would be the next step up. These devices would be more expensive to implement on several computers, as each machine would require its own hardware device.

### 2. Software Developments

The software aspect of network security is very vast. It includes firewalls, antivirus, VPN, intrusion detection, and much more. The research development of all security software is not feasible to study at this point. The goal is to obtain a view of where the security software is heading based on emphasis being placed now.

## IX.   FUTURE TRENDS IN SECURITY

What is going to drive the Internet security is the set of applications more than anything else. The future will possibly be that the security is similar to an immune system. The immune system fights off attacks and builds itself to fight tougher enemies. Similarly, the network security will be able to function as an immune system.

The trend towards biometrics could have taken place a while ago, but it seems that it isn't being actively pursued. Many security developments that are taking place are within the same set of security technology that is being used today with some minor adjustments.

## X.  CONCLUSION

Network security is an important field that is increasingly gaining attention as the internet expands. The security threats and internet protocol were analyzed to determine the necessary changes in security technology. The security technology is mostly software  based, but many common hardware devices are used.  The current development in network security is not very impressive.

Originally it was assumed that with the importance of the network security field, new approaches to security, both hardware and software, would be actively researched. It was a surprise to see most of the development taking place in the same technologies being currently used. Combined use of IPv6 and security tools such as firewalls, intrusion detection, and authentication mechanisms will prove effective in    guarding intellectual property for the near future. The network security field may have to evolve more rapidly to deal with the threats further in the future.

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# World's Highest Off-grid Solar PV Potential in India-Search and Penetrate

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**Abstract:** In this modern age, reliable and affordable electricity is requirement of every human being. 19% of population of the world is without access to electricity. Developed countries are managing to provide reliable and affordable electricity to all, while maintaining energy security. Developing countries are unable to supply the electricity to all, therefore, consuming kerosene for lighting and diesel for agricultural, telecom towers, commercial and miscellaneous activities. In India 300 millions peoples are without access to the electricity, one third of rural population and 6% of urban population [1]. Government of India is providing subsidy on kerosene for lighting and diesel for agricultural and other purposes. The Government of India has a vision to electrify 100% villages and households that are not in remote under Rajeev Gandhi Grameen Vidyutikaran Yojana. Such remote villages and households are to be electrified by off- grid solar PV under the guidelines of Jawaharlal Nehru National Solar Mission.

**Key Words –** Affordable, Demand, Grid parity, Reasonable, Reliable, Solar resource.

**Abbreviations** BPL – Below Poverty Line, GW- Gigawatt, IEA- International Energy Agency, JNNSM- Jawaharlal Nehru National Solar Mission, KW- Kilowatt, KWh- Kilowatt –hour, MW- Megawatt, RGGVY- Rajiv Gandhi Grameen Vidyutikaran Yojna, SELCO – Solar Electric Light Company.

## I. INTRODUCTION

Electricity can be generated in any corner of world in the solar resource regions by off-grid solar PV. India has a high solar resource and it is abundantly available in most part of the country. About 70% of population of India lives in villages, large number of village has no access to electricity, villagers are deprived from TV, computer, communication facilities and villagers are dependent on kerosene for illumination. Most of the villages are connected to the grid, villages have not been receiving perennial supply, and rural feeder is cut for several hours and receives poor quality of supply. 400 million grid connected people, the electricity was intermittent and unreliable [2]. Therefore, villagers in India are illiterate, socially and economically backward. Electrifying remote villages is not techno-economically feasible, since requires long transmission and distribution lines which involve heavy capital expenditure. Farmers are using diesel pump sets for irrigation, telecom towers are being supplied electricity from the diesel generating sets in un-electrified villages. In totality, there is huge consumption of kerosene and diesel in India. Diesel and kerosene is imported at the international market rates and government of India provide at the subsidized rates in the country. Import of large quantity of kerosene and diesel is challenge to the energy security of the country. Pollution from kerosene indoor lighting causes 64 % of deaths and 81% of disabilities among children under age of five [2]. Solar Lantern and Solar Home Lighting System are the best alternative of Kerosene, economical to kerosene. There is need to phase out kerosene by educating the peoples, providing capital subsidy and soft loans to adopt solar lantern and solar home lighting system. The Solar Electric Light Company, India or (SELCO India) is for - profit social enterprise based in Bangalore is actively working and installed 125,000 solar home lighting systems in rural and poor villages of Karnataka. In remote regions, micro grids can serve the requirement of electricity of the villages/cluster of villages 150 to 200 households, cottage industry, schools, dispensary, road lights and community halls. In India 9 million diesel pump sets are used for irrigation out of 21 million pump sets [3]. The cost of solar PV has come down and cost of diesel has been regularly increasing. At present the cost of solar PV is very much less to diesel, solar PV cost shall be half of diesel within three to four years, since approaching towards grid parity. 400,000 telecom towers are associated with diesel generating sets having capacity 3 to 5 KW. 60% Telecom towers located in urban and semi urban areas and 100% located in the villages are run by diesel generating sets [2]. In fact, off-grid potential is unlimited in India and is about 20 to 25% potential of the world.

## II. WORLD ACCESS TO ELECTRICITY

Developed countries have managed to supply electricity to everyone but millions of people have no access to electricity in Africa, developing Asia, Latin America and Middle East. Table 1, shows that by 2009, 58% of population of Africa, 19% of developing Asia, 7% of Latin America and 11% of middle east had no access to electricity. 25% of Indian peoples had no access to electricity out which 33% in villages and 6% in urban areas. By 2030, 12% of the world population would be without access to electricity.

**Table 1**, Number of people without access to electricity by region (million)

| S no. | Region/ country | 2009 | | | 2030 | | |
|---|---|---|---|---|---|---|---|
| | | Rural | Urban | Share of population | Rural | Urban | Share of population |
| *1* | *Africa* | *466* | *121* | *58%* | *539* | *107* | *42%* |
| | Sub-Saharan Africa | 465 | 121 | 69% | 538 | 107 | 49% |
| 2. | *Developing Asia* | *595* | *81* | *19%* | *327* | *49* | *9%* |
| | China | 8 | 0 | 1% | 0 | 0 | 0% |
| | India | 268 | 21 | 25% | 145 | 9 | 10% |
| | Rest of developing Asia | 319 | 60 | 36% | 181 | 40 | 16% |
| 3. | *Latin America* | *26* | *4* | *7%* | *8* | *2* | *2%* |
| 4. | *Middle East* | *19* | *2* | *11%* | *5* | *0* | *2%* |
| 5. | Developing countries | 1106 | 208 | 25% | 879 | 157 | 16% |
| *6.* | *World* | *1109* | *208* | *19%* | *879* | *157* | *12%* |

Source: World Energy Outlook, Energy for all, International Energy Agency, 2011

### III.  CAPACITY AND PV MARKET OF END –USE SECTORS

There are four end- use sectors with distinct market for PV, Residential systems (typically up to 20 KW systems on individual buildings/ dwellings), Commercial Systems (typically up to 1MW systems for commercial office buildings, schools, hospitals, and retail), Utility scale systems (starting at 1MW, mounted on buildings or directly on ground), Off-grid applications (varying sizes) [4] . As per table 2,   cumulative installed capacity of four end use sectors (residential, commercial, utility and off-grid) is expected to change significantly over time. The residential sector has the highest potential, it has maximum around 60%. After residential sector, utility sector is one of the biggest sectors and followed by off-grid and commercial sectors.  The relative shares of PV deployment among the different sectors will vary by country and according to the requirement of individual country. In India, limited land resource restricts the utility scale end-use sector. India has the highest potential of off –grid end use sector in the world, around 20 to 25% potential of world.

**Table 2**, Cumulative installed PV capacity (GW) by end –use sector (World)

| PV capacity (GW) | 2010 | 2020 | 2030 | 2040 | 2050 |
|---|---|---|---|---|---|
| Residential | 17 | 118 | 447 | 957 | 1380 |
| Commercial | 3 | 22 | 99 | 243 | 404 |
| Utility | 5 | 49 | 223 | 551 | 908 |
| Off-grid | 2 | 21 | 103 | 267 | 463 |
| Total | 27 | 210 | 872 | 2019 | 3155 |

IEA, Technology Roadmap, Solar Photovoltaic Energy, 2010

### IV.  OFF-GRID SOLAR PV

Off-grid solar PV generation means, generation in isolation (no utility grid is available) in solar resource region. The electricity can be generated from few watts to megawatts from off-grid solar PV. It has a great potential in developing countries. Mainly off-grid solar PV applications are lighting; agricultural pump sets for irrigation and telecommunication towers. Presently, Kerosene is used for lighting purposes and diesel is used for agricultural pump sets and telecommunication towers. Solar lantern, solar home lighting system and micro grids are the best alternative for replacing Kerosene. Solar PV pump sets can replace diesel pump sets. Solar PV application can replace/hybridize with diesel generating sets installed at telecommunication towers. Off- grid solar PV has several advantages and electricity can be generated anywhere in solar resource regions in daytime, while sun shines.

Solar Lantern

Solar lanterns are viable and cost effective for lighting of un- electrified households. Solar lanterns are for poor villagers who cannot afford high amount for illumination.  The solar lanterns are available between 0.5 to 5 Watts .These solar lanterns can replace the use of Kerosene, used by poor villagers.

Solar Home Lighting System

Solar home lighting system is also cost effective for lighting and other minimum requirement of house hold.  Solar home lighting system is for those who are above below poverty line and can afford for illumination and other minimum requirements. These solar home lighting systems are available between 2.5 to 70 Watts. Solar home lighting system can also replace the use of kerosene.

Solar PV Micro -grid

Solar PV micro grids are able to supply electricity to the villages or cluster of villages.  These micro grids are able to meet the demand of lighting loads, drinking water pumps, community buildings, school, and cottage industry and for commercial activities. Solar PV generates electricity during sunshine, therefore, running of cottage industry and commercial activities can take place during sun shine period. Batteries can be charged during sun shine hours for lighting load in night hours. Off-grid solar PV micro- grid can be hybridized with bio-mass or any other source of renewable energy.

Solar PV based Irrigation Pump Sets

A total land mass of 328.73 million hectare in country is used for agricultural and this includes 140.2 million hectare under cultivation [5]. Therefore, most of the crops in India depend upon electric/ diesel pump sets for irrigation.  The 17th electric power supply survey of India claimed that over the period 2010-2011, agricultural consumption accounted for 21% of total electric consumption of India [6]. There are 21 million pump sets in the country, out of which 9 million pumps run by diesel, rest are connected to the grid [3]. Off- grid solar PV based pump sets can replace diesel. These solar pumps can run in day hours only (i.e. during sunshine period) and cannot run in night, cloudy days or non availability of sunshine in the day. Mainly, water is required for irrigation in sunny days.

Off- grid Solar PV for telecom towers

India is the largest and fastest growing telecom market in the world. The number of telecom towers was 400,000 in 2010 and expected to be 800,000 by 2015 [2]. Average telecom tower is equipped with 3to 5KW diesel generating sets. 60 % telecom towers in urban / semi urban area and 100% in rural area are dependent on diesel generating sets. The consumption of diesel is around 2. 8 billion liters per annum and emits 6 million tones of $CO_2$ [2].

Cost of Off – grid solar PV

It was only few years ago, PV electricity was four to five times more expensive than the fossil fuels [7]. Continuing decreasing cost of solar PV and increasing cost of fossil fuels, grid parity could occur within three to four years in several states of India where high solar resource is available and prevailing high tariff of electricity. The grid parity is expected to be achieved in 2019-20 in the states where moderate solar resource is available and prevailing lower tariff of electricity. Cost of off-grid is higher to utility scale, residential and commercial end use sectors. Cost of off-grid applications increase due to transportation to remote places, since off- applications are in remote regions Battery further increases the cost of the off-grid solar PV system. Still, cost of off -grid solar PV is much less than grid in remote areas.

Advantages of off- grid solar PV

- Solar resource is abundantly and locally available.

- It is distributed form of electricity, need no transmission lines.

- It is clean and renewable, no emission.

- Free from market rates, fluctuating fuel prices and provides energy security.

- The capacity can be added since the system is flexible and scalable.

- It involves minimum maintenance since no moving parts.

 Disadvantages of off- grid solar PV

- Off- grid Solar PV system works effectively in solar resource regions.

- It works in day while solar resource is available in day time.

- It does not work in night hours and cloudy days.

- Storage of electricity is costly.

- It requires huge space i.e. 1KW requires 10 m$^2$.

## V.   Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)

Government of India launched Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) in 2005, for electrification of rural India; aim was to provide minimum requirement of electricity to 100% villagers that are not living in remote regions. There is a provision of free electricity connection to all below poverty line (BPL) households. Rural Electrification Corporation (REC) is a nodal agency for rural electrification under RGGVY. Under the schemes for rural electrification, 90% capital subsidy will be financed and balance 10% as a loan assistance on soft terms by REC. Electrification of un-electrified Below Poverty Line (BPL) households will be financed with 100% capital subsidy as per norms of Kutir Jyoti Programme in all rural habitations [8]. RGGVY had a target of electrifying 100,000 villages and providing free electricity connection to 17.5 million households below poverty line by March 2012 [1].

**Jawaharlal Nehru National Solar Mission**

Jawaharlal Nehru National Solar Mission has paid special attention to provide light and power to the peoples living in remote areas with off-grid opportunity (lighting homes), where grid connection is neither feasible nor cost effective. Government of India will deploy 20 million solar lighting systems by 2022. The Solar mission has a target of 1000 MW by 2017 and 2000 MW by 2022 for off-grid applications. Government of India has launched financial incentives and promotional schemes for use of decentralized applications. Government of India has been providing 90% subsidy for the poor people's living remote (tribal area). Government has developed mechanism for banks to offer low cost credit to the peoples of villages which are connected to the grid for promotion of solar lights.

## VI.   RESEARCH AND DEVELOPMENT (R&D)

R&D in the field of off –grid solar PV end-use sector is more important in India. Developed countries have no potential for off- grid solar PV system. Developing countries have total off- grid solar PV potential of the world. India is developed country among the developing countries that have highest off-grid solar PV potential. The off- grid solar PV potential in India is around 20 to 25% of world's potential. Therefore, India needs to concentrate and develop R&D mechanism for off-grid Solar PV system for illuminating the life of poor villagers of India and Developing world.

## VII.   POTENTIAL OF OFF- GRID SOLAR PV APPLICATIONS IN INDIA

Solar Lantern and Solar Home Lighting System

Solar lantern and solar home lighting system are the replacement of kerosene. 75 million households in India are without access to electricity and India has highest subsidy levels for kerosene in the world, the annual expenditure on kerosene in India is USD 2 billion for lighting [9]. In India, rural BPL card owners are 70 millions and without BPL 50-55 millions use Kerosene as per NSSO 2004-05. It is assumed that BPL card holder will adopt solar lantern and without BPL cards will adopt solar home lighting System.  Assuming 75% households are located in solar resource region, households in solar resource regions comes to 56 millions. These 56 million households are to be distributed in the ratio 70:55 BPL and non-BPL comes to 32 million and 24 million respectively. Adoption of solar lantern would be 27-37 million and SHS would be 19 -29 million respectively.

Solar PV Micro- grid

Almost 16% of villages of India are un-electrified, number of such villages are 95,000 [10]. Assuming 75 % of un-electrified villages are in solar resource region; number of un- electrified villages in solar resource region comes to 71,250.  60 % villages/ cluster of villages have 150 to 200 households in un–electrified and solar resource region; number of such villages comes to 42,750. Average 70 KW is required to fulfill the requirement of each village i.e. 1 .5 KWh to 2KWh per day per house hold (minimum requirement of each house hold). Total potential comes to 3000 MW.

Solar PV based Irrigation Pump Sets

 9 million pump sets for irrigation run by diesel out 21 million pump sets in India. The average capacity of pump is 3.73 KW (5 HP). Now a days, the rates of diesel has been regularly increasing, the cost solar PV has been drastically decreasing. Solar PV has become very much economical as progressing towards grid parity. The capital cost of solar PV Pump sets is very much higher than diesel pumps.  Government support is required for installation of solar PV pump sets, such as capital subsidy and soft loans. Now, there is need to replace diesel pumps with solar PV pumps.  Replacement of these diesel pumps depends upon availability of solar resource and land for installation of solar PV system i.e. 10 $m^2$ for 1 KW (around 40 $m^2$ for 5 HP pump set). Out of these 9 million diesel pump sets 75% are assumed to be in solar resource region; total number of diesel pump sets in solar resource region comes to 6.75 million. Out of 6.75 million diesel pumps, 70% have land for installation of PV System; total numbers of pump sets in solar resource region and have land for installation of solar PV comes to 4.725 millions. We may take it as 4.5 million (just half of 9 million diesel pumps). The replacement of these 4.5 million pump sets means the potential of 16,785 MW, the replacement of 4.5 million diesel pumps save 223,800 million liter of diesel and 469.98 billion Kg carbon dioxide per annum [11].

Telecom Towers

Telecom towers were 400,000 in 2010. Assuming, 70% telecom towers are powered by diesel generating sets between 3 to 5 KW; telecom towers run on diesel generating sets comes to 280,000. 75% of these towers are located in solar resource region; number of towers using diesel generating sets located in solar resource region comes to 210,000. Assuming, land shall be available to 40% towers; number of towers have land for installation of solar PV in solar resource region using diesel generating sets comes to 84,000. Average generating capacity of diesel generating set is 4KW. Total off-grid potential of solar PV is 336 MW.

## VIII.   STATUS OF ELECTRICITY IN RURAL INDIA

There has been wide gap between demand and supply of electricity in India. In India, there is deficit of electricity in base load and peak load hours. As per actual power supply conditions during 2011-12, base load requirement was 937,199 (MU) against the availability of 857,886 MU, an 8.5% deficit. During peak loads, the demand was for 130 GW against availability of 116 GW, a 10.6% shortfall [12]. The impact of deficit is visible in urban areas and rural areas, causing load shedding (declared and undeclared power cuts).  The rural feeder are under cut in day hours due shortage of supply. Villagers receive electricity in night hours; this electric supply is of poor quality and un- reliable. Poor quality and unreliable supply affects the agricultural production and life of villagers. Villagers needed to be remain in farms during night hours for irrigation of land (since availability of electricity in night hours). The

quality way of life of villagers has not been improved due to improper supply in rural India. Most of the works are carried out in day hours, therefore, availability of electricity night hours is not as useful as in day hours.

## IX. FUTURE OFF- GRID SOLAR PV POTENTIAL IN INDIA

The future of off-grid solar PV is bright in India. The economic and population growth will give rise to electricity demand in the country at a faster rate. The gap between supply and demand will increase further as the generation resources are very limited in the country. This will ultimately adversely affect the electricity supply in rural areas. The solar PV would achieve grid parity within three to four years; cost of electricity generated from solar PV would be less than grid supply. Million of the farmers in high solar resource regions would replace grid supply by off-grid solar PV for their irrigation pump sets. Now, the market of cell phone would develop at a faster rate in rural areas. Accordingly, new telecom towers shall be installed in rural areas. These telecom towers in rural areas would be associated with solar PV due to low cost. The economic rise in the country would further strengthen the economic conditions of villagers. The demand of electricity in rural areas would further rise, consequently, increase in requirement of solar lanterns, solar home lighting system and micro – grids. The economic and population growth of the country will increase supply and demand gap of electricity, this increasing supply and demand gap would substantially increase in off-grid potential. As per table 2, IEA, Technology Roadmap, Solar Photovoltaic Energy 2010, off-grid potential of the world will be 463 GW by 2050. India's share would be between 20 to 25%, hence, the potential would be 92 to 115 GW by 2050.

## X. DISCUSSIONS AND CONCLUSIONS

In India, 75 million households have no access to the electricity, use kerosene for lighting which is dangerous from health point of view. Annual expenditure on kerosene for lighting in India is approximately USD 2 billion, USD 1.8 billion in rural areas. Need to develop mechanism for making rural India free of kerosene by transfer of kerosene subsidy to solar lantern and solar home lighting System. Approximately 27-37 million solar lanterns and 19-29 million solar home lighting systems shall be required for making India free of kerosene.

About 16% of villages are un-electrified, approximately 95,000 villages. These villages of India are deprived from modern equipment such as TV, computers and mobiles. Therefore, these villages are socially and economically backward. Solar PV micro- grids can be set up in the villages for betterment of lives of rural India in solar resource regions. 42,750 villages may be electrified having 150- 200 households. The potential is around 3000 MW.

9 million diesel pump sets have been deployed by farmers for irrigation in India. Out of these 9 million pump sets, 4.5 million diesel pump sets are located in solar resource regions and have the land for installation Solar PV system. Average capacity of pump is 3.73 KW, and total potential of these pumps comes to 16,785 MW.

400,000 telecommunication towers are installed in India, out of which 84,000 telecom towers powered by diesel generating sets are located in solar resource regions and having land for installation of solar PV. Average capacity of diesel generating set is 4KW; the total potential comes to 336 MW.

Off-grid solar PV has a bright future in India. Mainly, three factors will collectively work and increase off- grid potential several times in India. First factor- limited land resource in India restricts utility scale solar PV end –use sector, Second factor- electrifying remote villages is not techno-economically feasible, since requires long transmission and distribution lines which involve heavy capital expenditure, and third factor - economic and population growth of the country will increase supply and demand gap of electricity, this increasing supply and demand gap would substantially increase in off-grid potential. As per IEA, Technology Roadmap, Solar Photovoltaic Energy 2010, off- grid solar PV potential of the world would be 463 GW by 2050, India would have potential of 20 to 25%, 92 GW to 115 GW by 2050.

The world's highest off-grid potential is in India, therefore, there is need to develop strong R&D on off –grid solar PV to enable to provide minimum requirement of electricity to the rural peoples at reasonable and affordable rates. Government of India and the State Governments need to encourage off-grid solar PV system in India, by providing capital subsidy and soft loans to phase out Kerosene and diesel from the Indian scene. NGO (Non-governmental organization) should come forward to phase out kerosene and diesel from rural India.

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# Grid Computing Architecture and Benefits

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**Abstract-** Grid Computing has become another buzzword after Web 2.0. However, there are dozens of different definitions for Grid Computing and there seems to be no consensus on what a Grid is.

This paper describes about Grid Computing. In various ways we are trying to explain grid computing along with its architecture and the standards available for grid computing. Then at last we have discussed about the benefits of grid computing.

**Index Terms-** Grid Computing, connectivity layer, resource layer, application layer, Open Grid Service Architecture (OGSA). Open Grid Services Interface (OGSI), OGSA-DAI (data access and integration), and Web Services Resource Framework (WSRF).

## I. INTRODUCTION

GRID computing [1, 2] is a technology for coordinating large scale resource sharing and problem solving among various autonomous group. Grid technologies are currently distinct from other major technical trends such as internet, enterprise distributed networks and peer to peer computing. Also it has some embracing issues in QoS, data management, scheduling, resource allocation, accounting and performance.
Grids are built by various user communities to offer a good infrastructure which helps the members to solve their specific problems which are called a grand challenge problem.

A grid consists of different types of resources owned by different and typically independent organizations which results in heterogeneity of resources and policies. Because of this, grid based services and applications experience a different resource behavior than expected.

Similarly, a distributed infrastructure with ambitious service put more impact on the capabilities of the interconnecting networks than other environments.

Grid High Performance Network Group [3] works on network research, grid infrastructure and development. In their document the authors listed six main functional requirements, which are considered as mandatory requirements for grid applications.

They are:
   i)  High performance transport protocol for bulk data transfer,
   ii)  Performance controllability,
   iii)  Dynamic network resource allocation and reservation,
   iv)  Security,
   v)  High availability and

   vi)  Multicast to efficiently distribute data to group of resources.

Grid computing can mean different things to different individuals. The grand vision is often presented as an analogy to power grids where users (or electrical appliances) get access to electricity through wall sockets with no care or consideration for where or how the electricity is actually generated.

In this view of grid computing, computing becomes pervasive and individual users (or client applications) gain access to computing resources (processors, storage, data, applications, and so on) as needed with little or no knowledge of where those resources are located or what the underlying technologies, hardware, operating system, and so on.

Grid computing could be defined as any of a variety of levels of virtualization along a continuum. Exactly where along that continuum one might say that a particular solution is an implementation of grid computing versus a relatively simple implementation using virtual resources is a matter of opinion. But even at the simplest levels of virtualization, one could say that grid-enabling technologies

## II. ARCHITECTURE

Grids started off in the mid-90s to address large-scale computation problems using a network of resource-sharing commodity machines that deliver the computation power affordable only by supercomputers and large dedicated clusters at that time.
The major motivation was that these high performance computing resources were expensive and hard to get access to, so the starting point was to use federated resources that could comprise compute, storage and network resources from multiple geographically distributed institutions, and such resources are generally heterogeneous and dynamic.

Grids focused on integrating existing resources with their hardware, operating systems, local resource management, and security infrastructure. In order to support the creation of the so called "Virtual Organizations"—a logical entity within which distributed resources can be discovered and shared as if they were from the same organization, Grids define and provide a set of standard protocols, middleware, toolkits, and services built on top of these protocols. Interoperability and security are the primary concerns for the Grid infrastructure as resources may come from different administrative domains, which have both global and local resource usage policies, different hardware and software configurations and platforms, and vary in availability and capacity.

Grids provide protocols and services at five different layers as identified in the Grid protocol architecture (see Figure 1). At the **Fabric layer**, Grids provide access to different resource types such as compute, storage and network resource, code repository, etc. Grids usually rely on existing fabric components, for instance, local resource managers.

General-purpose components such as GARA (general architecture for advanced reservation) [4],and specialized resource management services such as Falkon [5]

**Connectivity layer** defines core communication and authentication protocols for easy and secure network transactions. The GSI (Grid Security Infrastructure) [6] protocol underlies every Grid transaction.
The **Resource layer** defines protocols for the publication, discovery, negotiation, monitoring, accounting and payment of sharing operations on individual resources.
The GRAM (Grid Resource Access and Management) [7] protocol is used for allocation of computational resources and for monitoring and control of computation on those resources, and GridFTP [8] for data access and high-speed data transfer.
The **Collective layer** captures interactions across collections of resources, directory services such as MDS (Monitoring and Discovery Service) [9] allows for the monitoring and discovery of VO resources, Condor-G and Nimrod-G are examples of co-allocating, scheduling and brokering services, and MPICH [10] for Grid enabled programming systems, and CAS (community authorization service) [11] for global resource policies.
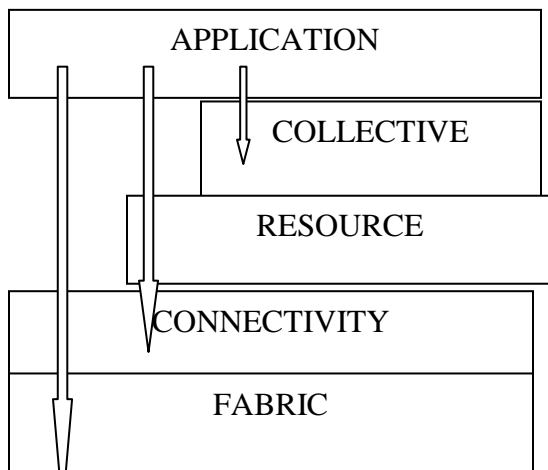


The **Application layer** comprises whatever user applications built on top of the above protocols and APIs and operate in VO environments.

### III. STANDARDS FOR GRID ENVIRONMENTS

**OGSA**

The Global Grid Forum has published the Open Grid Service Architecture (OGSA). To address the requirements of grid computing in an open and standard way, requires a framework for distributed systems that support integration,virtualization, and management. Such a framework requires a core set of interfaces, expected behaviors, resource models, and bindings.[12]

OGSA defines requirements for these core capabilities and thus provides a general reference architecture for grid computing environments. It identifies the components and functions that are useful if not required for a grid environment.

**OGSI**

As grid computing has evolved it has become clear that a service-oriented architecture could provide many benefits in the implementation of a grid infrastructure. The Global Grid Forum extended the concepts defined in OGSA to define specific interfaces to various services that would implement the functions defined by OGSA.

More specifically, the Open Grid Services Interface (OGSI) defines mechanisms for creating, managing, and exchanging information among Grid services. A Grid service is a Web service that conforms to a set of interfaces and behaviors that define how a client interacts with a Grid service. These interfaces and behaviors, along with other OGSI mechanisms associated with Grid service creation and discovery, provide the basis for a robust grid environment. OGSI provides the Web Service Definition Language (WSDL) definitions for these key interfaces.

**OGSA-DAI**

The OGSA-DAI (data access and integration) project is concerned with constructing middleware to assist with access and integration of data from separate data sources via the grid. The project was conceived by the UK Database Task Force and is working closely with the Global Grid Forum DAIS-WG and the Globus team.[12]

**GridFTP**

GridFTP is a secure and reliable data transfer protocol providing high performance and optimized for wide-area networks that have high bandwidth. As one might guess from its name, it is based upon the Internet FTP protocol and includes extensions that make it a desirable tool in a grid environment. The GridFTP protocol specification is a proposed recommendation document in the Global Grid Forum (GFD-R-P.020).[12]

GridFTP uses basic Grid security on both control (command) and data channels. Features include multiple data channels for parallel transfers, partial file transfers, third-party transfers, and more.

**WSRF**

Web Services Resource Framework (WSRF). Basically, WSRF defines a set of specifications for defining the relationship between Web services (that are normally stateless) and stateful resources.[12]

**Web services related standards**

Because Grid services are so closely related to Web services, the plethora of standards associated with Web services also apply to Grid services. We do not describe all of these standards in this document, but rather recommend that the reader become familiar with standards commonly associate with Web services,such as:

_ XML
_ WSDL
_ SOAP
_ UDDI

## IV. BENEFITS OF GRID COMPUTING

**Exploiting underutilized Resources:**

One of the basic uses of grid computing is to run an existing application on a different machine. The machine on which the application is normally run might be unusually busy due to a peak in activity. The job in question could be run on an idle machine elsewhere on the grid.

**Parallel CPU capacity**

The potential for massive parallel CPU capacity is one of the most common visions and attractive features of a grid. In addition to pure scientific needs, such computing power is driving a new evolution in industries such as the bio-medical field, financial modeling, oil exploration, motion picture animation, and many others.

**Virtual resources and virtual organizations for collaboration**

Another capability enabled by grid computing is to provide an environment for collaboration among a wider audience. In the past, distributed computing promised this collaboration and achieved it to some extent.[12]

**Access to additional resources**

As already stated, in addition to CPU and storage resources, a grid can provide access to other resources as well. The additional resources can be provided in additional numbers and/or capacity.[12]

**Resource balancing**

grid federates a large number of resources contributed by individual machines into a large single-system image. For applications that are grid-enabled, the grid can offer a resource balancing effect by scheduling grid jobs on machines with low utilization.[12]

**Reliability**

High-end conventional computing systems use expensive hardware to increase reliability. They are built using chips with redundant circuits that vote on results, and contain logic to achieve graceful recovery from an assortment of hardware failures.

**Management**

The goal to virtualized the resources on the grid and more uniformly handle heterogeneous systems will create new opportunities to better manage a larger,
more distributed IT infrastructure. It will be easier to visualize capacity and utilization, making it easier for IT departments to control expenditures for computing resources over a larger organization

## V. CONCLUSION

In this we have described about grid computing and its architecture. All the protocols considered under grid computing and benefits of grid computing. In future we will discuss about the security issues of grid computing and try to provide specific solution for the problem of security.

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# Relationship between Periodontal Inflamed Surface Area [PISA] and anaerobic periodontal infections assessed by BANA [N-benzoyl-DL- arginine-β-napthylamide] assay

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**Abstract: Background:** chronic periodontitis is an inflammatory disease of the periodontium caused by microbial infection. The BANA test is a simple chairside test which allows the clinician to quantify the amount of anaerobic periodontal infection. PISA quantifies the inflammatory burden posed by periodontitis to cause systemic inflammatory response. By comparing the BANA test values with PISA, the validity of PISA as a tool to quantify the amount of inflamed periodontal tissues can be analysed.

**Aim:** to compare PISA values with anaerobic periodontal infection assessed by BANA assay.

**Patients and Methods:** A total of 80 sites were selected [40 each from 10 patients in healthy group and 10 patients in chronic periodontitis group]; after measuring the probing depth/clinical attachment levels, the tooth with deepest probing pocket depth from each sextant was selected, and the plaque sample was collected for BANA assay and the corresponding PISA values were calculated.

**Results:** The Mann-Whitney test was used to compare the BANA test results with PISA values in healthy and periodontitis groups. There was a significant difference [p≤0.0001], in PISA values from BANA positive sites compared to BANA negative sites in both the groups.

**Conclusion:** PISA values can be considered as indicators of anaerobic periodontal infection, which clearly demonstrates the validity of PISA in quantifying the inflammatory burden.

**Keywords:** periodontal inflamed surface area, anaerobic periodontal infection, N-benzoyl-DL- arginine-β-napthylamide[BANA] test.

## I.  INTRODUCTION

Periodontal disease comprises of  a group of inflammatory conditions of the supporting tissues of the teeth, which is characterized by loss of connective tissue attachment and alveolar bone resulting in the formation of probeable pockets around the teeth. Periodontal microbiota are a complex community of micro-organisms which play a primary role in the initiation and progression of the periodontal disease.Although several distinct bacterial species are found in the oral cavity, only a finite number of species appear to be associated with the clinical disease[1]. A limited number of bacterial species such as P.gingivalis[2],T.forsythia[3],T.denticola[4] and other spirochetes are associated with most forms of chronic periodontitis. Also this microbial complex is strikingly related to clinical measurements of periodontal disease.

Most of the suspected periodontal pathogens are gram negative anaerobes and use proteins and peptides as nutrients. Such anaerobic infections could be diagnosed by detecting enzyme activity directed towards proteins and peptides. One such enzyme, capable of hydrolyzing the synthetic trypsin substrate N-benzoyl-DL-arginine-β- napthylamide [BANA] is a trypsin- like enzyme [BANA hydrolyzing enzyme].

P.gingivalis,B.forsythus and T.denticola species which are putative periodontal pathogens which  possess BANA hydrolytic activity[5]. This BANA test has been designed into a commercially available,solid-state assay[BANAMET LLC,Ann Arbor, MI USA] which is a simple, chairside diagnostic test. It provides useful information regarding the intensity of anaerobic infection associated with periodontal disease.

The great variation in periodontal classification used in the various studies and the lack of a tool that adequately assesses the inflammatory burden of periodontitis is a major drawback of the studies published on the periodontal inflammation systemic disease interaction. Therefore, a new measure of periodontitis as a risk factor for other diseases was developed, the PISA. PISA quantifies the amount of inflamed periodontal tissue, thereby quantifying the inflammatory burden posed by periodontitis[6].

Thus by comparing  the PISA values  with BANA test results the validity of PISA as a tool to assess the inflammatory burden can be determined. In this perspective this study was carried out to analyse the validity of PISA.

## II.  MATERIAL AND METHODS

The subjects for this study were selected from the patients attending  a private clinic in Chennai.

The patients were selected on the basis of clinical examination using the following criteria[7].

1.  Eighty sites were selected [fourty sites each from,ten patients in   healthy control group consisting of patients with no/minimal signs of inflammation and ten patients from the periodontitis group consisting of patients suffering from chronic generalized form of periodontitis with probing pocket depth/attachment loss ≥ 5mm were selected.

2.  Above the age group of 35 years.

3.  Free from systemic diseases.

4.  Who have not received any local or systemic antimicrobial and anti-inflammatory therapy for the past six months.

5.  Who had not received any periodontal treatment for atleast one year before examination.

6.  Pregnant women and women who were on contraceptive medications were not selected for the study.

## III.  PROCEDURE

After measuring the probing depth/clinical attachment levels, the tooth with deepest probing pocket depth from each sextant was selected[ a total of 80 sites were selected 40 sites from the healthy group and 40

 sites from the chronic periodontitis group], and the plaque sample was collected for BANA assay and correspondingly the PISA values were calculated using bleeding on probing, attachment levels and probing depth measurements.

Sub-gingival plaque collection and sampling:

Name and age of the patient along with information of described site were recorded in the reagent strip.

Supragingival plaque was removed  and discarded prior to sampling. Subgingival plaque material was collected using periodontal curettes positioned in the deepest areas of the periodontal pockets.

Each sample was applied on the raised reagent matrix affixed to the lower portion of the test  strips in the location corresponding to the number of the tooth from where the specimen was taken.

After sampling the desired sites, the upper test matrix was moistened with distilled water using a sterile cotton swab.

The reagent strip was folded at the perforation so that lower and upper matrices come in direct contact with each other. The reagent strip was then placed in the incubator for 15 minutes at $55^0$c.The lower portion of the test strip was separated from the upper strip and discarded. After incubation, the test results [colour reaction] from the matrix were read as follows, using the following BANA reagent interpretation chart.following BANA reagent chart.
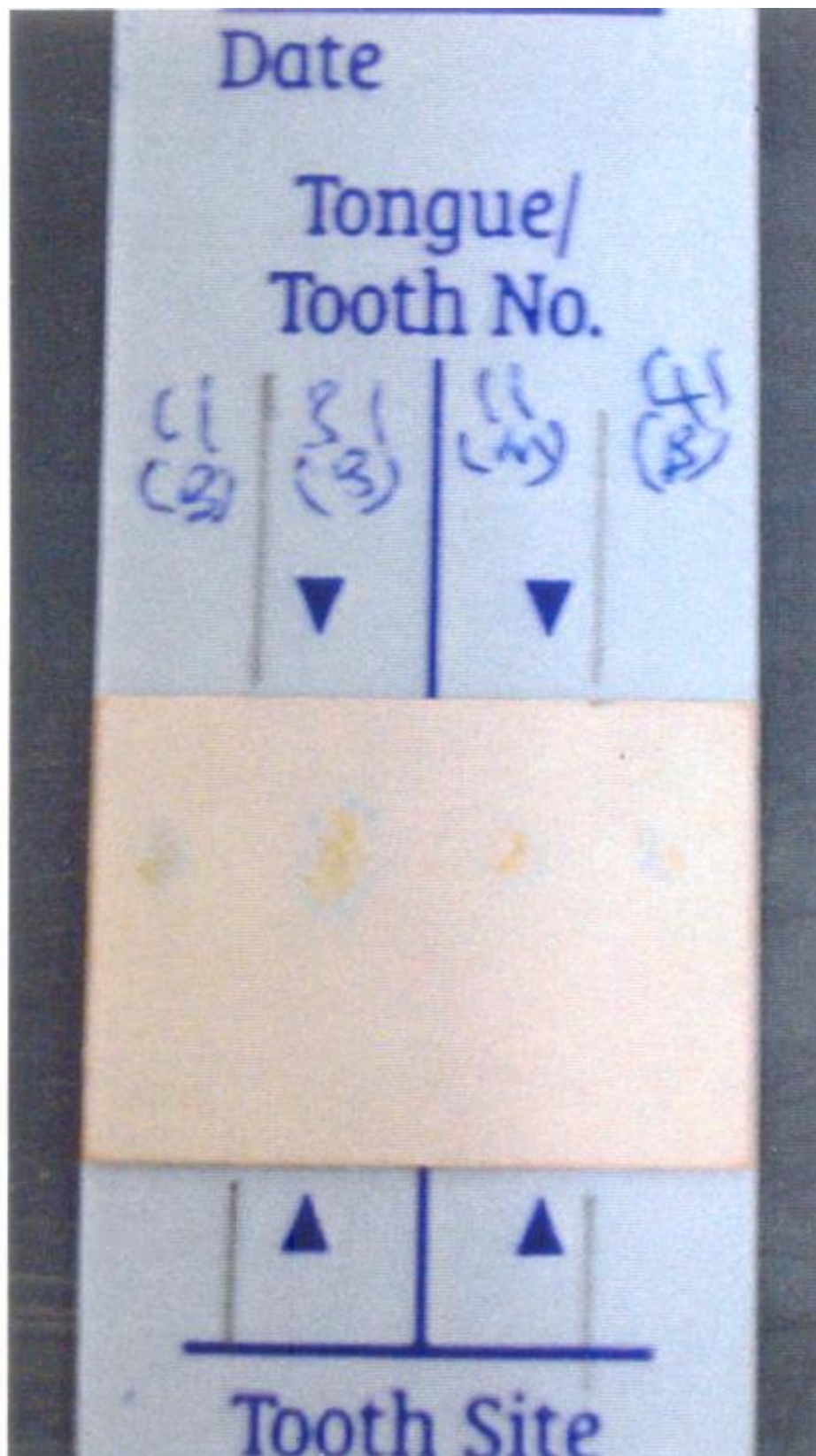
Fig (1) BANA reagent strip after incubation [colour change seen in upper matrix]

Negative: no blue color is observable on a pale red background.

Weak positive: faint blue color on a pale red background.

Positive: distinct patches of blue somewhat larger and darker than weak positive reaction on a pale red background.

PISA was calculated for the corresponding tooth by filling in clinical attachment level, recession and bleeding on probing on six sites per tooth in the freely downloadable spread sheet available from www.parsprototo.info.

The average of PISA scores of the healthy and periodontitis group was calculated and the results were compared  with BANA test results of the corresponding groups.

## IV.   STATISTICAL ANALYSIS

The collected data was analysed with SPSS 17.0 version. To describe about the data the descriptive statistics, mean and standard deviation was used. Frequency analysis was used to find the distribution of BANA scores for a independent bi-variate analysis, the non-parametric mann-whitney test was used with significance level of $p \leq 0.05$.

**Results:**

**Table 1**

**BANA Score Comparison**

| Groups | NEGATIVE | WEAK POSITIVE | POSITIVE |
|---|---|---|---|
| Healthy [%] | 27.5 | 27.5 | 45 |
| Periodontitis [%] | 5 | 12.5 | 82.5 |
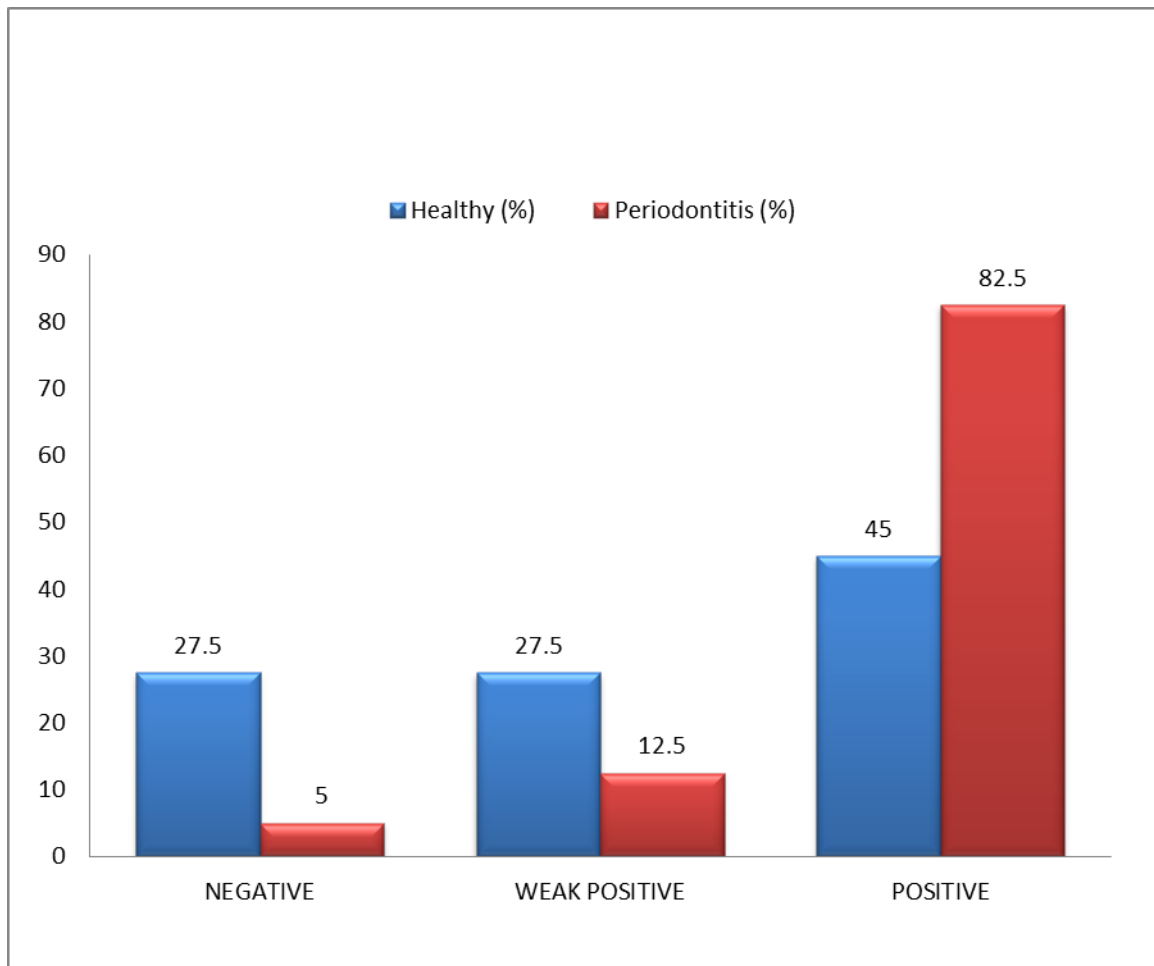
Fig(2) Bana Score Comparison

**Table 2**

**Comparison of BANA with PISA**

| BANASCORE COMPARISON WITH PISA USING MANN-WHITNEY TEST | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Groups | NEGATIVE | WEAK POSITIVE | POSITIVE | MANN-WHITNEY | P-VALUE | SIG |
| BANA SCORE | Healthy | 11[27.5%] | 11[27.5%] | 18[45%] | 3.568 | 0.000 | S** |
| | Periodontitis | 2[5%] | 5[12.5%] | 33[82.5%] | | | |
| PISA | Healthy | $14.31 \pm 10.11$ | $16.07 \pm 7.60$ | $23.32 \pm 20.65$ | 7.458 | 0.000 | S** |
| | Periodontitis | $77.1 \pm 41.57$ | $76.7 \pm 22.49$ | $99.2 \pm 44.45$ | | | |
| S** denotes significant at P < .0001 | | | | | | | |
| | | | | | | | |
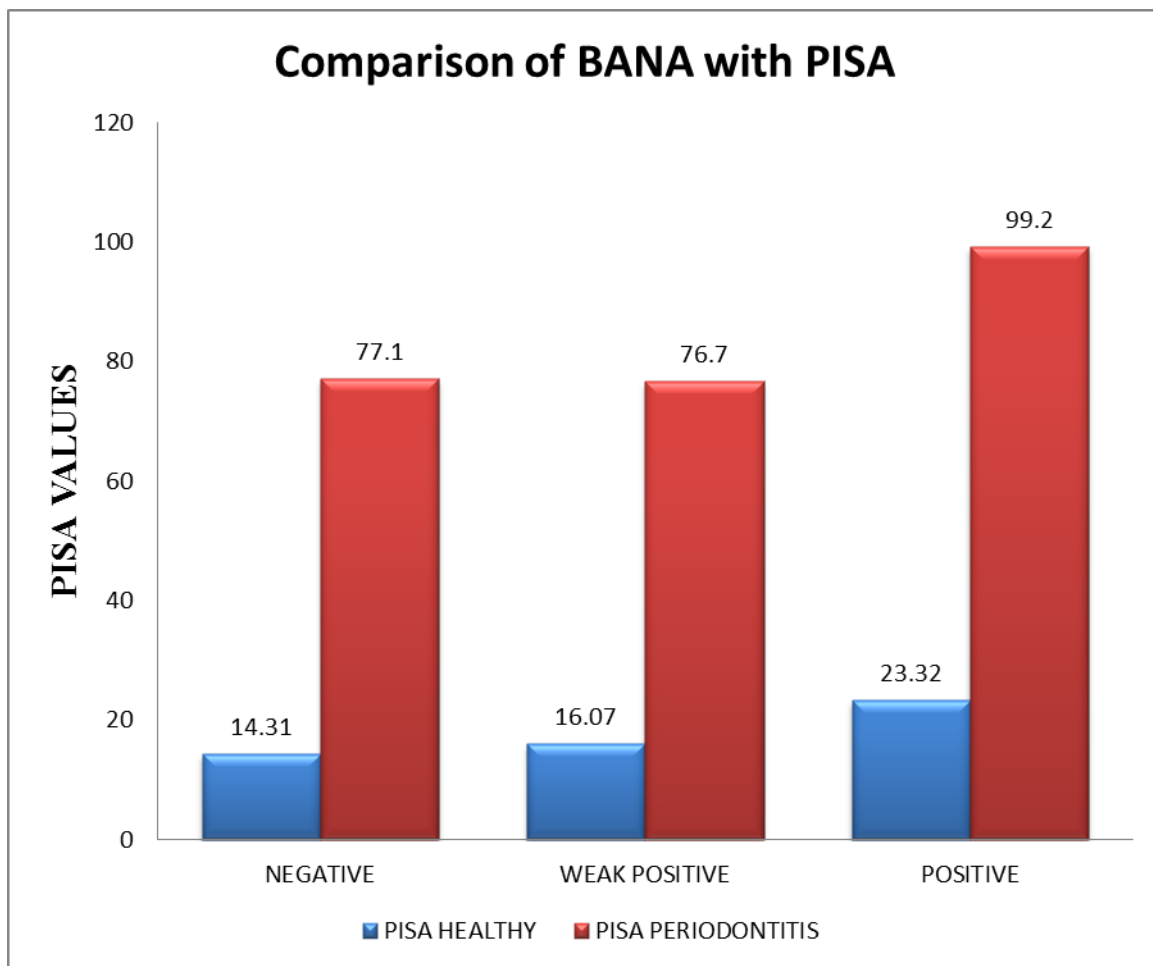
Fig (3) Comparison of BANA scores with PISA

## V. DISCUSSION

The objective of the present study was to check the validity of the PISA classification system, by comparing the levels of putative

periodontal pathogens[BANA test results] which are the primary etiological factors for chronic periodontitis with PISA values.

Chronic periodontitis is an inflammatory disease of the periodontium caused by microbial infection. Although several distinct

bacterial species are present in the oral cavity, a limited number of bacterial species such as Porphyromonas gingivalis, Tanerella

forsythia, Treponema denticola and other spirochetes are associated with most forms of chronic periodontitis, also they are strikingly

related to clinical measurements of periodontal disease.

BANA test[BANAMET LLC] format was used because it is helpful as a simple objective chair side test to find out the presence of

putative periodontal pathogens[Porphyromonas gingivalis, Tanerella forsythia, Treponema denticola]. The limitation of BANA test is,

it does not identify which of the three BANA positive species is present in the plaque. However, as all the three species are anaerobes,

it allows the clinician to determine that an anaerobic infection is present[8], hence it was used in the present study.

The need to quantify the amount of inflamed periodontal tissue in order to quantify the inflammatory burden to establish the role of

inflamed periodontal tissue in eliciting bacteraemia, systemic inflammatory responses or cross-reactivity[9] led to the development of

PISA, a classification of periodontitis that quantifies the amount of inflamed periodontal tissue and, as such quantifies the systemic inflammatory burden. The limitations of PISA are , first the parameters [CAL, recession and BOP measurements] always include measurement errors related to observer, instrument, teeth, patients and their interactions, second the formulas transforming  CAL recession to surface area, use population- based mean values of both root surface areas and root lengths. Thus, individual variations in root surface area and root length are not taken into account when calculating PISA and third PISA quantifies  the amount of inflamed periodontal tissue in two dimensions, whereas in fact periodontitis is a three dimensional inflammatory process, i.e. extending into the connective tissue around the root.

For these reasons, PISA may not precisely quantify the the amount of inflammatory tissue. However, PISA likely quantifies the amount of inflamed periodontal tissue for each individual patient more accurately than any classification currently used, hence it was used in the present study.

Out of the 80 sites examined 13 sites showed negative BANA results [11 sites  from the healthy group and 2 sites from the chronic periodontitis group]. The negative BANA test reactions in healthy sites may be due to the presence of putative microorganisms below the detection level of  BANA test and/or presence of non-putative microorganisms. A negative BANA result indicates that the BANA positive organisms are below the range of 10,000 to 1,00,000 colony forming units[cfu] at the site of sampling[10].

16 sites showed weak positive reactions[11 sites from healthy group and 5 sites from chronic periodontitis group]. A weak positive reaction indicates that the BANA positive species are above the level of 1,00,000 cfu. The presence of a weak positive reaction may be explained by the ability of the BANA test to identify the microbial colonization of pre-clinical infection.[11]

51 sites showed BANA positive reactions [18 from healthy group and 33 from chronic periodontitis group]. A positive BANA reaction  indicates that the BANA positive species are present in high proportions in the sample. The positive BANA test reactions in healthy group may be explained by the fact that, even though pocket depth was small, clear gingival changes were present and the site may have been colonized by BANA positive microorganisms[12].

When the PISA values were compared with BANA test results, there was a significant difference in PISA values between BANA positive  and BANA negative sites.[23.32+20.65  and 14.31+10.11 for healthy group and  99.2+44.5 and 77.1+41.57 for chronic periodontitis group ]. The results clearly demonstrate increased PISA values from  BANA positive sites from both healthy and chronic periodontitis group compared to PISA values from BANA negative sites from both healthy and chronic periodontitis group, which clearly demonstrates the association between increased load of anaerobic microbial infection and periodontal inflammation.Thus PISA values  can be considered as indicators of  anaerobic periodontal infection, which adds weight to the validity of the PISA classification system and hence PISA apart from being used to quantify periodontal inflamed surface area  can also be used as a valid clinical tool to quantify anaerobic periodontal infection.

Further studies correlating certain oral microorganisms that might play a key role in causing systemic diseases[e.g. campylobacter rectus, prevotella intermedia, porphyromonas gingivalis and peptostreptococcus micros][13] with PISA might help in predicting the probability of periodontitis to cause other diseases, thereby helping to establish a biological plausibility for the role of periodontitis in causing systemic disease.

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# Comparative Analysis of Air Conditioning System Using PID and Neural Network Controller

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**Abstract-** Now a days air conditioning system is the necessity part of human life. The different controllers used for controlling air conditioning system like on-off controllers or PID controllers. But these controllers cannot give the sufficient response and consume high power. This paper aims to control the air conditioning system such that the output temperature of air conditioning systems are getting as required by the operator with fast response and low consuming power. For this purpose neural network controllers are designed which is feedback to the air conditioning system. We designed such neural network control system that speculates its own control law. The advantage of using neural networks are this controller is self-learning system and give the faster and better response with comparison to another controllers and give the zero overshoot output.

*Index Terms*- air conditioning system; neural network controller; Simulink model

## I. INTRODUCTION

From last few decades traditional ON-OFF controllers and conventional PID controllers were used for controlling the Air Conditioning system. But these controllers don't always produce desired and fast response. And tuning of conventional PID controllers was difficult. So in recent years intelligent control system are designed for controlling the air conditioning (AC) system. Neural network controllers are best option for controlling the system. By choosing suitable neural networks, learning method and input-output data the neural network can be learn the system states, to predict the future behavior of the system. Neural network controllers give the fast response and these controllers are reliable and robustness. The system which are linear or non-linear can be controlled by neural network because of neural networks have the ability to approximate arbitrator value through self-learning property. Due to this property of neural network the designed controllers make up the system uncertainties and system nonlinearities and make system response stable.

A numerous number of applications based on neural network controller are developed for temperature control. Generally temperature control systems are control by PID controllers. But decoupled temperature system can't be controlled by conventional PID because of these system have large time constant with long delay time characteristics. Similar to this system, neural network with PID controllers are designed to control the system [1].

Controllers like on-off or PID controller were designed for ordinary AC system. With increasing uses of AC, the centralized heating ventilating and air conditioning (HVAC) system and air handling units (AHUs) are developed. For controlling these systems, neural networks based control systems are used. While by simple PID control system controlling of this system are difficult [2].

Application of neural network increases with time. The system which is uncertain and non-linear is control by adaptive neural network control to approximate and determine the characteristics of the uncertain nonlinear system with predictive compensation [3]. Some uncertain system has specified nonlinearities like non smooth nonlinearities. By taking certain well defined sign function and suitable neural network approximation to control the uncertain system with non-smooth nonlinearities. Different temperature control system like MRC and NRMA controllers used in industry for thermal treatment process. For better response nonlinear neural network controller were introduced in [4]. Some system has large inertia and pure lag compensation characteristics. This system can't be controllable by simple PID controller. Similar to this system is variable frequency air conditioning system which has large inertia and lag compensation characteristics. Neural network PID controllers are introduced for controlling to this system [5].

Although PID controllers are simple in structure intelligent control strategies have more advantages over different ordinary controllers. Control system has suffering with problem of undesired response, overshoot, vibration and large settling time, if the system going from one state to another state. Optimal fuzzy logic controller using genetic algorithm remove the problem of overshoot, vibration and large settling time and give the desired response while system specification change [6].

For designing of controller for air conditioning system studied, modeling and simulink of DC motor with compressor [9] is necessary. Air conditioner comfort the human life but there is problem in using of air conditioning system one is performance and life of air conditioning system and second is power consumption. This paper aims to design a controller using neural network for controlling Air Conditioning system and compare the result neural network controller with traditional PID controllers.

## II. EASE NEURAL NETWORK CONTROLLERS

Here we are using neural network for controlling air conditioner. ON-OFF controller and conventional PID controller is already design for this purpose. But due to change in temperature, external environmental conditional ON-OFF controller failed for controlling the system and the tuning of PID controllers are difficult for states change of system. So for the complex system we are using neural network structure for controlling air conditioning system. Controlling of temperature of system in industry, which have long delay time and large constant is controlled by [1]. A PID controller can be used for variable frequency air conditioning system but the richness of PID is weak whenever the parameters of model are changes. The proposed control scheme for controlling air conditioning system gives the improve result. Result of proposed controller is compare with result of conventional PID controller.

As we know that artificial neural network is an information processing system and it has some characteristics same as biological neural network. Intelligent control strategies can design a method that can estimate any signal for getting desired response without assuming signal behavior. A neural network control strategy is one of the intelligent control strategies.

Any neural network can be characterized by its three parts. Fist part is the architecture of neural network means the method for connection of neurons. Second part is the training, or learning or algorithm for determining the weights and last part is the activation function. The neural network architecture can be described in three parts:

- Input Layer – The input layer has input neurons which are the state of the system. The output of the system (air conditioner) at different time which is desired at that time is input to the neural network controllers.

- Hidden layer – The neuron in this layer is known as hidden neuron which performs different activation function. The activation function of hidden layer's neuron of proposed controller is tan sigmoid (tansig) function.

- Output layer – The output layer contains two output neurons. The activation function of the output layer's neurons is the hyperbolic tangent sigmoid function. A simple structure showing the different layers of neural network in Fig. 1. Equations of input and output for different layer are described below.
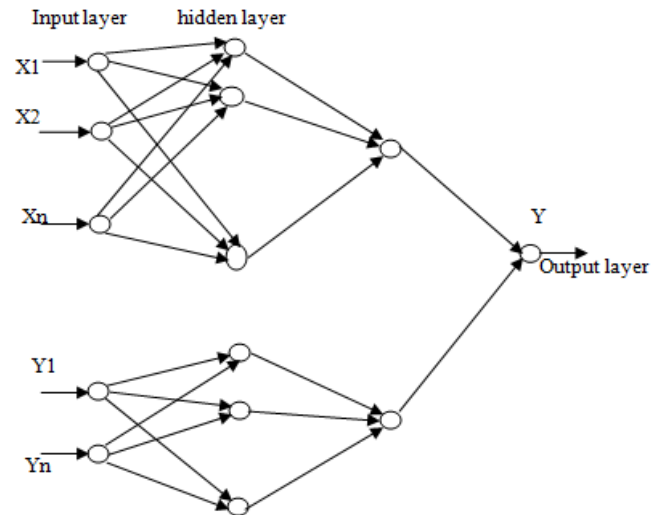


**Figure 1.Structure of neural network.**

In Fig. 1 output from the input neuron of input layer can be expressed by following equation (1).

$$I_j^1 = x_j \quad \text{where } j = 1, 2, \ldots \ldots \ldots s$$
$$I_k^1 = y_k \quad \text{where } k = 1, 2, \ldots \ldots \ldots r \quad (1)$$

Where $I_j^1$ and $I_k^1$ is the output of the $j^{th}$ and $k^{th}$ input neuron of the input layer. The number of input layer's neurons are j and k. these neurons lies on the complex degree of controller used for air conditioning system.

The input apply to the hidden neurons of the hidden layer can be expressed by following equations (2).

$$net_1^{(2)} = \sum_{j=0}^{X} W_{1j}^{(2)} * I_j^{(1)}$$
$$net_m^{(2)} = \sum_{k=0}^{Y} W_{mk}^{(2)} * I_k^{(1)} \quad (2)$$

Here $net_1^{(2)}$ and $net_m^{(2)}$ are the input to the hidden layer's neurons. Input for $l^{th}$ neuron of hidden layer is $net_1^{(2)}$ while for $m^{th}$ neuron of hidden layer's input is $net_m^{(2)}$. $W_{1j}^{(2)}$ and $W_{mk}^{(2)}$ are the weights of hidden layer.

The following equation (3) can be expressed as the output of the hidden layer's neuron.

$$H_p^2 = f_1[net_1^{(2)}]$$
$$H_q^2 = f_2[net_m^{(2)}] \quad (3)$$

Where $f_1[..]$ and $f_2[..]$ are the activation function for hidden layer's neurons. Here tan sigmoid is used as the activation

function in hidden layer. Here $f_1[..]$ activation function means $f_1[..] = \text{tansig}(x)$ while $f_2[..] = \text{tansig}(y)$.

The input equation (4) applies to the output neurons of the output layer.

$$net_n^{(3)} = \sum_{p=0}^{X} W_{np}^{(3)} * H_p^{(2)}$$

$$net_o^{(3)} = \sum_{q=0}^{Y} W_{oq}^{(3)} * H_q^{(2)} \qquad (4)$$

The equation (5) for output of the output layer's neuron can be given.

$$H_r^{(3)} = g_1[net_n^{(3)}]$$

$$H_s^{(3)} = g_2[net_o^{(3)}] \qquad (5)$$

Here $g_1$ and $g_2$ both are tan sigmoid activation function of output layer's neuron. $W_{np}^{(3)}$ and $W_{oq}^{(3)}$ are weights for output neurons. Here used neural network are self-learning system so these weights are adjusted by themselves as required response.

A simple block diagram of neural network controller with air conditioning system is shown in Fig. (2). Neural network is directly used here to controlling the air conditioning system. The neural network controller has two inputs, first input is measured compressor's temperature and second input is the output of controller which feedback to
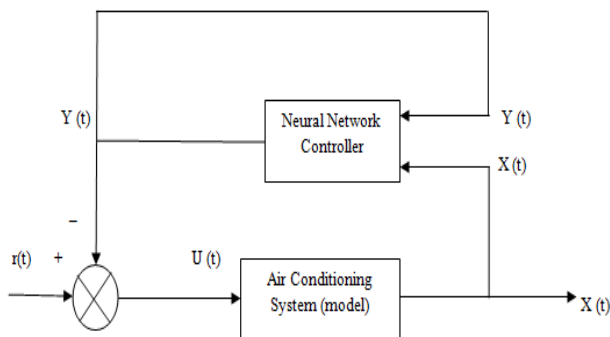


**Figure 2. Block diagram of proposed controller**

Control system. The control signal apply to the air conditioning system is optimized signal of controlled signal by neural network controller and desired reference temperature by operator.

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The mathematical equation for the neural network model is given by equation (1). The output of neural network model can be defined as

$$Y(t) = f\{y(1), y(2) \ldots \ldots \ldots . y(n), x(1), x(2) \ldots \ldots \ldots . x(m)\}$$

(6)

The output value of neural network model $Y(t)$ is feedback to neural network model and output of the air conditioning system $x(t)$ inputs apply to the neural network model.

The output of neural network $Y(t)$ compare with the reference input given by the operator and optimizing the control input. This control input signal applies to the air conditioning model.

### III. MODELING OF AIR CONDITIONER

Cooling of a room, whole house, or entire business room is done by Air-Conditioner. Air Conditioner uses chemicals like Freon, or R-410A. These chemicals can be converting easily from a gas to liquid and vice versa. Transformation of heat from the air inside of home to the outside air is done by these chemicals.

Air Conditioner has three main parts first is compressor, second is condenser, third and last is evaporator. Compressor and condenser are placed outside to the air portion of the air conditioner. The evaporator is placed inner side of the house. Compressor is used for compressing the cool and low pressure gas. Condenser is used for cooling the hot gas from compressor and converts high pressure gas into liquid under high pressure. Evaporator evaporates and liquid change into gas.

Controller of air conditioner means controlling of speed of DC motor used for compressor. Temperature of air conditioning system depends upon the speed of compressor. So by controlling the speed of air conditioning system we can control temperature and can get desired temperature set by operator.

Generally brushless DC motor drive is used for Air Conditioning compressor. Electrical equivalent circuit of DC motor is shown in figure (3).
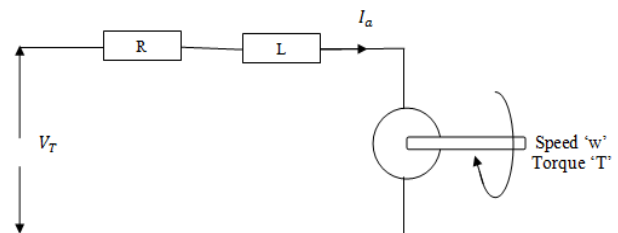


**Figure 3. Equivalent circuit of DC motor.**

Applying Kirchhoff voltage law (KVL) to equivalent circuit.

$$V_T - E_b = R * I_a + L * \frac{dI_a}{dt} \qquad (7)$$

Torque of the motor can be written as

$$T = K * I_a \qquad (8)$$

Where K is torque constant.

The generated voltage

$$E_b = K * \omega \qquad (9)$$

By using equation (7) and (9)

$$V_T - K * \omega = R * I_a + L * \frac{dI_a}{dt} \qquad (10)$$

$$J * \frac{d\omega}{dt} + b * \omega = K * I_a \qquad (11)$$

Using these equation block diagram of DC motor is shown in Fig. 4. Here we used direct neural network controllers. Whenever compressor temperature increase or decrease then neural network set the value of temperature to a limit such that the output of air conditioning system means output temperature of compressor will be same as the desired or reference temperature given by the operator.
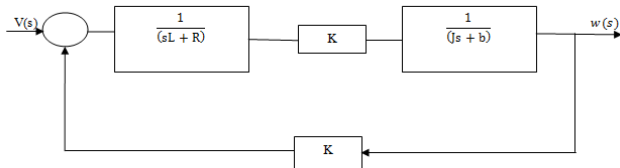


**Figure 4. Block diagram of DC motor**

IV.     SIMULINK MODEL OF CONTROLLER

Assigned values for our desired air conditioning DC motor model are following

J = 0.25; b = 1.1;

K1 = 0.23; K2 = 0.5;

K = 1;

L = 0.01; R=1;
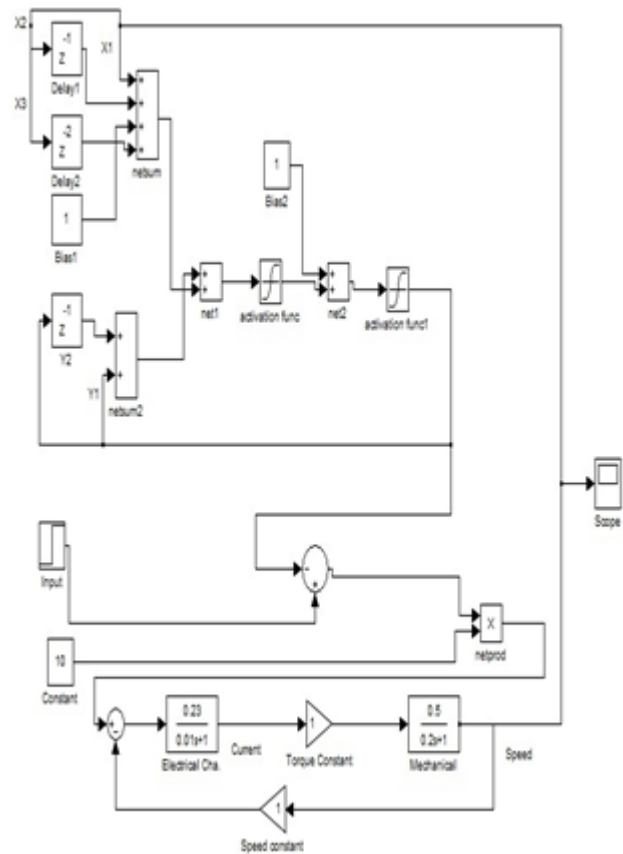


**Figure 5.  Simulink model of NN controller**

A.   *Simulink of NN controller*

Fig. 5 shows the simulink model of controller with air conditioning system. Here neural network is self-learning system. There is no need in modification or changing in neural block or activation function if there is change in reference speed (denote the temperature of air conditioning system) by the operators. The neural network controller receives data from output of air conditioning system and output of self-block as input to controller. The output of controller is such that the output of air conditioning system is very close to desired response.

In any case if the output of the air conditioning system is not close to desired response by operator, then output of self-learning neural network controller adjust themselves in such a way that the output response of the air conditioning system becomes very close to the desired output response set by the operator. Here the activation function of both layer hidden layer and output layer is tan sigmoid function. General form of tan sigmoid function is defined as

$$S(x) = \tanh(nx) = \frac{e^{nx} - e^{-nx}}{e^{nx} + e^{-nx}} \qquad (12)$$

## B.  *Simulink of PID controller*

PID model for air conditioning system is shown in Fig. 6. Here proportional gain $K_P$ = 10; derivative gain $K_D$ = 16; and integrated gain $K_I$ = 24; are chosen for speed control of DC motor model. Input speed 27.64 is applied to PID controller specified by operator's speed. The output of this controller is compared with result of proposed Neural Network Controller.
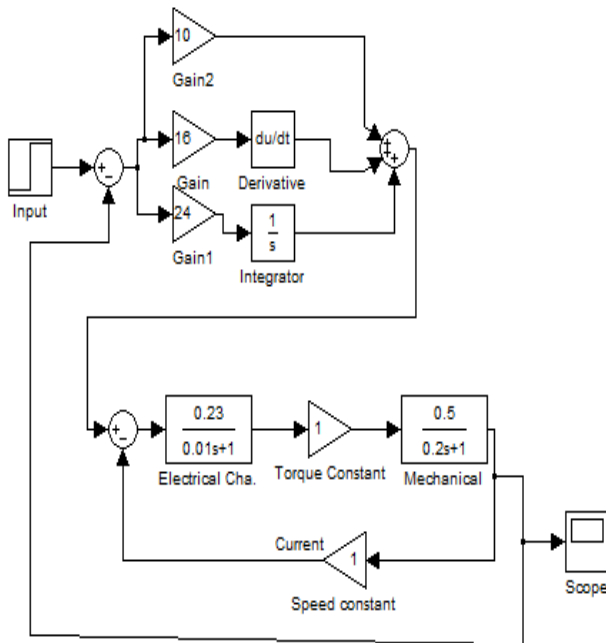


Figure 6.  Simulink model of PID controller

## V.    RESULT AND DISCUSSION

The output response of both PID and Neural Network controller is shown in Fig. 6. Transient response of Neural Network controller and conventional PID controllers are compared with each other as shown in table (1). Neural Network controller gives the better performance for controlling the speed of compressor compared to conventional PID controller. Fig. 6 and table (1) shows the response of Neural Network controller is fast and smooth with compared to conventional PID controller. Overshoot of NN controller is zero. Hence energy consumption is less and compressor's life increase.
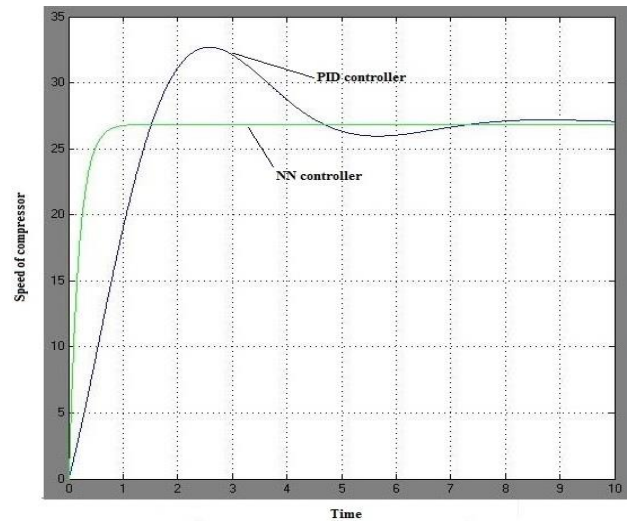


**Figure 6.  Simulation result of NN and PID controller**

TABLE I.        **TRANSIENT RESPONSE OF NN AND PID CONTROLLER**

| *Type of controller* | *Rise time* | *Oversh oot* |
|---|---|---|
| Conventional          PID controller | 1.18 | 5.59 |
| NN controller | 0.38 | 0 |

## VI.    CONCLUSION

ON-OFF controller or PID controllers have simple structure but for large operating range tuning of PID controllers are difficult and can't give desired response. To remove these difficulties neural network controller is designed which is gives the fast and desired response.

In this paper neural network control strategy for air conditioning system is introduced. The neural network structure is simple and self-learning system. The temperature control response of air conditioning system is getting better and improved as compared with conventional PID control system. We gets fast and desired response of air conditioning system as set by operator.

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# Expanding opportunities for working capital in the fisheries sector: Lessons learnt from formal and informal credit programmes operated for Tangalle fishing community in Sri Lanka

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**Abstract:** Working capital is one of the most significant credit needs in the fisheries sector. Fisher-folks mostly use informal credit sources to fulfill their credit needs. Nevertheless, there is an urgent need and desire of the government to make reasonably priced credit available at local level for all fisher-folk communities. Therefore, prime objectives of this paper was to examine the types of credit sources available for fisher-folk in *Tangalle* while identifying the barriers for formal credit sources and to suggest mitigation measures to overcome the barriers. A questionnaire survey was conducted for fisher-folk in *Tangalle.* A convince sample of fifty members was selected. Data were analyzed using SPSS 13.0.

Working capital requirements for capital investment, covering fishing operations and fish processing activities were 56 %, 26 % and 18 % respectively. Chi-square test did not result a statistically significant relationship between demographic factors (i.e. age, gender, income and education level) and access to credits. Nevertheless, there was a statistically significant relationship between income level and amount of credit taken as working capital ($\chi^2$ =9. 475, df = 1, *p* = 0.002). Friedman test results indicated that there was a statistically significant difference in access to credit for working capital depending on which type of credit source was used ($\chi^2$ = 101.10, df= 6,  *p* = 0.000) was used.

Because of the easy access to informal credits in terms of not having collateral requirements, no guarantors are required, no formal rules and regulations and documentation process; fisher-folk has a tendency to obtain informal loans from money lenders although the interest rate is very much high. However, they prefer formal credit from government banks under '*Diwineguma* project'. Formal credit institutions currently encourage micro financing models to provide credit for working capital to avoid bad experience which they faced in the past.

**Index Terms:** working capital, formal credit, informal credit, fishery

## 1.0 Introduction

Demand for financial services in the fisheries sector is growing. Different financial products and services are required to cater the demand (Ataquba and Olowosegun, 2013). The most significant credit needs in the fisheries sector are those relating to working capital and fixed assets (*ibid*). According to Ataquba and Olowosegun (2013), there are four types of working capital in artisanal fisheries i.e. 'working capital for the purchase fishing gear/ nets and small fishing equipment, 'working capital to cover fishing operations' (ex: ice, fuel, labor for crew, repair and maintenance), 'working capital to cover marketing costs such as ice, package, storage and 'working capital to cover fish processing activities' including fish trading advances.

Most financial services available to fisher-folks are mostly provided by informal credit sources (*ibid*). Nevertheless, there is an urgent need and desire of the government to make reasonably priced credit available at local level for all fisher-folk communities and linking financial arrangements to community based management of fishery resources, exploitation and marketing (De Silva, De Seram and Fernando, 1990). Prime objectives of this paper was to examine the types of credit sources available for fisher-folk in *Tangalle* while identifying the barriers for formal credit sources and to suggest mitigation measures to overcome the barriers.

## 2.0 Methodology

A survey was conducted in *Tangalle* for two weeks in June, 2013 to collect data from fisher-folk. A convenience sample of fifty respondents was selected. The sample purposively included different strata of fishing community i.e. fishermen, fisher women, boat owners (multiday or single day) considering their different credit needs. A questionnaire was used to collect primary data during the survey. A Likert-scale was used to measure the items which were ranging from 'Strongly agree' (1) to 'Strongly disagree' (5). Research papers, journals and internet were used to collect secondary data. Data analyze was done using SPSS 13.0 by performing descriptive statistics and some non-parametric statistics such as Friedman test, Wilcoxon test and Chi-square test.

## 3.0 Results and discussion

Fisher-folk in *Tangalle* fishing community have obtained credits from different sources to acquire different types of working capital. Composition of the working capital has illustrated by figure 1. Working capital for the purchase fishing gear, equipment, boats and repairing those items was 56 %. Working capital to cover fishing operations (for ice and labor) was 26 %. Working capital to cover fish processing activities was 18 %.
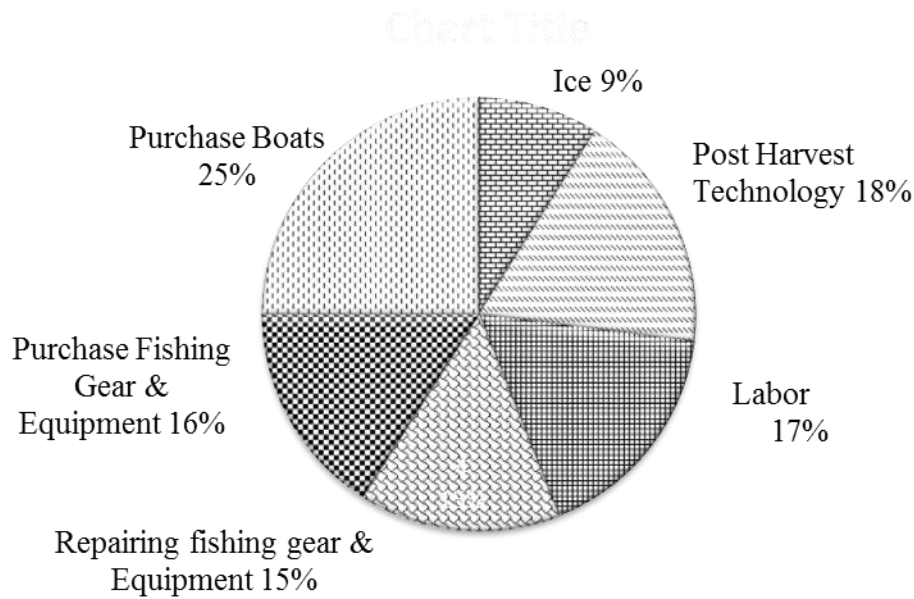
Figure 1: Composition of working capital in *Tangalle* fishing community

Source: Field survey, 2013

According to the chi-square test, demographic factors (i.e. age, gender, income and education level) and access to credits did not show a statistically significant relationship. Nevertheless, there was a statistically significant relationship between fisher-folk income level and amount of credit taken as working capital ($\chi^2$ =9. 475, df = 1, $p$ = 0.002).

Friedman test results indicated that there was a statistically significant difference in access to credit for working capital depending on which type of credit source was used ($\chi^2$ = 101.10, df= 6, $p$ = 0.000) was used. When consider the easy access to the credit sources, informal money lenders plays an important role in the fisheries community. However, fisher-folk believed that it was extremely difficult to obtain credits from their relatives (Table 1). Respondents did not have an idea about fisheries societies as a mean of access to credit. Findings of this study revealed that fisher-folk did not consider micro finance institutes as an easy approach for working capital. The reason for this may be the policy implemented in some micro finance institutes i.e. providing loans only for women. Composition of the sample which included 66 % males may influence this negative perception regarding the micro finance institutes.

Table 1: Results of the Wilcoxon singed rank test for fisher-folk perceptions' towards the access to credit

| Credit source | Mean | Z value | Remarks |
|---|---|---|---|
| Government banks | 2.4 | -2.459* | Agree |
| Private banks | 3 | -0.303 | Not significant |
| Micro finance Institutions | 4.16 | -4.145* | Disagree |
| Fisheries Societies | 2.88 | -0.339* | Neither agree or disagree |
| Friends | 4.1 | -4.290* | Disagree |
| Relatives | 4.56 | -5.699* | Strongly disagree |
| Informal money lenders | 1.72 | -4.796* | Agree |

∗   Significant at 0.05

Source: Field survey, 2013

As a formal credit source, fisher-folk believed that it is somewhat easy to take loans from government banks. Further, half of the respondents (50 %) showed their interest towards "*Diwineguma* Project" (a recent project launched by the Ministry of Economic Development to improve the living standards and social well-being of the people) as a proper channel of obtaining credits from formal sources to acquire the working capital.

A series of indicators were used to measure the perceptions of fisher-folk towards formal credit access (Table 2). When compared to informal credits, it is essential to have collaterals and guarantees in order to access the formal credit for working capital. Further, access to formal credit has a long documentation process which consumes time. Also, there are strict rules and regulations adhered to formal credit and it has a stipulated time period to recover the loan. The loan recovery period will not be extended based on personal relationship. Findings of this study regarding formal credit in lined with the previous research findings. Ruddle (2011) also reported that "lacking collateral that includes land deeds/ titles, other immovable property, and third party guarantees, as required by banks, almost everywhere in poor countries small-scale fishers find it either difficult or, more likely, impossible to obtain institutional credit for working capital. For that reason, financial institutions have been essentially uninvolved in financing the small-scale fisheries sector."

Table 2: Results of the Wilcoxon singed rank test for fisher-folk perceptions' towards the access to formal credit

| Perception | Mean | Z value | Remarks |
|---|---|---|---|
| There is a problems of keeping collaterals | 1.8 | -4.33 | Agree |
| It is difficult to find guarantors | 1.78 | -4.365 | Agree |
| It is a time consuming process | 1.04 | -6.944 | Strongly Agree |
| Low interest rate | 2.42 | -3.587 | Agree |

| There is a long documentation process | 1.22 | -6.545 | Strongly Agree |
|---|---|---|---|
| Strict rules and regulations | 1.36 | -6.329 | Strongly Agree |
| It is not based on relationships | 2.04 | -5.892 | Strongly Agree |
| It is required to pay loans within a fixed time period | 1.12 | -6.737 | Strongly Agree |
| Literacy is required | 2.24 | -4.428 | Agree |

∗   Significant at 0.05

Source: Field survey, 2013

Because of the easy access to informal credits in terms of not having collateral requirements, no guarantors are required, no formal rules and regulations and documentation process; fisher-folk has a tendency to obtain informal loans from money lenders although the interest rate is very much high.

However, not like earlier days now formal credit institutions are ready to provide credits for working capital. Bank of Ceylon in *Tangalle* is willing to provide formal credits for working capital under '*Diwineguma* project'. Considering the lessons learnt from the past, formal credit institutions now encourage micro finance models to provide credits for working capital. Small groups having five to eight members can apply for a small and medium scale loans for fisheries activities (i.e. fishing gear and equipment purchase, fish processing activities). Once group recommend and guaranteed, credit will be released.

## 4.0 Conclusion

There is a higher demand for working capital from the fisher-folk in *Tangalle* for purchasing fishing gear, equipment and boat, repairing fishing gear and equipment, covering fishing operations and covering fish processing activities. They prefer to obtain informal credit from money lenders and formal credit from government banks under '*Diwineguma* project'. Formal credit institutes currently encourage micro finance models to provide credits for working capital to avoid bad experience which they faced in the past.

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# BUBBLES IN MAIZE MARKET PRICE IN SOUTH-WEST GEOPOLITICAL ZONE OF NIGERIA

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***ABSTRACT:** Prices of grains in Nigeria are usually outrageous at certain periods over the years followed by rapid reversals. This study identifies the factors influencing the (rise and fall) deviation of maize prices from its market fundamental values and tested for the presence of bubbles in eight maize markets in the South-West, Nigeria. Ordinary Least Square and Residual Augmented Dickey Fuller were used to examine the influencing factors and test for the presence of bubbles respectively. Results indicate that Consumer Price Indexes and crude oil price were the major factors influencing maize market prices in the zone, while maize market price bubbles were detected in Lagos Markets, Ogun, Osun and Oyo States Urban Markets.*

**Index Terms:** Market, Fundamentals, Price, Bubbles and Test

## 1.   INTRODUCTION

The grain sub-sector in Nigeria plays an important role in economic development of the country. It contributes a larger portion of staple food stuff in the country (Akande, 1999). Grains accounted for about 50% of total food supply between 1985 and 1995 (Olayemi, 1999). The commonly grown cereal grains in Nigeria are maize, rice, sorghum, millet and wheat. While some of it is actually consumed as food, most is converted into animal feed, ingredients for processed food or feedstock for ethanol (Mansharamani, 2012).  Among these grains, the most available important sources of energy and affordable are maize, rice, millet and sorghum (Maziya-Dixon *et al*, 2004).

One of the determining factors to how much an average poor Nigerian can consume these available energy giving food is price. The nominal price of the individual grains has continuously fluctuated over the past years. Major grain crops in Nigeria have shown broad variations in nominal prices or producer prices over the decades (Akpan and Udoh, 2009).  As illustrated by Akpan, the price of rice increased by more than 100% between 1975 -1979 from that obtained between the previous five years averages (1970 -1974), similar trend was obtained for maize, millet and sorghum not until between 1994 -1999 the prices were lowered by less than 40% of their preceding prices as shown in the Table 1.

**Table 1: Major Grain Crops and their Mean Prices in Nigeria**

| Year | Rice | | Maize | | Millet | | Sorghum | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean price | | Mean price | | Mean price | | Mean price | | Inflation |
| | (N)ton. | CV% | (N)ton | CV% | (N)ton | CV% | (N)ton | CV% | Rate(%)Mean |
| 1970-1974 | 301.4 | 17.12 | 157.12 | 14.79 | 140.0 | 39.56 | 148.4 | 17.27 | 10.36 |
| 1975-1979 | 604.0 | 20.12 | 375.8 | 28.57 | 141.0 | 19.32 | 274.6 | 12.24 | 19.78 |
| 1980-1985 | 1423.7 | 38.85 | 788.0 | 21.22 | 622.7 | 35.36 | 582.3 | 32.80 | 17.80 |
| 1986-1993 | 7483.1 | 67.97 | 2938.3 | 69.39 | 2759.6 | 83.97 | 2689.9 | 70.61 | 27.13 |
| 1994-1999 | 39789.8 | 24.53 | 20113.8 | 37.89 | 19201.0 | 35.99 | 18562.0 | 33.23 | 30.70 |
| 2000-2008 | 46802.6 | 38.94 | 26255.0 | 26.74 | 32750.7 | 50.33 | 23437.0 | 45.20 | 12.79 |
| Agg CV(%) | | 134.03 | | 138.99 | | 159.13 | | 148.24 | |

*Adopted from Akpan and Udoh (2009); Data Source CBN Annual Report (1987-2008)*

Prices of food commodities on world markets, adjusted for inflation, declined substantially from the early 1960s to the early 2000s, when they reached a historic low (FAO, 2011). They increased slowly from 2003 to 2006 and then surged upwards from 2006 to the middle of 2008 before declining in the second half of that year. The sudden increases led to increased concern over the ability of the world food economy to adequately feed billions of people, presently and in the future. Although various observers attach differing degrees of importance to assorted factors, there is a relatively strong consensus that multiple factors had a role in the price increases that began in 2003(FAO, 2011).

Currently, Nigeria is at the level of high food prices following the order of the surge in the international food market. It has been observed that most urban and rural markets have been exhibiting historically high prices since 2007 which worsen in April 2008 and until now the prices are still high above its 2005 level (FEWSNET, 2008). Prices of major cereals in some parts of the country has been found in 2012 to soar above their 2009 price level. For instance in some major markets in the North serving regional traders (Dawanu International Market), the prices of sorghum and millet were 47% and 31% higher than their respective four-year averages respectively. The retail price of a 100 kg bag of maize in Saminaka market, another major northern market, was 56% higher than the four-year average. On the other hand, in the South, the retail price of a 100 kg bag of maize was 34%, 54% and 40% higher in Ibadan, Enugu and Aba respectively (Odozi and Omonona, 2012).

Food price hikes have been linked to supply shortfalls, low stocks, continued increase in food and feed use, and the high growth in demand for biofuels (Minot, 2010). Other causes include government actions and the more integration of the food and energy markets and consequently the link to oil prices. In the light of these, the World Bank (2012) opined that price increase on grains will affect not only bread and processed food, but also animal feed and ultimately the price of meat. While higher prices are generally good news for farmers, the impact on the poor in developing countries who spend a high proportion of their income on food can be devastating. However, higher prices can bring desperately needed income to poor farmers, enabling them to invest, increase their production and thereby become part of the global food security solution (World Bank, 2012).

The episodes of price increases with regard to food availability recorded over the years in the country might be well explained only in non-competitive markets. In most cases, price hike does not follow food shortage or shock in production but due to over optimism arising from price expectations. When agents are limited by the information they have or by their cognitive capacities, they make expectation errors with destabilizing consequences on markets. Therefore, limited logical conditions can thus explain why prices deviate from the fundamental asset values. For instance, if agents anticipate an increase in the grain price while these expectations are not based on changes in the fundamentals, the asset demand and its price will increase moving the grain price away from its intrinsic value. This in Araujo and Simonet (2011) opinion corresponds to self-fulfilling expectation. Self-fulfilling expectations may be related

to a default of public information on climatic, agronomic and economic conditions and/or to the agent's decisional limitations that impede them to make rational choices. Based on the agent's expectation and considering an efficient market in that regard, an upward price movement (bubble) will occur over an extended range that then implodes. The bubble increases at the required rate of return and bursts when agent's expectations will return (Araujo and Simonet, 2011).

Based on the heterogeneous expectations about price and resale of goods at higher prices, bubble is defined as the difference between the market price of an asset and its fundamental valuation or a rapidly rising prices; unrealistic expectations of future price increases and the departure of prices from fundamental valuation (Markus K. 2008). Until now, testing for speculative bubbles has mostly been focused on stock markets, housing, for which only little work has been done with respect to agricultural commodity markets, and the existing evidence is very little.

In this paper, maize is considered as an asset that can be held for a long time. However, the aim of this study is to examine the presence of market prices bubble in South-West Markets, in Nigeria and specifically identifies the major influence of maize market price deviation from its fundamental price and also affirms the presence of bubble in eight selected markets in the study area. This paper is organized into four sections; section one is the introductory part, section two covers the theory behind the methodology used for the study, section three discusses the result and its interpretation and finally the last section gives the conclusion of the study.

## II.THEORETICAL AND CONCEPTUAL FRAMEWORK

Prices are the most readily available and reliable information that guide farmers' planting decisions in Nigeria and the world at large. A farmer's decision depends on anticipated profits which in fact depend on anticipated prices of planted crops. Hence, prices are important tool in economic analysis.

Prices are a standard and important component of market and food security analysis because they serve as an indicator of both food availability and food access. Prices are a measure of availability because they tend to rise as the supply of food falls in relation to demand (e.g. poor production, constrained imports of food), and they tend to fall when supply expands in relation to demand (e.g . a bumper harvest). Food prices are also a measure of food access because they affect the household's purchasing power; the ability of a household to acquire goods and services based on the amount of money or other forms of wealth they possess. Prices observed through time are as a result of a complex mixture of changes associated with seasonal, cyclical, trend and irregular factors.( Akintunde et al 2012). The most common regularity observed in agricultural prices is a seasonal pattern of change. Normally, prices of storable commodities are lowest at harvest time, rise as the season progresses, and reach a peak prior to the next harvest (Olukosi and Ositor, 1990).

Most agricultural commodity markets are characterized by a high degree of volatility. Three major market fundamentals explain why that is the case. First, agricultural output varies from period to period because of natural shocks such as weather and pests. Second, demand elasticities are relatively small with respect to price and supply elasticities are also low, at least in the short run. In order to get supply and demand back into balance after a supply shock, prices therefore have to vary rather strongly, especially if stocks are low. Third, because production takes considerable time in agriculture, supply cannot respond much to price changes in the short term, though it can do so much more once the production cycle is completed. The resulting lagged supply response to price changes can cause cyclical adjustments (such as the often referenced hog cycle) that add an extra degree of variability to the markets concerned.

The liberalization of agricultural markets implies accepting potentially substantial variation in prices across time, space and product form. This price variation is necessary if agricultural markets are to perform its marketing functions (Tschirley, 1995). Information on agricultural commodity price and its trend in both developed and developing countries like Nigeria is important to both producers and consumers. Prices vary almost throughout the year and understanding the trend of such variations is therefore essential for good planning by the producers, consumers and policy makers. An average household after the price increase spends as high as 75% of their

income on food compared with an average of 65% before food crisis (Zoellick, 2008). The volatility in price of agricultural commodities in Nigeria has been attributed to various factors including variances in bargaining power among consumers, cyclical income fluctuations among sellers and consumers, natural shocks such as flood, pests, diseases, and inappropriate response by farmers to price signals ( Udoh *et al* 2007, Adebusuyi, 2004). Also short-run fluctuations in agricultural commodity prices occur between production seasons (Cashin and Pattillo, 2000).

Empirical studies analyzing whether agricultural speculators apply feedback trading strategies, shows that If speculators systematically buy (sell) when past returns are positive (negative), this may lead to overshooting (undershooting) agricultural prices. Apart from Irwin and Holt (2004), most studies argue that agricultural speculators systematically follow past price trends, and thus can be characterized as positive feedback traders. This evidence is based on linear Granger-causality tests (Sanders *et al*., 2009) and non-linear smooth transition auto-regressive (STAR) models (Reitz and Westerhoff, 2007; Rothig and Chiarella, 2007). Only Wang (2003), finds evidence that agricultural speculators can be characterized by negative feedback trading which, if profitable, does not destabilize markets.

The role of speculators has also been discussed from an economic viewpoint. A comprehensive overview about the pros and cons is provided by Sanders *et al*. (2010) and Sanders and Irwin (2010). Proponents argue that speculation contributes to price discovery in information efficient markets, provides liquidity to otherwise illiquid markets, and is a necessary counterpart to hedging activities. Also, Milton's classical argument that profitable speculation has a stabilizing effect on prices has been recalled (Gilbert 2009). On the other hand, it has been emphasized that rational as well as irrational speculation can set price trends which may be self-enforced by herd behaviour and result in prices bubbles. Moreover, noise trading has been identified as a source of risk that deters rational market participants from betting against erroneous beliefs (De Long *et al*. 1990).

Given that Prices, in turn, deviate from their fundamental values and do no longer reflect solely demand and costs of production, work has been done to analyse the causal relation between financial investors/speculators and commodity prices and to detect speculative bubbles in commodity prices. Robles *et al*. (2009), conducted Granger causality tests in order to test whether speculative activities in futures markets can help explaining price movements of spot prices for agricultural commodities. They provided evidence that speculation affects prices of wheat, rice, maize, and soybeans. Gilbert (2009), looked for evidence of trend-following behaviour in the commodity price process. Using a positive augmented Dickey-Fuller-Test he finds that index-based investment in commodity futures had an impact on the prices of wheat, corn, and soybeans and that these investments generated a bubble in futures prices.

## III. METHODOLOGY

**Study Area:** The study area is south western Nigeria which consists of Lagos, Ogun, Oyo, Osun, Ondo and Ekiti States. It is also known as the south West geographical zone of Nigeria. The area lies between longitude 20 311 and 60 001 East and Latitude 60 211 and 80 371N (Agboola, 1979) with a total land area of 77,818 km2 and a population of 27, 721, 832 (NPC, 2006). The study area is bounded in the East by Edo and Delta states, in the North by Kwara and Kogi states, in the West by the Republic of Benin and in the south by the Gulf of Guinea. The study area has 85 constituted Forest reserves with a forest area cover of 842,499 hectares. The climate of Southwest Nigeria is tropical in nature and it is characterized by wet and dry seasons. The temperature ranges between 21oCand 34oCwhile the annual rainfall ranges between 1500mm and 3000mm. The wet season is associated with the Southwest monsoon wind from the Atlantic Ocean while the dry season is associated with the northeast trade win from the Sahara desert. The vegetation is Southwest Nigeria is made up of fresh water swamp and mangrove forest at the belt, the low land in forest stretches inland to Ogun and part of Ondo state while secondary forest is towards the northern boundary where derived and southern Savannah exist (Agboola, 1979). For the purpose of this study, four states were selected from the zone which include Lagos, Ogun, Osun and Oyo States.

**Data Collection:** Data on the market price of maize used for this study were sourced from the Nigerian Agricultural Development Project (ADPs) of each selected state in the zone, between the years 2001- 2011. Commodity food  price index and oil price of the period were sourced from  International Monetary Fund website and Energy Information Administration website (EIA) respectively.

**Analytical Tool**s :- The analytical tools used in this study include linear regression and Augmented Dickey Fuller unit root test. The procedures adopted were therefore modelled as stated below;

 **Bubble model:-** In testing the hypothesis that some food crises may be due to rational speculative bubbles, a procedure is built.  A simple asset-pricing model used in this study as proposed by Bonjean and Simonet (2011) assume rational expectations.

We consider a simple model for maize price with linear supply and demand. Market equilibrium is given by the set of equation (I) to (III).

Net supply (Q) in period t is positively related to the current price of maize

$$Q_t = a_t + bP_t + \varepsilon_t \qquad\qquad b > o \qquad\qquad\qquad\qquad\qquad\text{(I)}$$

$P_t$ is the maize price level in period t

$a_t$ is an index that depends on current and lagged values of $y_t$ a vector of exogenous supply and demand variables.

Expectation of future rise in price that will compensate for storage cost and losses induces famers and traders to withhold supply. With the assumption of risk neutrality, demand for stocks in period t ($S_t$) is positively related to the price spread between the future expected price and the current price given by:

$$s_t = c(E_t P_{t+1} - P_t) + d_{t+W_t} \qquad\qquad c > o \qquad\qquad\qquad\text{(II)}$$

$d_t$ is an index that depends on vector of variables reflecting the opportunity cost of holding maize
$E_t P_{t+1}$ is the expected price of maize in period t+1
$E_t$ is the conditional expectations operator
$\varepsilon_t$ and $w_t$ are zero-mean , finite variance, serially uncorrelated disturbance terms. They are for unaccounted variables on the demand and supply side.


On the other hand market equilibrium is given by:
$$S_t = Q_t + s_{t+1} \qquad\qquad\qquad\qquad\qquad\qquad\qquad\text{(III)}$$
Where $S_{t-1}$    is initial stock.
The market price at equilibrium becomes
$$E_t P_{t+1} = \lambda P_t + x_i + \mu_i$$
Where; $\lambda = \frac{b+c}{c} > 1$ and $x_t = a_t - d_t,\ \mu_t = \varepsilon_t - w_t + S_{t-1}$ \qquad\qquad (IV)
$x_t$ is an index that depend on a vector of variables of market fundamentals.
$\mu_t$ is an error term .
The forward-looking solution of equation (IV) for p involves two components: $F_t$ the market-fundamentals component and the potential rational bubbles component $B_t$ ( Blanchard and Watson, 1982 and Bonjean and Simonet(2011) is given by equation (V):
$$P_t = B_t + F_t \qquad\qquad\qquad\qquad\qquad\qquad\qquad\text{(V)}$$

It is assumed that $E_t(X_{t+j} + \mu_{t+j})$ does not grow at a geometric rate. Therefore $\geq \lambda, F_t$ is convergent sum (Bonjean and Simonet2011) given by:

$$F_t = E_t \sum_{i=0}^{\infty} (\lambda^{(i+1)} x_{t+1} + \mu_{t+1\mu}) \qquad\qquad\qquad\qquad\text{(VI)}$$

The market –fundamentals component of the maize price relates to the expected value of the exogenous variables determining supply and demand.

   In contrast to the fundamentals component, the bubble part, $B_t$, is not stationary.  $B_t$ is the solution to the homogenous expectationnal difference equation given as:

$E_t B_{t+1} - \lambda B_t = 0$ \hfill ( VII)

If $B_t$ is less or greater than zero, there exists a rational bubble. The conditional expectations of the bubble are explosive as expressed by equation (VIII):

$E_t B_{t+j} = \lambda^j B_t$    for all j > 0 \hfill (VIII)

The presence of rational bubble does not violate the non-arbitrage condition. The bubble is expected to grow at the required rate of return and stock holders expect to get the required rate of return on the bubbly asset.

This bubble process satisfies equation (VII) since the expected growth rate of the bubble is $al$ways $\lambda$. For $B_t <$  c the bubble increases slowly at mean rate $\lambda$; if $B_t$ rises above the threshold it expands faster at the mean rate $\lambda \pi^{-1}$ but may collapse with probability1-$\delta$. The bubble grow at a higher rate during expanding phases to compensate the investor for the possibility of collapse. When the bubble collapses, it falls to a means value of $\delta$ and the process begins again (Evans 1991; Bonjean and Simonet, 2011). As a consequence periodically collapsing bubbles not only account for occasional asset price crashes but also for rapid run-ups in asset prices before a crash.

 *Test For periodically Collapsing Bubbles:*

Most of empirical test for rational speculative bubbles are indirect tests that exploit the theoretical properties of bubbles. Bubbles are explosive process that should be detected through stationary tests (Diba and Grossman, 1988).

The fundamental component of the maize price and the potential bubbles are estimated The presence and properties of the bubbles are tested using the residual ADF of Taylor and peel, (1998) .

It is assumed that the forecasts of $x_t$ in Eqn (vi) are based on current and past values of $x_t$ i.e exogenous variables that determine supply and demand and all relevant available information about future net supply.

 $p_t$ in Eqn (IX) is regressed on supply and demand determinants as well as on information variables and use the residuals as our measure of the bubble: this is represented thus;

$p_t = \infty_i cumulative\ rainfall_t + \infty_2 CPI_t + oil\ price_t + \sum_{s=1}^{12} \emptyset + V_t$ \hfill (IX)

Where

$P_t$ : Market price of maize at time

Cumulative rainfall$_t$:  measures the cumulative rainfall level during the rainy season (from January to December) in the production
                area.

 Oil price$_t$ : variable capturing production and trade costs.

 CPI$_t$ : Consumer price index in Nigeria

$M_s$: Monthly dummies that capture seasonal variations

 The error term $V_t$ includes all factors not explained by the variable $x_t$. $v_t$ is assumed to follow a random walk so that $E_t V_{t+1} = V_t$ and to be serially independent.

The fitted value of $P_t$ in (IX) measures the fundamental value of maize $(F_t - \dot{P}_t).B_t = P_t \dot{P}_t$ is the apparent deviation from fundamentals. Measuring  bubbles as the residuals of a price regression on fundamental value generates positive and negative apparent bubbles. In what follows we only consider positive bubbles.

 Hence, fundamentals may be misspecified leading to measurement errors in the bubble term. However the tests are invariant to linear transformation of $B_t$. The deviation between current price and the fundamental component represent the bubble part.

*Testing for unit root in the error process:*

By adopting the pattern of Campbell and Schiller, (1987), we investigated the stationarity properties of maize prices deviations from fundamentals.    Residuals from Eq. (ix) that represent the bubble component of maize prices were used. The Jarque Bera test  was carried out to test for normality for all markets at 10% confidence level. Non-normality is consistent with the presence of periodically collapsing bubbles (Payne and Waters 2007).   The standard ADF test has been used in most empirical studies but the test is not very informative. Many authors who adopted this model found that it fails to reject stationarity in the presence of PCB that may be stationary on the whole period but are locally explosive. Due to this flaw, the Residual Augmented Least Squares Dickey-Fuller

(RADF) test developed by Taylor and peel (1998) was used to test for the presence of stationarity in the presence of periodically collapsing bubble. The Residual Augmented Dickey Fuller(RADF) test is robust to skewness and kurtosis in the distribution of the residual term and is more powerful in detecting periodically collapsing bubbles. The RADF Test equation is given by:

$$\Delta B_t = \theta B_{t-1} + \gamma \hat{w}_t + \acute{e}_t \qquad \text{………………………..…………… (X)}$$

Where: $\hat{w}_t = [(\hat{u}_t^3 - 3\hat{\varrho}^2 \hat{u}_t \quad), (\hat{u}_t^2 - \hat{\varrho}^{2)]}$. The vector, $\hat{w}_t$ corrects the estimate of Ө for skewness and excessive kurtosis of the residuals. $\hat{u}_t$ are the residuals of equation (XI) and $\hat{\varrho}^{2)]}$, the estimated variance; $\acute{e}t$ is the white noise.

Equation (x) is rewritten as

$$\Delta B_t = \Theta B_{t-1} + u_t \qquad\qquad\qquad (XI)$$

Where the test statistics is $t_A = \qquad \text{Ö}/\sqrt{Var(\text{Ö})}$

Ö is the estimated coefficient in (XI); var (Ö )is the variance-covariance matrix of Ö.

## IV. RESULTS

### *Fundamental components of maize price*

From the study, eight major maize markets were surveyed for eleven years (from January 2001 to December, 2011 (see figure1). The markets were the rural and urban markets in four states selected from south-west geopolitical zone of Nigeria. The price of maize in the selected markets were the key variable of interest. Studies have shown that price is made up of fundamental component and certain component which are not explained, known as the residual or bubble component. In order to estimate the fundamental components of maize price in the stipulated markets; these were determined using the monthly consumer price index, oil price and cumulative rainfall. An econometric tool; regression analysis was used to generate the markets price residuals (bubble components) for each market. Figure 2 is a typical illustration of fundamental and bubble components of Lagos Urban Maize market price; the figure shows periods during which the maize price in Lagos Urban Market rose dramatically beyond its fundamental value: between mid-2005 to early 2006, mid 2008 to almost late 2010. A deeper analysis shows that apparent bubbles break out at lean season and end at the arrival of the new harvest. This implies that the price increases exponentially at lean season from May to September after which it crashes to the initial price at the arrival of the new harvest.

The result from the econometric analysis (Table II) indicates an adjusted $R^2$ in Lagos State Markets, Oyo State Markets and Osun State Rural Market above 50%, showing that more than 50% of the explanatory variables explains the variations in the market price of maize in the surveyed markets. The result further shows factors influencing market price of maize. Result depicts that the consumer price index and oil price were the core factors influencing the price of maize in Lagos state rural and Urban markets. Consumer price indexes positively influence all the market prices in the zone. Cumulative rainfall positively influences Osun State Urban market price. Oil price has negative influence on the prices of Lagos State Market, Osun State Urban Market and Oyo State rural market.

### *Bubble Characteristics and Tests*

The characteristics of the bubble components were accessed based on certain properties (skewness, kurtosis and Jarque Beta test). From Table III, the bubble components of maize prices shows excessive skewness in Lagos Markets and excessive catharsis in all the markets. These characteristics indicate abnormal prices of maize markets in the zone. The Jarque Bera test rejects normality for all markets except Ogun, Osun and Oyo State Rural markets at 10% confidence level. The non-normality test is consistent with the presence of periodically collapsing bubble (Taylor and Beel, 1998, Payne and Waters, 2007). This implies that market price bubbles were present in Lagos Rural and Urban and Ogun, Osun and Oyo States Urban Maize Markets.

On testing for a unit root using Standard Augmented Dickey Fuller Unit Root Test (see Table III), the test accepts the unit root null hypothesis in all cases. This implies that the test rejects stationary in all markets surveyed in the zone. However, the test has been proven to be less informative.

On examining the robustness of the result, Residual Augmented Least Square Dickey Fuller (RADF) test was employed. The RADF t-statistics indicates stationarity in the series and this implies the presence of periodically collapsing bubbles in all the markets. The test is robust to skewness and kurtosis in the distribution of the residual terms. The test shows excess skewness in Lagos maize market prices and excessive kurtosis in all the markets indicating abnormality in the market price of maize. The Jarque Bera test rejects normality for all markets except for Ogun, Osun and Oyo Rural maize markets. From the test result it is concluded that maize market price bubbles were present in Lagos market and all Urban Markets in the zone.

## V. CONCLUSION

The econometric results are consistent with the existence of speculative bubbles in urban maize markets in the study. However, the existence of bubbles could indicate a misspecification of market fundamentals. To strengthen this result, further test might need to be conducted such as M-TAR and rolling ADF tests.

The detection of rational bubbles on maize market in South-western Nigeria is very important for policy priority and in improving the quality and availability of information to economic agents, farmers, traders and consumers. It is also important as it gives information for public intervention in markets through security stock and trade policy.

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APPENDIX



Figure 1:Maize price/Kg in southwest Nigeria



*Figure2.* Fundamental (fitted) components of the maize price in Lagos Urban Market (₦/kg)
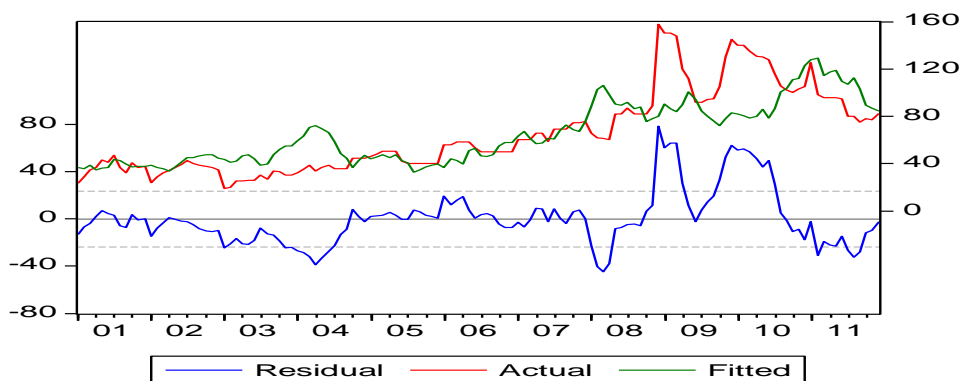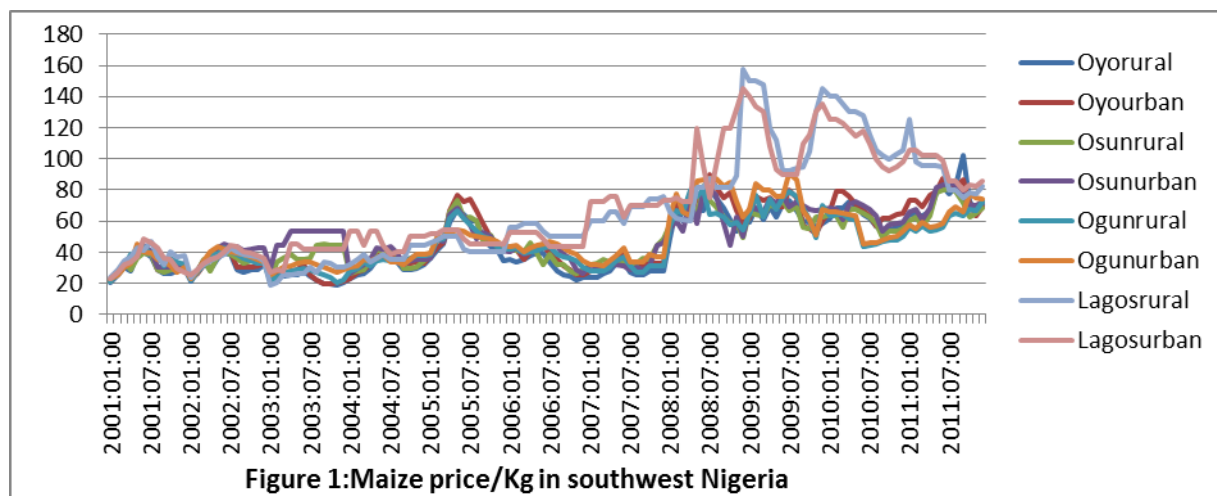
**Table II: Estimation of the Fundamental Values: Dependent Variable (Current Maize Price)**

|  | LagosR | LagosU | OgunR | OgunU | OsunR | OsunU | OyoR | OyoU |
|---|---|---|---|---|---|---|---|---|
| CPI | 1.4815 | 1.3843 | 0.2852 | 0.3481 | 0.4041 | 0.4917 | 0.4954 | 0.4876 |
| t-stat | 7.8637 | 8.6023 | 2.9887 | 3.4536 | 4.8712 | 5.3704 | 4.9623 | 4.6251 |
| prob. | 0.0000 | 0.0000 | 0.0034 | 0.0008 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| Cum. R/F | 0.0004 | 0.0042 | -0.0005 | 0.0025 | 0.0087 | 0..0183 | 0.0038 | 0.0058 |
| t-stat. | 0.0189 | 0.2356 | -0.0354 | 0.1900 | 0.8896 | 1.6872 | 0.3331 | 0.4818 |
| prob. | 0.9850 | 0.8141 | 0.9719 | 0.8496 | 0.3753 | 0.0940 | 0.7396 | 0.6308 |
| 0ilprice | -0.8281 | -0.7354 | 0.0421 | 0.0281 | -0.0379 | -0.1662 | -0.0506 | -0.0151 |
| t-stat | -4.1857 | 8.6023 | 0.4208 | 0.2664 | -0.4348 | -1.7283 | -0.4829 | -0.8918 |
| prob. | 0.0001 | 0.0000 | 0.6746 | 0.7904 | 0.6644 | 0.0864 | 0.0000 | 0.8918 |
| Monthly Variable | yes | yes | yes | yes | yes | yes | yes | yes |
| $R^2$ | 0.5445 | 0.6072 | 0.4413 | 0.4861 | 0.5818 | 0.5075 | 0.5881 | 0.5869 |
| Adj R2 | 0.5339 | 0.5980 | 0.4282 | 0.4741 | 0.5720 | 0.4959 | 0.5784 | 0.5773 |
| Obs. | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |

SOURCE: Authors' computation, 2013

**Table III: Bubbles' Characteristics**

|  | LagosR | LagosU | OgunR | OgunU | OsunR | OsunU | OyoR | OyoU |
|---|---|---|---|---|---|---|---|---|

| Obs. | 132 | 132 | 132 | 132 | 132 | 132 | 132 | 132 |
|---|---|---|---|---|---|---|---|---|
| Skewness | 1.1821 | 1.1771 | 0.3623 | 0.6914 | 0.2172 | -0.2448 | 0.1382 | 0.4568 |
| Kurtosis | 4.7146 | 4.0270 | 2.6643 | 3.2362 | 2.8292 | 2.2198 | 2.8634 | 3.1374 |
| Jarque Bera | 46.9137 | 36.2827 | 3.5079 | 10.8232 | 1.1986 | 4.6656 | 0.5225 | 4.6950 |
| Prob. | 0.0000 | 0.0000 | 0.1730 | 0.0045 | 0.5492 | 0.0970 | 0.7701 | 0.0956 |

**ADF Test**

| $P$ | -0.0036 | -0.0017 | -0.0004 | -0.0002 | -0.0017 | -0.0021 | -0.0007 | 0.0041 |
|---|---|---|---|---|---|---|---|---|
| t-stat | -0.3243 | -0.1707 | -0.0389 | -0.0222 | -0.1475 | -0.1796 | -0.0655 | -0.3992 |

**RADF Test**

| $P$ | -0.0814 | -0.1014 | -0.1188 | -1182 | -0.1836 | -0.1844 | -0.1213 | -0.1132 |
|---|---|---|---|---|---|---|---|---|
| $t_A$ | **-2,3991** | **-2.7105** | **-2.8344** | **-2.8452** | **-3.6540** | **-3.6289** | **-2.9069** | **-2.8171** |

| T-stat: Kurtosis | 4.7147 | 4.0270 | 2.6643 | 3.2362 | 2.8292 | 2.2198 | 2.8634 | 3.1374 |
|---|---|---|---|---|---|---|---|---|

| T-stat: skewness | 1.1821 | 1,1771 | 0.3623 | 0.6914 | 0.2172 | -0.2448 | 0.1382 | 0.4588 |
|---|---|---|---|---|---|---|---|---|

| Jarque Ber | 46. 9137 | 36.2827 | 3.5079 | 10.8232 | 1.1985 | 4.6656 | 0.5225 | 4.6950 |
|---|---|---|---|---|---|---|---|---|
| Prob. | 0.0000 | 0.0000 | 0.1730 | 0.0045 | 0.5492 | 0.0970 | 0.7701 | 0.0956 |

Source: Authours computation, 2013

Note: ADF Test equation includes no intercept and no lagged difference terms of the dependent variable

Critical Value for $t_A$: 1.6151 @10% level.

TableIV: Unit Root Test Sample Period: January 2001- December, 2011

| State | Market | Min. | Max. | Mean | No. of Obs. | ADF p.-value |
|---|---|---|---|---|---|---|
| Lagos | Rural | 18.95 | 158.00 | 64.82 | 132 | 0.5669 |
|  | Urban | 23.21 | 145.00 | 67.51 | 132 | 0.6228 |
| Ogun | Rural | 20.64 | 80.24 | 45.31 | 132 | 0.6935 |
|  | Urban | 23.01 | 90.88 | 48.36 | 132 | 0.6881 |
| Osun | Rural | 20.45 | 82.21 | 47.37 | 132 | 0.6310 |
|  | Urban | 23.39 | 84.44 | 50.25 | 132 | 0. 6197 |
| Oyo | Rural | 18.58 | 102.06 | 44.43 | 132 | 0. 6591 |
|  | Urban | 19.64 | 90.20 | 48.23 | 132 | 0.5382 |

Authors' Computation

ADF test: H0: I(1): Tests administrated on current price values.

# Initial Response of Electric Field Monitoring System towards Measurement of Atmospheric Electric Field during Normal and Lightning Times

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*Abstract-* For over a considerable length of time, scientists have shown keen interest in studying the atmospheric dynamics. Especially when it comes to the investigation of the atmospheric electric field, the changes associated with it help the researcher fundamentally in characterizing other important parameters in the atmospheric studies additionally. These changes in the atmospheric and its response under fair weather or turbulent phases of climate become a promising source of investigation and may prove to be vital in early warning systems provided they are studied on the longer run on consistent basis.

In this paper, authors discuss a ground based method for analyzing and investigating the electric field variation in the atmosphere through the electric field mill system installed at the institutional premises of Madhav Institute of Technology and Science at Gwalior in the state of Madhya Pradesh (26° 14' N, 78° 10' E).

*Index Terms-* Atmospheric Electric Field, Electric Field Mill, Fair Weather

## I. INTRODUCTION

The stochastic behavior of the atmosphere has always inspired researchers to indulge in long term investigation, in order to explore the complexities hidden in the atmosphere. In this context, the investigation of the atmospheric electric field has been a major point of consideration for research during different seasons. Atmospheric electricity plays significant role in the highly coupled system representing the Earth's atmosphere and the near Earth environment (Herman and Goldberg, 1978). Whether during rainfall or dusty clouds (Frier, 1960), or changes during abrupt geophysical conditions, these investigations have assisted, to a great extent in estimating and characterizing the electric field perturbation in the atmosphere during a long course of time. The global fair weather phenomena have been well studied using the Carnegie-curve as depicted by Bering et al. (1998). Electric field events in extreme weather conditions have been well synthesized in the past couple of decades subjected to various climatic regions and condition (Farman et al., 1985; Rycroft, 1990; Solomon, 1999). Measurements of electric current flowing upward during thunderstorm conditions have been illustrated by Kasemir (1979) and Blakaslee et al. (1989) earlier. A number of mathematical models have been suggested in this regard and could be found in past research papers (Hays and Roble, 1979; Volland, 1982; Ogawa, 1985). Considerable amount of work has been done previously in exploration of atmospheric electrodynamics through modeling by Markson (1979, 1983) where correlations have been attempted between electric field and solar influences and by Israelsson et al. (1987;1994) in investigating the various phenomena such as lightning activities and electrical discharges in the atmosphere and power plant harmonics in context to electric field measurement. Various methods are employed the detection of various phenomena associated with atmospheric parameters for example Time of Group of Arrival (TOGA) is a multiple lightning sensor network in the recent times being successfully run to detect lightning activities worldwide (Dowden et al., 2002; Rodger et al., 2006). Other significant works by Hoppel et al. (1986) and Tammet et al. (1992) have estimated the variation and characterization of the ions in the atmosphere in terms of their mobility with precision. Blanchard (1963) indicated at a much earlier stage that a large amount of current also flows from sea surface to atmosphere and cause the electric field enhancement. Based on the earlier platforms of such investigation the current paper is written with an objective of briefly discussing a ground based experimental technique to measure the atmospheric vertical electric field. In this context some results of extreme initial stage of installation of the set-up for a very short time period are also presented to give a very brief idea of the atmospheric electric field behaviour.

## II. EXPERIMENTAL SET-UP

The experimental set-up is installed at Madhav Institute of Technology and Science at Gwalior, Madhya Pradesh (26° 14' N, 78° 10' E) and comprises of an electric field mill which is connected through interfacing and communication cables to the computational and recording facility in the laboratory as shown in Figure-1. A brushless motor with heavy-duty bearings along with a stainless steel shaft forms the part of the sensor unit. The working is based on the principle, when an uncharged sensor plate is exposed to an external electric field it then becomes charged. A detailed working of such experimentation could be found in similar research studies conducted by Murphy et al. (2008) and Ferro et al. (2011), which has further inspired the current manuscript to be written. Further, it is stated that the rate

and level of the activity measured by the field mill (popularly known as EFM-100 used in our present study) is being continuously recorded by the computer through suitable software as a raw data to be analyzed later on. The data is being recorded on daily basis as in the present case for long term comprehensive investigation. It is to be mentioned here that the equipment has been manufactured by Boltek Corp., USA under the funded project by All India Council for Technical Education (AICTE, New Delhi).
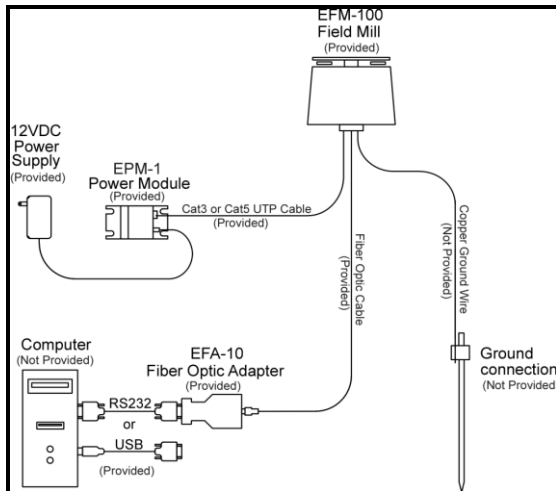


Figure 1 Experimental setup of the Electric field Monitoring system

### III. OBSERVATIONAL RESULTS

As the continuous recording of data started in the first week of July, 2012, after proper installation, brief results are presented here for two days only. In this paper, fundamental test results have been presented to see short response of the electric field mill system mounted on the roof-top and exposed to open sky for best results.

In this section, two day results have been presented to observe the initial response of the set up during the month of July 2012. It is felt important to mention, that the month of July is considered to be primarily a monsoon month in which Gwalior records a considerable amount of rainfall. Figure 2 presents the twenty four hour result of the electric field variation along with local time for 11.07.2012. One could clrearly observe a very dormant nature of the electric field and the values of the electric field is just of the order of around 80 to 90 Volts/meter  at most and the remaining time it is observed to be even lower. This is the state of the atmospheric electric field under normal conditions although the data is gathered only for a span of twenty four hours.

Figure 3 represents the electric field observation for 15.07.2012. There have been a marginal amount of rainfall recorded in the early hours of 15.07.2012 (around 8.5 mm of rainfall was recorded on the day) followed by heavy lightning activities. On analysis of the response of electric field variation from Figure 3., it is evident that there are some strong

perturbation occuring in the early hours around 01:00:00 hrs Local Time when significant change is observed and the value reaches as high a 6000 Volts/meter in the negative Y-axis which is a drastic change. This is possibly attributable to the lightning events that have taken place in those hours in the closeby region as there have been evidences in past that support our theory (Williams et al., 1992;Harrison and Ingram, 2005). A similar situation arises later in the day around 16:00:00 hrs local time when the magnitude of the electric field varies between +2000 to -2000 Volts/meter and gradually returns to its normal value (of the order of a few Volts/meter) for the remaining period of the day. The results are confirmed in Figure 4 which shows  that approximately 800 lightning strokes have been recorded during the whole day on the 15th of July 2012 which has possibly resulted in the sudden variation of the elcetric field of the atmosphere.
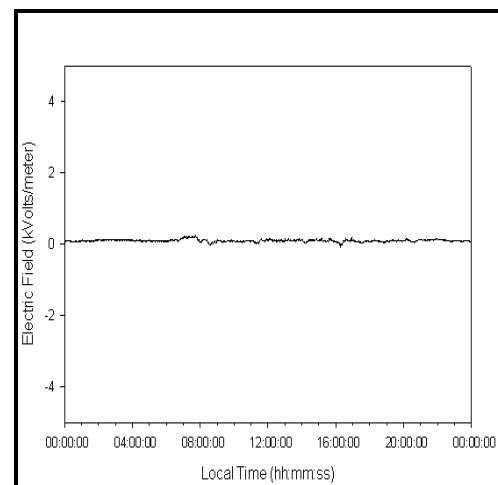


Figure 2 Atmospheric Electric field plot on 11 July 2012
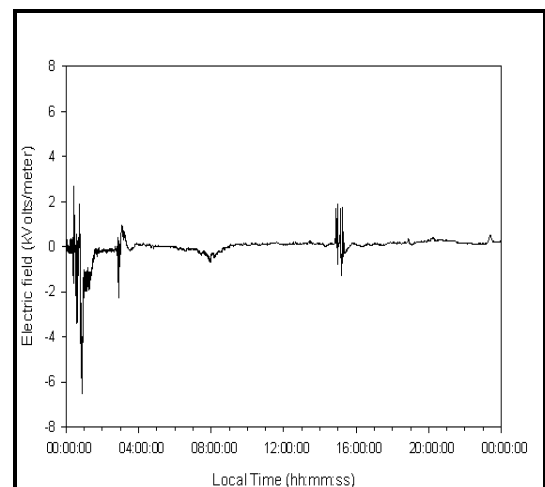


Figure 3 Atmospheric Electric field plot on 15 July 2012

Figure 4 Occurrence of lightning strokes on 15 July 2012

## IV.  DISCUSSION AND CONCLUSION

The authors in this paper, have emphasized on the significance of the atmospheric electric field measuremnet system using the electric fill mill set up  which is the first of its kind in the city of Gwalior which lies in the low-mid latitudnal region in the state of Madhya Pradesh and is subjected to extremity in the weather conditions in all seasons. In this context, the installation and brief methodology of the apparatus has been discussed followed by significant results to prove the authenticity and the vitality of the such measurements to be carried out. Two contrasting day results are presented which have been supported by  a reasonable number of evidences (Rycroft et al.,2000; Cummer and Fullekrug, 2001; Williams, 2007). As in the first case, no variation is observed to indicate a fair weather day (Latha, 2003; Bennet and Harrison, 2006), the second case projects clearly the changes in the atmospheric electric field pertaining to moderate rainfall and also arising due to sudden lightning activities (Guha et al., 2010) that were recorded in the vicinity of 24 miles in radii from the location of the set-up. However, it is to be admitted that a large networking chain needs to be acquired if one wants to precisely locate the occurrence of the lightning activity in terms of the geographic coordinates which may also be attained using a Global Positioning System. However, the fact remains to be considered that in a hybrid of agricultural and commercially developing city like Gwalior, it is very essential to carry out long term studies by using such ground based and comparatively robust and ergonomical methods that can give us an idea about the characterisation of the atmospheric electric field and the installation of such an experimental technique at an initail stage  holds no exception in laying a platform for the investigation of the atmospheric electric field which may also be useful in studying various other parameters..

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# Evaluation of Various Synthetic Insecticides against Sucking Insect Pests of Cluster Bean

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**Abstract-** An investigation on evaluation of various synthetic insecticides against sucking insect pests of cluster bean was carried out at Anand Agricultural University, Anand during summer 2010. Among the tested nine synthetic insecticide, the higher effectiveness was observed with the application of clothianidin 50 WDG (0.025%) and thiamethoxam 25 WG (0.0125%) against jassid and whitefly, and with imidacloprid 70 WG (0.015%) against jassids and spiromesifen 240 SC (0.0192%) against whitefly. Fipronil 5 SC (0.005%), acephate 75 SP (0.075%) and carbosulfan 25 EC (0.025%) effectively managed thrips on cluster bean.

*Index Terms*- synthetic insecticides, sucking insect pests, cluster bean

## I. INTRODUCTION

The cluster bean, *Cyamopsis tetragonoloba* (Linnaeus) Taubert is an important seed as well as vegetable crop, which belongs to family fabaceae. The crop regularly damaged by jassid (*Empoasca kerri* Pruthi), whitefly (*Bemisia tabaci* Gennadius) and thrips (*Megaleurothrips distalis* Karny) like sucking insect pests in Gujarat, Butani (1979). The information on efficacy of synthetic insecticides against sucking insect pests of cluster bean is scanty in Gujarat. Therefore to find out the effect of synthetic insecticides on sucking insect pests of cluster bean, the present study was carried out.

## II. MATERIALS AND METHODS

In order to study the bio-efficacy of newer insecticides against sucking insect pests of cluster bean, a field experiment was laid out during the 2nd week of February in a Randomized Block Design, with three replication having plot size of 3.00 X 2.25 m during summer 2010 at College Agronomy Farm, BACA, AAU, Anand. Cluster bean variety Pusa Navbahar was sown at a distance of 45 x 15 cm.

First spray application of newer insecticides was applied on the crop at appearance of the pest and subsequently two spray were given at 10 day interval using manually operated knapsack sprayer having duromist nozzle.

For recording observations, 10 plant were selected randomly and tagged in each net plot area per replication. The observations on sucking insect pests (jassid, whitefly, thrips and aphid) were recorded prior to spray as well as 3, 7, 10 and 15 day after each spray.

### Results and discussion

Nine different synthetic insecticides were evaluated for their bio-efficacy against sucking insect pests (jassid, whitefly and thrips) of cluster bean. Pest population recorded before the application of insecticides showed non-significant results indicating uniform distribution of insect pests in all the experimental plots. Further, the results also revealed that the pest incidence was significantly reduced in all the plots treated with synthetic insecticides as compared to control up to 15 day of spray and pooled over period and sprays during summer season.

**Table 1: Bio-efficacy of synthetic insecticides against jassid infesting summer cluster bean (Pooled over period and sprays)**

| Insecticides | Conc. (%) | No. of jassid / 3 leaves day after spray | | | | |
|---|---|---|---|---|---|---|
| | | 3 | 7 | 10 | 15 | Pooled |
| Imidacloprid 70 WG | 0.015 | 1.60 (2.06) | 1.87 (3.00) | 1.36 (1.35) | 1.24 (1.04) | 1.52 (1.81) |
| Acephate 75 SP | 0.075 | 1.89 (3.07) | 1.63 (2.16) | 1.68 (2.32) | 1.59 (2.03) | 1.69 (2.36) |
| Carbosulfan 25 EC | 0.025 | 1.89 (3.07) | 1.88 (3.03) | 1.61 (2.09) | 1.52 (1.81) | 1.72 (2.46) |
| Clothianidin 50 WDG | 0.025 | 1.37 (1.38) | 1.24 (1.04) | 1.02 (0.54) | 0.88 (0.27) | 1.14 (0.80) |
| Fipronil 5 SC | 0.005 | 1.97 (3.38) | 1.87 (3.00) | 1.77 (2.63) | 1.67 (2.29) | 1.82 (2.81) |
| Thiamethoxam 25 WG | 0.0125 | 1.57 (1.96) | 1.43 (1.54) | 1.31 (1.22) | 1.24 (1.04) | 1.39 (1.43) |
| Thiacloprid 48 SC | 0.012 | 1.87 (3.00) | 1.38 (1.40) | 1.68 (2.32) | 1.57 (1.96) | 1.62 (2.12) |
| Spiromesifen 240 SC | 0.0192 | 1.99 (3.46) | 1.45 (1.60) | 1.80 (2.74) | 1.70 (2.39) | 1.73 (2.49) |
| Ethion 50 EC | 0.05 | 2.03 (3.62) | 1.74 (2.53) | 1.84 (2.89) | 1.75 (2.56) | 1.84 (2.89) |
| Control (water spray) | - | 2.82 (7.45) | 2.83 (7.51) | 2.89 (7.85) | 2.85 (7.62) | 2.84 (7.57) |
| | | | | | | |
| S. Em. ± Treatment (T) | | 0.11 | 0.10 | 0.14 | 0.16 | 0.12 |
| Spray (S) | | 0.03 | 0.04 | 0.03 | 0.04 | 0.07 |
| T × S | | 0.10 | 0.14 | 0.09 | 0.11 | 0.10 |
| C. D. at 5 % T | | 0.32 | 0.30 | 0.43 | 0.47 | 0.35 |
| S | | NS | NS | NS | NS | NS |
| C. V. % | | 9.16 | 13.35 | 9.56 | 12.37 | 11.21 |

**Jassid (*E. kerri*)**

The higher effectiveness was noted in the treatment of clothianidin (1.38) and it was at par with thiamethoxam (1.96) and imidacloprid (2.06) after 3 day of spray (Table 2). Thiacloprid, acephate and carbosulfan treated plots exhibited 3.00 to 3.10 jassid per 3 leaves and they were equally effective as thiamethoxam and imidacloprid. The higher (3.62) incidence was recorded in the treatment of ethion and it was at par with spiromesifen (3.46) and fipronil (3.38). After 7 day of spray, clothianidin (1.04) showed higher effectiveness against *E. kerri* followed by thiacloprid (1.40), thiamethoxam (1.54) and spiromesifen (1.60). Acephate and ethion registered 2.16 and 2.53 jassid per 3 leaves, respectively and they were equally effective as spiromesifen. The highest (3.03) incidence was noticed in the treatment of carbosulfan followed by fipronil (3.00) and imidacloprid (3.00).

The lowest *E. kerri* population was noticed in the treatment of clothianidin after 10 (0.54) and 15 day of spray (0.27) and it was at par with thiamethoxam and imidacloprid (Table 1). Carbosulfan, thiacloprid and acephate treated plots exhibited 2.09 to 2.32 jassid per 3 leaves after 10 day of spray and 1.81 to

2.03 jassid per 3 leaves after 15 day of spray. Ethion treated plots recorded higher incidence of *E. kerri* followed by spiromesifen, fipronil and acephate.

Pooled over period and sprays results (Table 1) revealed significantly higher (0.80 jassids/3 leaves) effectiveness of clothianidin than rest of the insecticidal treatments except thiamethoxam (Fig. 1). Imidacloprid (1.81), thiacloprid (2.12), acephate (2.36), carbosulfan (2.46) and spiromesifen (2.49) were equally effective as thiamethoxam in checking the pest incidence on cluster bean. The higher (2.89) population of *E. kerri* was registered in the plots treated with ethion followed by fipronil (2.81) and spiromesifen (2.49).

**Whitefly (*B. tabaci*)**

Plots treated with spiromesifen registered lowest (1.61) population of *B. tabaci* on cluster bean and it was at par with clothianidin (1.81) after 3 day of spray (Table 2). Thiamethoxam (2.53) and thiacloprid (1.78) were equally effective as clothianidin in checking the incidence of *B. tabaci*. Acephate and imidacloprid treated plots recorded 3.00 and 3.46 whitefly per three leaves. The highest (4.21) incidence of *B. tabaci* was noted

in the plots treated with carbosulfan followed by ethion(3.87), fipronil (3.74) and imidacloprid (3.46). After 7 day of spray, spiromesifen (1.09) stood first in controlling the pest and it was at par with clothianidin (1.30). Thiamethoxam (2.00), thiacloprid (2.12), acephate (2.46) and imidacloprid (2.89) were equally effective in checking the *B. tabaci* incidence. Among the evaluated insecticidal treatments, carbosulfan registered higher (3.68) incidence of *B. tabaci* followed by ethion (3.34) and fipronil (3.19).

The lowest (0.78) whitefly population was found in plots treated with spiromesifen and it was at par with clothianidin (1.04) after 10 days of spray (Table 2). Thiamethoxam (1.72) and thiacloprid (1.87) were equally effective as clothianidin as well as at par with acephate and imidacloprid in checking *B. tabaci* incidence on cluster bean. Higher (3.42) population of *B. tabaci* recorded in plots treated with carbosulfan followed by ethion, fipronil and imidacloprid. More or less similar trend of effectiveness was observed after 15 day of spray. Spiromesifen treated plots recorded 0.58 whitefly per 3 leaves and it was at par with clothianidin (0.82) and thiamethoxam (1.43). Thiacloprid (1.84), acephate (2.00) and imidacloprid (2.46) were equally effective as thiamethoxam in checking *B. tabaci* incidence. Higher (3.22) population of *B. tabaci* was found in plots treated with carbosulfan followed by ethion and fipronil.

Pooled over period and sprays results (Table 2 and Fig. 1) showed higher effectiveness of spiromesifen (0.99) and it was at par with clothianidin (1.22). These two insecticides were significantly more effective than rest of the insecticidal treatments. Thiamethoxam (1.90) and thiacloprid (2.12) were at par in checking the *B. tabaci* incidence on cluster bean crop. Acephate (2.39) was equally effective as thiacloprid as well as at par with imidacloprid (2.85) in reducing the whitefly population. The highest (3.62) population of whitefly was recorded in plots treated with carbosulfan and it was at par with ethion and fipronil.

**Table 2: Bio-efficacy of synthetic insecticides against Whitefly infesting summer cluster bean (Pooled over period and sprays)**

| Insecticides | Conc. (%) | No. of whitefly / 3 leaves day after spray | | | | |
|---|---|---|---|---|---|---|
| | | 3 | 7 | 10 | 15 | Pooled |
| Imidacloprid 70 WG | 0.015 | 1.99 (3.46) | 1.84 (2.89) | 1.78 (2.67) | 1.72 (2.46) | 1.83 (2.85) |
| Acephate 75 SP | 0.075 | 1.87 (3.00) | 1.72 (2.46) | 1.64 (2.19) | 1.58 (2.00) | 1.70 (2.39) |
| Carbosulfan 25 EC | 0.025 | 2.17 (4.21) | 2.04 (3.68) | 1.98 (3.42) | 1.93 (3.22) | 2.03 (3.62) |
| Clothianidin 50 WDG | 0.025 | 1.52 (1.81) | 1.34 (1.30) | 1.24 (1.04) | 1.15 (0.82) | 1.31 (1.22) |
| Fipronil 5 SC | 0.005 | 2.06 (3.74) | 1.92 (3.19) | 1.86 (2.96) | 1.80 (2.74) | 1.91 (3.15) |
| Thiamethoxam 25 WG | 0.0125 | 1.74 (2.53) | 1.58 (2.00) | 1.49 (1.72) | 1.39 (1.43) | 1.55 (1.90) |
| Thiacloprid 48 SC | 0.012 | 1.78 (2.67) | 1.62 (2.12) | 1.54 (1.87) | 1.53 (1.84) | 1.62 (2.12) |
| Spiromesifen 240 SC | 0.0192 | 1.45 (1.61) | 1.26 (1.09) | 1.13 (0.78) | 1.04 (0.58) | 1.22 (0.99) |
| Ethion 50 EC | 0.05 | 2.09 (3.87) | 1.96 (3.34) | 1.89 (3.07) | 1.83 (2.74) | 1.94 (3.26) |
| Control (water spray) | - | 2.58 (6.16) | 2.63 (6.42) | 2.66 (6.58) | 2.68 (6.68) | 2.64 (6.47) |

| S. Em. ± Treatment (T) | 0.09 | 0.09 | 0.11 | 0.12 | 0.05 |
|---|---|---|---|---|---|
| Spray (S) | 0.03 | 0.03 | 0.03 | 0.05 | 0.06 |
| T × S | 0.08 | 0.09 | 0.10 | 0.14 | 0.05 |
| C. D. at 5 % T | 0.26 | 0.26 | 0.32 | 0.35 | 0.14 |
| S | NS | NS | NS | NS | NS |
| C. V. % | 7.59 | 9.01 | 10.01 | 14.98 | 10.51 |

**Thrips (*M. distalis*)**

The treatments of fipronil registered lowest (1.57) population of *M. distalis* and it was at par with acephate (1.90) and carbosulfan (1.96) after 3 day of spray (Table 3). Clothianidin (2.46) treated plots were found equally effective as acephate and carbosulfan. The higher (3.38) incidence of *M. distalis* was noted in the treatment of spiromesifen followed by thiacloprid (3.07), thiamethoxam (2.96) and imidacloprid (2.89). After 7 day of spray, fipronil (0.52) stood first in controlling the *M. distalis* population and it was at par with acephate (0.82) and carbosulfan (1.04). These three treatments were significantly superior to rest of the insecticidal treatments. Ethion, thiamethoxam and spiromesifen treated plots noticed thrips population between 2.50 and 2.70 per 3 leaves.

**Table 3: Bio-efficacy of synthetic insecticides against Thrips infesting summer cluster bean**
**(Pooled over period and sprays)**

| Insecticides | Conc. (%) | No. of thrips / 3 leaves day after spray | | | | |
|---|---|---|---|---|---|---|
| | | 3 | 7 | 10 | 15 | Pooled |
| Imidacloprid 70 WG | 0.015 | 1.84 (2.89) | 1.81 (2.78) | 1.67 (2.29) | 1.57 (1.96) | 1.72 (2.46) |
| Acephate 75 SP | 0.075 | 1.55 (1.90) | 1.15 (0.82) | 0.98 (0.46) | 0.82 (0.17) | 1.12 (0.75) |
| Carbosulfan 25 EC | 0.025 | 1.57 (1.96) | 1.24 (1.04) | 1.01 (0.52) | 0.88 (0.27) | 1.17 (0.87) |
| Clothianidin 50 WDG | 0.025 | 1.72 (2.46) | 1.81 (2.78) | 1.60 (2.06) | 1.73 (2.49) | 1.72 (2.46) |
| Fipronil 5 SC | 0.005 | 1.44 (1.57) | 1.01 (0.52) | 0.77 (0.09) | 0.76 (0.08) | 1.00 (0.50) |
| Thiamethoxam 25 WG | 0.0125 | 1.86 (2.96) | 1.75 (2.56) | 1.62 (2.12) | 1.64 (2.19) | 1.72 (2.46) |
| Thiacloprid 48 SC | 0.012 | 1.89 (3.07) | 1.84 (2.89) | 1.73 (2.49) | 1.73 (2.49) | 1.80 (2.74) |
| Spiromesifen 240 SC | 0.0192 | 1.97 (3.38) | 1.79 (2.70) | 1.81 (2.78) | 1.68 (2.32) | 1.81 (2.78) |
| Ethion 50 EC | 0.05 | 1.83 (2.85) | 1.73 (2.49) | 1.58 (2.00) | 1.61 (2.09) | 1.69 (2.36) |
| Control (water spray) | - | 2.53 (5.90) | 2.87 (7.74) | 3.23 (9.93) | 3.33 (10.59) | 2.99 (8.44) |
| S. Em. ± Treatment (T) | | 0.07 | 0.11 | 0.11 | 0.15 | 0.1 |
| Spray (S) | | 0.03 | 0.05 | 0.04 | 0.04 | 0.02 |
| T × S | | 0.09 | 0.15 | 0.11 | 0.13 | 0.06 |
| C. D. at 5 % T | | 0.22 | 0.32 | 0.32 | 0.44 | 0.29 |
| S | | NS | NS | NS | NS | NS |
| C. V. % | | 8.22 | 14.9 | 12.31 | 14.01 | 12.46 |

Among the evaluated insecticidal treatments, thiacloprid registered higher (2.89) population of *M. distalis* followed by clothianidin (2.78) and imidacloprid (2.78). Fipronil (0.09), acephate (0.46) and carbosulfan (0.52) were equally effective in reducing the incidence of *M. distalis* and they were significantly superior to rest of the insecticidal treatments after 10 day of spray (Table 3). Ethion, clothianidin and thiamethoxam treated cluster bean plots registered 2.00, 2.06 and 2.12 thrips per 3 leaves, respectively. The higher (2.78) population of *M. distalis* was found in plots treated with spiromesifen followed by thiacloprid (2.49) and imidacloprid (2.29). More or less similar trend of effectiveness was noticed after 15 day of spray. Fipronil (0.08), acephate (0.17) and carbosulfan (0.27) were more effective against thrips on cluster bean. Imidacloprid, ethion, thiamethoxam and spiromesifen treated plots exhibited 1.96 to 2.32 thrips per 3 leaves. Clothianidin and thiacloprid treated plots registered higher (2.49) population of the pest.

Pooled over period and sprays results (Table 3 and Fig. 1) showed higher effectiveness of fipronil (0.50) and it was at par with acephate (0.75) and carbosulfan (0.87) in controlling the *M. distalis* incidence on cluster bean crop. These three insecticidal treatments were found significantly superior to rest of the insecticidal treatments. Ethion, thiamethoxam, clothianidin and imidacloprid treatments recorded 2.36 to 2.46 thrips per 3 leaves. The higher (2.78) population of *M. Distalis* was noticed in the treatment of spiromesifen followed by thiacloprid.
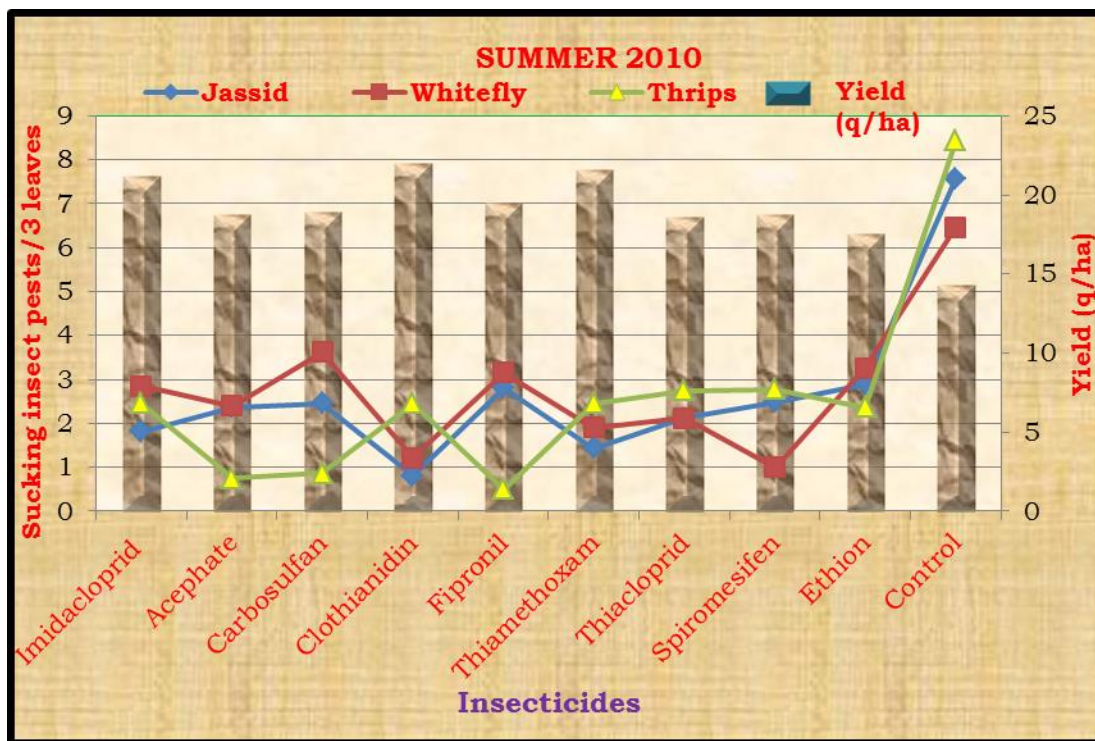
**Fig 1: Bio-efficacy of synthetic insecticides against sucking insect pests of cluster bean**

### III. CONCLUSION

The higher effectiveness was observed with the application of clothianidin 50 WDG (0.025%) and thiamethoxam 25 WG (0.0125%) against jassid and whitefly, whereas imidacloprid 70 WG (0.015%) against jassids and spiromesifen 240 SC (0.0192 %) against whitefly. Fipronil 5 SC (0.005%), acephate 75 SP (0.075%) and carbosulfan 25 EC (0.025%) effectively managed thrips on cluster bean. Thiacloprid 48 SC (0.012%) and ethion 50 EC (0.05%) were found less effective against sucking insect pests of cluster bean. Carbosulfan, acephate and fipronil were observed comparatively less effective against jassid and whitefly on cluster bean. Spiromesifen was noticed poor in suppressing the jassid and thrips, whereas imidacloprid against whitefly and thrips. Clothianidin and thiamethoxam were observed less effective against thrips on cluster bean.

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# Motor Vehicle Tyre and Low Density Polyethylene into Refinery Feed

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*Abstract-* Vehicle used tyre and low density polyethylene mixture to fuel production process was performing into laboratory batch process. Catalyst was use as a ferric oxide and percentage was 3%. For experiment purposed waste mixture was 75 g, motor vehicle tyre was 25 g and low density polyethylene was 50 g by weight. Temperature range was 270 - 440 ºC and reactor was use Pyrex glass reactor. Product fuel density is 0.76 g/ml and liquid fuel conversion rate was 61.73%, light gas was 7.07%, and left over residue was 31.2%. Fuel was analysis using GC/MS and GC/MS Chromatogram showed hydrocarbon range $C_3$ to $C_{28}$ including aliphatic, aromatic, halogenated, nitrogen content, oxygen content and alcoholic content. Fuel can use for internal combustion engines and refinery feed.

*Index Terms*- tyre, waste plastic, LDPE, refinery feed, hydrocarbon, oil

## I. INTRODUCTION

In 1993, the total production of plastics in the United States was 19.3 million tons [1]. A predominant part of such materials is ultimately disposed as waste. Further, about 280 million automotive tires were discarded in the United States in 1990 [2]. As a result, the effective disposal of waste polymers is now recognized as a major environmental problem. Plastics and rubbers are undesirable components for landfilling, since they are not presently biodegradable. Their destruction by incineration poses air pollution problems due to the release of airborne particles and carbon dioxide into the atmosphere. An alternative would be true recycling, i.e., conversion into monomers that can be reused. For example, DuPont has commercialized a depolymerization process for polyethylene terephthalate (PET) to reclaim ethylene glycol and terephthalic acid for reuse in the production of new PET. However, waste streams usually consist of polymer mixtures; furthermore, even pure polymers do not depolymerize thermally to corresponding monomers with sufficient selectivity. On the other hand, waste plastics and rubbers can be regarded as a potentially cheap and abundant source for transportation fuels and useful chemicals. Thermodegradation of polymers has been investigated extensively since World War II, [3-7] but relatively few studies on the catalytic conversion of polymers have been carried out, especially for production of liquid fuels [8].

In recent years, because of the growth of urban waste, there has been increasing attention paid to the coutilization of coal and waste materials [9-11]. The intention of this is to reduce the high cost of the coal hydrogenation process [12] and at the same time to profitably employ some waste materials by taking advantage of their components, [13] in addition to reducing environmental damage [14]. This attention has mainly been focused on plastics [15, 16] and rubber [17]. Discarded automotive tires, with 60-70% of their composition originating from petroleum, have shown to be a very attractive material [18]. Different types of reactors have been used for tire pyrolysis, such as autoclaves [19] and fixed bed reactors,[20-24] and for a larger scale operation, bubbling fluidized bed reactors,[23-28] moving beds under vacuum, in one and two steps,[29-31] ablative beds, [32] and rotary ovens [33-35]Key factors for process viability are high throughput and products with suitable properties for their subsequent valorization toward value added compounds such as high-quality carbon black, active carbon, or chemical compounds, such as benzene, toluene, xylene, limonene, and so on [36]. This good performance of the conical spouted bed has been proven in catalytic polymerizations, [37, 38] in the thermal and catalytic pyrolysis of biomass, [39, 40] and in plastic wastes [41- 43]. It has also been proven to be suitable for the kinetic study of tire pyrolysis thanks to bed isothermicity and gas flow versatility, given that operation with a short gas residence time allows for minimizing secondary reactions of tire devolatilization products. [44] In a recent paper, a study was carried out on the effect of operating conditions on the yields and composition of tire pyrolysis products [45].

## II. MATERIALS AND METHOD DESCRIPTION
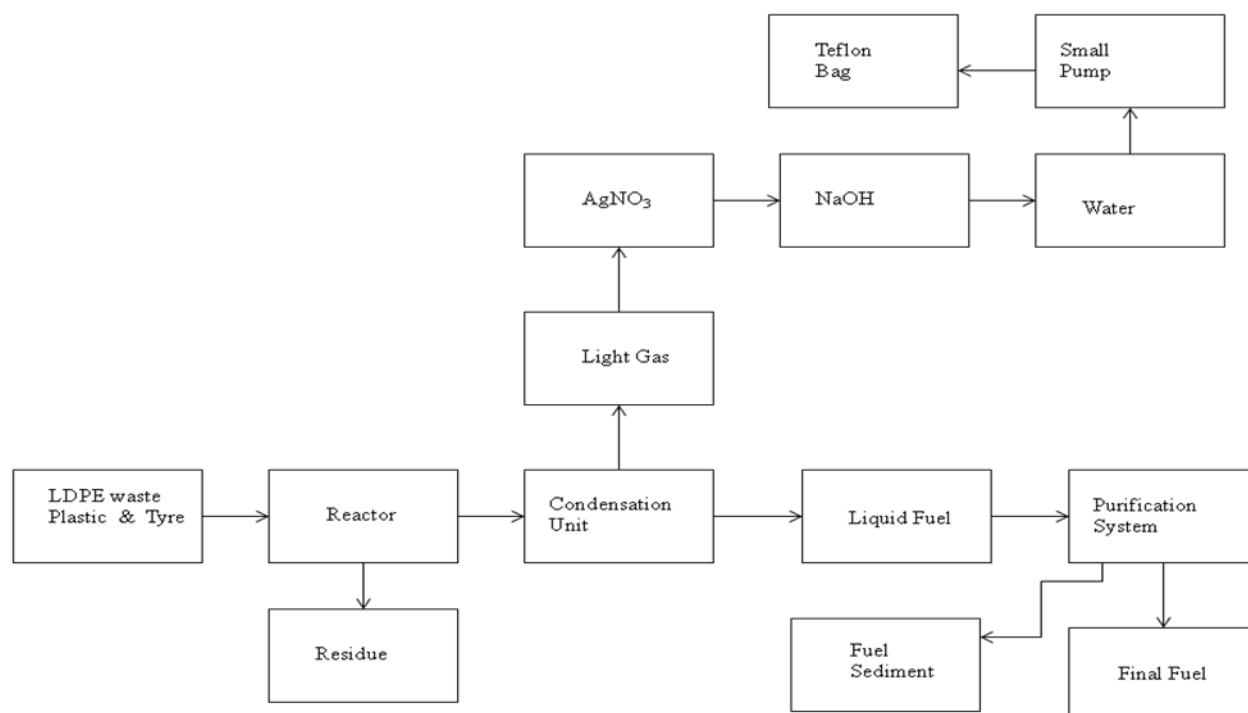
**Figure 1: Motor Vehicle Tyre and Low Density Polyethylene into oil Production Process**

Motor vehicle used tyre and low density polyethylene was collected from local city motor vehicle collision center and home depo store. Both waste materials were dirty and it was clean with water and liquid soap using laboratory sink. Then waste materials were cut into small pieces for reactor setup and liquefaction process. For experimental process purpose catalyst was provided from VWR Company. Ferric Oxide catalyst was powder format. 3% catalyst was use for the experiment and motor vehicle used tire 25 g, low density polyethylene was used 50 g by weight. Total raw materials were use 75 g. Small scale conversion process was performing under laboratory fume hood to prevent gas leakage into environment. Catalyst helps to accelerate the reaction performance. Whole process diagram showed figure 1 and necessary accessories and equipment was glass reactor with heating device and temperature controller, condensation unit, fuel collection container, fuel purification small device with filter system, fuel sediment container, final fuel collection container, light gas cleaning liquid solution silver nitrate (0.25N), sodium hydroxide solution (0.5N), water container, small pump, Teflon bag and residue collection container. Waste materials was transfer into glass reactor chamber then placed into heating chamber for liquefaction temperature range was 270 - 440 °C. Temperature was controlled by controller device because sometimes temperatures need to increase and sometimes temperatures need to decreased.

When LDPE waste plastic, motor vehicle mixture heated up with ferric oxide catalyst it's create huge amount of vapor. Produce vapor can pass through condensation unit at the end collected liquid fuel. But in this case all vapors cannot turn into liquid oil because during heat materials breaking down $C_1$ to higher compounds. $C_1$ to $C_4$ compounds are lighter compounds and their boiling point negative due to negative boiling point they cannot convert into liquid in normal temperature. $C_1$ to $C_4$ coming out as light gas and this type of gas can generate from start to experiment finished time. Light gas cleaning purpose silver nitrate solution was use because plastic has halogenated additives and it forms chlorinated compounds. Silver nitrate solution and chlorine can produce silver chloride salt. Same a sodium hydroxide solution can produce sodium chloride salt. The gas was passes through clean water to remove alkali. Liquid oil was cleaned with micron filter and removed sediment keep into separate container as container as final clean fuel. Fuel sediment keep into separate container and its can reuse with initial materials. Collected fuel density is 0.76 g/ml and conversion rate was 61.73%. In mass balance calculation showed 75 g raw materials to liquid fuel was 46.30 g, residue was 23.4 g, and light gas was 5.3 g. Total experiment run time was 4.50 hours. Input electricity was required 0.65 KWh. Catalyst recoveries under investigation.

III. RESULTS AND DISCUSSIONS
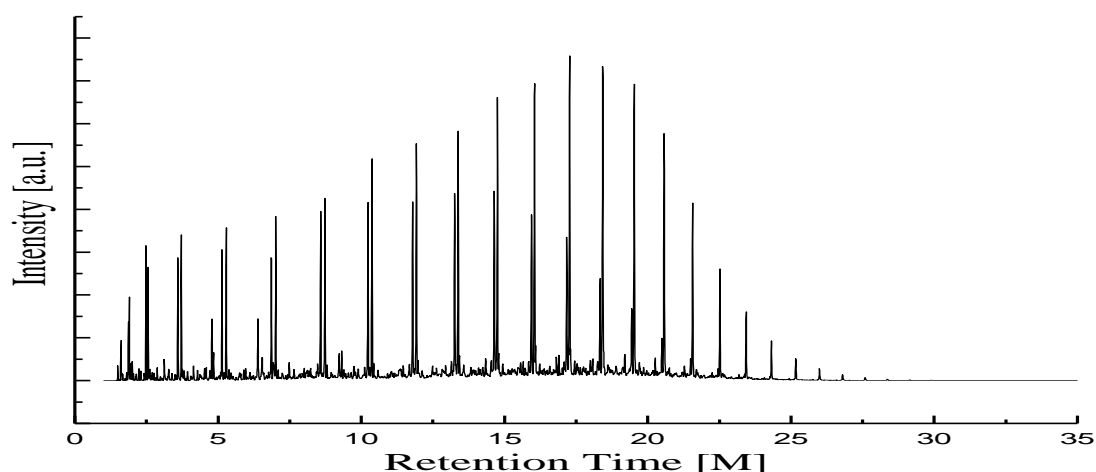


**Figure 2: GC/MS Chromatogram of Motor Vehicle Tyre and Low Density Polyethylene into oil**

**Table 1: GC/MS Chromatogram compound list of Motor Vehicle Tyre and Low Density Polyethylene into oil**

| Number of Peak | Retention Time (min.) | Trace Mass (m/z) | Compound Name | Compound Formula | Molecular Weight | Probability % | NIST Library Number |
|---|---|---|---|---|---|---|---|
| 1 | 1.49 | 41 | Cyclopropane | C3H6 | 42 | 29.2 | 18854 |
| 2 | 1.56 | 43 | Isobutane | C4H10 | 58 | 68.1 | 121 |
| 3 | 1.60 | 41 | 2-Butene, (E)- | C4H8 | 56 | 26.7 | 105 |
| 4 | 1.61 | 43 | Butane | C4H10 | 58 | 73.2 | 18940 |
| 5 | 1.67 | 41 | 2-Butene, (E)- | C4H8 | 56 | 26.1 | 105 |
| 6 | 1.81 | 43 | Butane, 2-methyl- | C5H12 | 72 | 79.1 | 61287 |
| 7 | 1.87 | 42 | Cyclopropane, ethyl- | C5H10 | 70 | 21.3 | 114410 |
| 8 | 1.90 | 43 | Pentane | C5H12 | 72 | 78.9 | 114462 |
| 9 | 1.94 | 55 | 2-Pentene, (E)- | C5H10 | 70 | 15.2 | 231217 |
| 10 | 2.05 | 67 | 1,3-Pentadiene, (Z)- | C5H8 | 68 | 19.2 | 160480 |
| 11 | 2.12 | 67 | 1,4-Pentadiene | C5H8 | 68 | 17.9 | 114494 |
| 12 | 2.42 | 57 | Pentane, 3-methyl- | C6H14 | 86 | 44.6 | 565 |
| 13 | 2.48 | 56 | 1-Hexene | C6H12 | 84 | 32.0 | 227613 |
| 14 | 2.56 | 57 | Hexane | C6H14 | 86 | 82.4 | 61280 |
| 15 | 2.62 | 55 | 3-Hexene, (Z)- | C6H12 | 84 | 22.3 | 114381 |
| 16 | 2.88 | 56 | Cyclopentane, methyl- | C6H12 | 84 | 65.9 | 114428 |
| 17 | 2.94 | 67 | 3-Hexyne | C6H10 | 82 | 30.6 | 19282 |
| 18 | 2.98 | 79 | 1,3-Cyclopentadiene, 5-methyl- | C6H8 | 80 | 10.9 | 419 |
| 19 | 3.12 | 67 | Cyclopentene, 1-methyl- | C6H10 | 82 | 20.0 | 107747 |
| 20 | 3.28 | 41 | 1-Pentanol, 2-ethyl- | C7H16O | 116 | 21.0 | 114889 |
| 21 | 3.39 | 43 | Hexane, 3-methyl- | C7H16 | 100 | 66.7 | 113081 |
| 22 | 3.50 | 67 | Cyclohexene | C6H10 | 82 | 32.4 | 114431 |
| 23 | 3.60 | 56 | 1-Heptene | C7H14 | 98 | 41.9 | 107734 |
| 24 | 3.72 | 43 | Heptane | C7H16 | 100 | 77.0 | 61276 |
| 25 | 3.76 | 81 | 3-Hexene, 2-methyl-, (E)- | C7H14 | 98 | 8.80 | 114086 |
| 26 | 3.81 | 55 | 2-Heptene | C7H14 | 98 | 22.5 | 113119 |
| 27 | 4.15 | 83 | Cyclohexane, methyl- | C7H14 | 98 | 72.2 | 118503 |
| 28 | 4.29 | 69 | Cyclopentane, ethyl- | C7H14 | 98 | 29.8 | 231044 |
| 29 | 4.37 | 79 | Cyclopropane, trimethylmethylene- | C7H12 | 96 | 9.33 | 63085 |
| 30 | 4.59 | 67 | 1-Ethylcyclopentene | C7H12 | 96 | 42.2 | 114407 |

| 31 | 4.71 | 43 | Butane, 1-chloro-3-methyl- | C5H11Cl | 106 | 8.89 | 227754 |
|---|---|---|---|---|---|---|---|
| 32 | 4.78 | 91 | Toluene | C7H8 | 92 | 45.9 | 291301 |
| 33 | 4.84 | 81 | Cyclopropane, trimethylmethylene- | C7H12 | 96 | 9.00 | 63085 |
| 34 | 4.95 | 67 | 3,4-Heptadiene | C7H12 | 96 | 14.1 | 54096 |
| 35 | 5.13 | 55 | 1-Octene | C8H16 | 112 | 29.5 | 1604 |
| 36 | 5.29 | 43 | Octane | C8H18 | 114 | 50.0 | 229407 |
| 37 | 5.37 | 55 | 3-Octene, (Z)- | C8H16 | 112 | 13.1 | 113895 |
| 38 | 5.75 | 95 | 1-Methyl-2-methylenecyclohexane | C8H14 | 110 | 9.95 | 113437 |
| 39 | 5.90 | 81 | 1,4-Heptadiene, 3-methyl- | C8H14 | 110 | 5.41 | 1484 |
| 40 | 5.96 | 83 | Cyclohexane, ethyl- | C8H16 | 112 | 66.3 | 113476 |
| 41 | 6.39 | 91 | Ethylbenzene | C8H10 | 106 | 62.6 | 114918 |
| 42 | 6.54 | 91 | Cyclohexanol, 1-ethynyl-, carbamate | C9H13NO2 | 167 | 13.8 | 313023 |
| 43 | 6.77 | 70 | 4-Nonene | C9H18 | 126 | 9.28 | 113904 |
| 44 | 6.86 | 56 | 1-Nonene | C9H18 | 126 | 13.1 | 107756 |
| 45 | 6.92 | 104 | Bicyclo[4.2.0]octa-1,3,5-triene | C8H8 | 104 | 35.2 | 154588 |
| 46 | 7.02 | 43 | Nonane | C9H20 | 128 | 34.0 | 2665 |
| 47 | 7.36 | 67 | Cycloheptene, 1,2-dimethyl- | C9H16 | 124 | 5.53 | 2342 |
| 48 | 7.48 | 105 | Benzene, (1-methylethyl)- | C9H12 | 120 | 48.5 | 228742 |
| 49 | 7.65 | 55 | Cyclohexane, propyl- | C9H18 | 126 | 12.1 | 249350 |
| 50 | 7.75 | 95 | 1,2-Dipentylcyclopropene | C13H24 | 180 | 5.98 | 90651 |
| 51 | 7.86 | 67 | Cyclopentene, 1-butyl- | C9H16 | 124 | 29.1 | 113491 |
| 52 | 7.94 | 57 | 1-Tridecyne | C13H24 | 180 | 7.77 | 232732 |
| 53 | 8.01 | 91 | Benzene, propyl- | C9H12 | 120 | 63.5 | 113930 |
| 54 | 8.48 | 70 | trans-4-Decene | C10H20 | 140 | 5.73 | 162825 |
| 55 | 8.59 | 55 | 1-Decene | C10H20 | 140 | 17.3 | 107686 |
| 56 | 8.73 | 57 | Decane | C10H22 | 142 | 40.0 | 291484 |
| 57 | 8.81 | 55 | cis-3-Decene | C10H20 | 140 | 15.7 | 113558 |
| 58 | 9.23 | 119 | Benzene, 1-methyl-3-(1-methylethyl)- | C10H14 | 134 | 21.8 | 149866 |
| 59 | 9.31 | 68 | Limonene | C10H16 | 136 | 24.6 | 57640 |
| 60 | 9.39 | 55 | Cyclodecane | C10H20 | 140 | 11.0 | 237923 |
| 61 | 9.65 | 105 | 1-Decen-4-yne, 2-nitro- | C10H15NO2 | 181 | 10.1 | 186798 |
| 62 | 9.75 | 91 | Bicyclo[3.1.0]hex-3-en-2-ol, 2-methyl-5-(1-methylethyl)-, (1α,2α,5α)- | C10H16O | 152 | 11.3 | 250249 |
| 63 | 9.89 | 57 | Decane, 3-methyl- | C11H24 | 156 | 25.0 | 113894 |
| 64 | 10.12 | 70 | Bicyclo[3.1.1]heptan-3-ol, 6,6-dimethyl-2-methylene-, [1S-(1α,3α,5α)]- | C10H16O | 152 | 4.99 | 151861 |
| 65 | 10.24 | 41 | 1-Undecene | C11H22 | 154 | 7.31 | 232523 |
| 66 | 10.30 | 55 | 5-Undecene, (E)- | C11H22 | 154 | 5.27 | 114227 |
| 67 | 10.38 | 57 | Undecane | C11H24 | 156 | 33.5 | 114185 |
| 68 | 10.43 | 55 | 5-Undecene, (E)- | C11H22 | 154 | 12.3 | 114227 |
| 69 | 10.58 | 55 | 2,4-Pentadien-1-ol, 3-pentyl-, (2Z)- | C10H18O | 154 | 8.45 | 142197 |
| 70 | 11.68 | 70 | 2-Undecene, 3-methyl-, (E)- | C12H24 | 168 | 4.47 | 61840 |
| 71 | 11.79 | 55 | 1-Dodecene | C12H24 | 168 | 13.9 | 107688 |
| 72 | 11.92 | 57 | Dodecane | C12H26 | 170 | 36.3 | 107687 |
| 73 | 11.98 | 55 | 3-Dodecene, (E)- | C12H24 | 168 | 11.8 | 70642 |
| 74 | 13.15 | 70 | 5-Tridecene, (E)- | C13H26 | 182 | 5.49 | 142619 |
| 75 | 13.26 | 55 | 1-Tridecene | C13H26 | 182 | 14.4 | 107768 |
| 76 | 13.38 | 57 | Tridecane | C13H28 | 184 | 49.1 | 114282 |
| 77 | 14.54 | 70 | 7-Tetradecene | C14H28 | 196 | 6.33 | 70643 |
| 78 | 14.64 | 55 | 1-Tetradecene | C14H28 | 196 | 5.31 | 69725 |
| 79 | 14.76 | 57 | Tetradecane | C14H30 | 198 | 43.4 | 113925 |

| 80 | 14.80 | 55 | 3-Tetradecene, (E)- | C14H28 | 196 | 7.71 | 139981 |
| 81 | 15.84 | 70 | Z-10-Pentadecen-1-ol | C15H30O | 226 | 6.46 | 245485 |
| 82 | 15.94 | 55 | 1-Pentadecene | C15H30 | 210 | 12.8 | 69726 |
| 83 | 15.94 | 55 | 1-Pentadecene | C15H30 | 210 | 12.8 | 69726 |
| 84 | 16.05 | 57 | Pentadecane | C15H32 | 212 | 39.6 | 107761 |
| 85 | 16.08 | 55 | E-2-Hexadecacen-1-ol | C16H32O | 240 | 6.72 | 131101 |
| 86 | 17.17 | 55 | 1-Hexadecene | C16H32 | 224 | 9.93 | 69727 |
| 87 | 17.27 | 57 | Hexadecane | C16H34 | 226 | 39.9 | 114191 |
| 88 | 17.45 | 55 | 1-Dodecanol, 3,7,11-trimethyl- | C15H32O | 228 | 4.69 | 22776 |
| 89 | 18.08 | 55 | Hexadecane, 3-methyl- | C17H36 | 240 | 16.2 | 68902 |
| 90 | 18.34 | 55 | E-14-Hexadecenal | C16H30O | 238 | 6.65 | 130980 |
| 91 | 18.43 | 57 | Heptadecane | C17H36 | 240 | 38.9 | 107308 |
| 92 | 19.44 | 55 | E-15-Heptadecenal | C17H32O | 252 | 5.39 | 130979 |
| 93 | 19.53 | 57 | Octadecane | C18H38 | 254 | 17.0 | 57273 |
| 94 | 19.70 | 57 | 1-Hexadecanol, 2-methyl- | C17H36O | 256 | 7.02 | 36540 |
| 95 | 20.26 | 57 | Heptadecane, 9-octyl- | C25H52 | 352 | 7.06 | 15951 |
| 96 | 20.49 | 55 | 9-Nonadecene | C19H38 | 266 | 10.1 | 113627 |
| 97 | 20.57 | 57 | Nonadecane | C19H40 | 268 | 31.3 | 114098 |
| 98 | 21.28 | 57 | Nonadecane, 2,3-dimethyl- | C21H44 | 296 | 13.1 | 68922 |
| 99 | 21.49 | 55 | 1-Eicosene | C20H40 | 280 | 6.74 | 13488 |
| 100 | 21.57 | 57 | Eicosane | C20H42 | 282 | 30.6 | 290513 |
| 101 | 21.70 | 57 | 1-Docosanol | C22H46O | 326 | 5.64 | 23377 |
| 102 | 22.46 | 55 | 10-Heneicosene (c,t) | C21H42 | 294 | 8.44 | 113073 |
| 103 | 22.52 | 57 | Heneicosane | C21H44 | 296 | 28.5 | 107569 |
| 104 | 23.38 | 55 | 1-Docosene | C22H44 | 308 | 14.7 | 113878 |
| 105 | 23.44 | 57 | Heneicosane | C21H44 | 296 | 11.6 | 107569 |
| 106 | 24.32 | 57 | Heneicosane | C21H44 | 296 | 10.1 | 107569 |
| 107 | 25.17 | 57 | Tetracosane | C24H50 | 338 | 17.8 | 248196 |
| 108 | 25.99 | 57 | Heneicosane | C21H44 | 296 | 10.7 | 107569 |
| 109 | 26.80 | 57 | Nonadecane | C19H40 | 268 | 19.9 | 114098 |
| 110 | 28.37 | 57 | Octacosane | C28H58 | 394 | 4.33 | 149865 |

Vehicle tyre and low density polyethylene mixture to fuel was analysis using GC/MS and solvent was use carbon disulfide ($C_2S$). Perkin Elmer GC/MS model 5000 Clarus and capillary column was use. Helium was use as a carrier gas. Liquid sample Chromatogram was analysis using NIST library and compounds was traced based on chromatogram peak intensity, trace mass (m/z), and retention time (m). GC/MS Chromatogram and compounds table showed figure 2 and table 1. Waste LDPE plastic and motor vehicle tyre mixture into fuel hydrocarbon range is showed by GC/MS $C_3$ to $C_{28}$. GC/MS staring compounds showed Cyclopropane (C3H6) (t=1.49, m/z=41) compound probability percentage is 29.2 %, then rest of all compounds traced low carbon number to higher carbon number wise such as 2-methyl- Butane (C5H12) (t=1.81, m/z=43) compound probability percentage is 79.1 %, (Z)-1,3-Pentadiene (C5H8) (t=2.05, m/z=67) compound probability percentage is 19.2 %, Hexane (C6H14) (t=2.56, m/z=57) compound probability percentage is 82.4 %, methyl- Cyclopentane (C6H12) (t=2.88, m/z=56) compound probability percentage is 65.9 %, 1-methyl-Cyclopentene (C6H10) (t=3.12, m/z=67) compound probability percentage is 20.0 %, 3-methyl- Hexane (C7H16) (t=3.39, m/z=43) compound probability percentage is 66.7 %, 3- (E)-2-methyl-Hexene (C7H14) (t=3.76, m/z=81) compound probability percentage is 8.80 %, methyl-Cyclohexane (C7H14) (t=4.15, m/z=83) compound probability percentage is 72.2 %, 1-chloro-3-methyl- Butane (C5H11Cl)
(t=4.71, m/z=43) compound probability percentage is 8.89 %, 1-Octene (C8H16) (t=5.13, m/z=55) compound probability percentage is 29.5%, 1-Methyl-2-methylenecyclohexane (C8H14) (t=5.75, m/z=95) compound probability percentage is 9.95 %, Ethylbenzene (C8H10) (t=6.39, m/z=91) compound probability percentage is 62.6 %, Nonane (C9H20) (t=7.02, m/z=43) compound probability percentage is 34.0 %, (1-methylethyl)- Benzene (C9H12) (t=7.48, m/z=105) compound probability percentage is 48.5 %, 1-butyl-Cyclopentene (C9H16) (t=7.86, m/z=67) compound probability percentage is 29.1%, propyl- Benzene (C9H12) (t=8.01, m/z=91) compound probability percentage is 63.5 %, 1-methyl-3-(1-methylethyl)-Benzene (C10H14) (t=9.23, m/z=119) compound probability percentage is 21.8 %, Limonene (C10H16) (t=9.31, m/z=68) compound probability percentage is 24.6 %, 3-methyl-Decane (C11H24) (t=9.89, m/z=57) compound probability percentage is 25.0 %, Undecane (C11H24) (t=10.38, m/z=57) compound probability percentage is 33.5%, (E)-3-methyl-2-Undecene (C12H24) (t=11.68, m/z=70) compound probability percentage is 4.47 %, (E)-3-Dodecene (C12H24) (t=11.98, m/z=55) compound probability percentage is 11.8 %, Tridecane (C13H28) (t=13.38, m/z=57) compound probability percentage is 49.1 %, Tetradecane (C14H30) (t=14.76, m/z=57) compound probability percentage is 43.4 %, Z-10-Pentadecen-1-ol (C15H30O) (t=15.84, m/z=70) compound probability percentage is 6.46%, Pentadecane (C15H32) (t=16.05, m/z=57) compound probability

percentage is 39.6%, Hexadecane (C16H34) (t=17.27, m/z=57) compound probability percentage is 39.9 %, Heptadecane (C17H36) (t=18.43, m/z=57) compound probability percentage is 38.9%, Octadecane (C17H36) (t=19.53, m/z=57) compound probability percentage is 17.0 %, Nonadecane (C19H40) (t=20.57, m/z=57) compound probability percentage is 31.3 %, Eicosane (C20H42) (t=21.57, m/z=57) compound probability percentage is 30.6 %, Heneicosane (t=22.52, m/z=57) compound probability percentage is 28.5%, Tetracosane (C24H50) (t=25.17, m/z=57) compound probability percentage is 17.8%, Octacosane (C28H58) (t=28.37, m/z=57) compound probability percentage is 4.33 %. Analysis fuel result showed that fuel has aliphatic compounds, aromatic compounds, halogen group, nitrogen content, oxygen content compounds and alcoholic group compounds. Halogen group compounds appeared from raw materials additives. Plastic and tyre has additives that additive some negligible percentage are appeared into liquid fuel and rest of all additives are comes out as solid black residue. Fuel additives or sediment can remove by using separation technique. Fuel aromatic group appeared from tyre materials because tyre has aromatic group and LDPE waste plastic has long chain hydrocarbon only aliphatic group.  Fuel can use for internal combustion engines and refinery feed.

## IV.  CONCLUSION

Motor vehicle used tyre and low density polyethylene waste plastic mixture into liquid fuel using Ferric Oxide catalyst in presence of oxygen. Laboratory batch process experiment was conducted to recover liquid fuel and conversion percentage determination. Low percentage motor vehicle tyre and high percentage waste LDPE plastic mixture to fuel conversion rate was 61.73%. Residue percentage was high because tyre to liquid fuel conversion rates less because tyre has high percentage of additives that additives cannot convert into liquid oil.  Fuel density is 0.76 g/ml, fuel color is yellow and liquid fuel is ignited. Product fuel has some aromatic group compounds such as Toluene (C7H8), Ethylbenzene (C8H10),  (1-methylethyl)-Benzene (C9H12),  propyl-Benzene (C9H12), 1-methyl-3-(1-methylethyl)-Benzene (C10H14), Limonene (C10H16). Light gas and solid black residue analysis under investigation and also catalyst recover from solid black residue under investigation. Fuel can use for refinery process for further modification and appropriate for combustion engines. By using this present technology can convert all LDPE waste plastic and motor vehicle to fuel and same time can save the environmental problem. For waste plastics and motor vehicle tyre are creating environmental problem this waste problem can solve convert into liquid fuel using this technology.

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# The Iligan City Public Library and Services:  Its Community Sectors' Awareness and Responses

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*Abstract-* This descriptive study was conducted in Iligan City, northern coast of Mindanao, occupying the Southern portion of the Philippine archipelago. This is a survey of 462 respondents coming from the cross-section of the communities during the Calendar Year 2012 to assess if the City Public Library was able to level the library services as based on its collections. Moreover, personal interviews were conducted, daily statistics on library users was utilized, and survey questionnaire on awareness, patronage, gauge of services against needs, other information sources information needs, and library resources were done in data gathering.   Findings revealed that of the 313,291 total population (as of 2012 census)  which is the target users of the city public library, only 8,397 or 2.68% actually made use of its library services.   Out of this, an overwhelming majority or 88.46% are students, followed by the children with 4.74% and the professionals with 3.87% patronage.   There has been no patronage from the handicaps and inmates and very least from the out-of-school-youth, non professionals, and senior citizens. Factors affecting these wide gaps between the legitimate and the actual users include: awareness in ICPL's existence and the mandate of Republic Act 7743, geographical accessibility, policies of ICPL, library services, and the presence of other information centers within the city.   These findings imply that the Iligan City Public Library must plan massive reach-out programs in order to bring the library resources closer to all sectors of its intended users which are the whole of the Iligan City community.

*Index Terms*- Social Sciences, Library Science, Public Libraries, Library Services, Library Users, Descriptive study, Iligan City, Mindanao, Philippines

## I. INTRODUCTION

Historical sketches on libraries show that the library as a component part of the history of civilization, its story interwoven with the story of the people it has served.  The needs to which libraries from their earliest existence have responded are as diverse as the conditions out of which they have grown.  In the story of libraries, however, certain types of needs recur frequently enough to be identified with each of these types of needs.  Many of the basic needs which are served by librarians today- public libraries in particular- such as education, research, information, civic responsibility, aesthetic appreciation, and recreation- are also served by other agencies and groups.  The library, in a collective sense, is the agency devoted solely to the purpose of recollecting, making available and securing the widest

and most effective use of records of civilization by the society of which it is a part (David, 1979 as cited in by Montebon, 2010). Thus, the need of any highly industrial and technical society, in such a day as this when fast and radical changes are taking place throughout the world, the need for the library is almost without limit (Gates, 1968 as cited in by Lopera, 2011).

To realize the above presentations, the Republic Act 411 of 1949 which called for the establishment of 1,000 new town libraries over a period of five (5) years and which has been expanded by R.A. 7743 of 1994 was created which mandates that as an "indispensable societal instrument,  public libraries are committed to provide an equal and easy access to information resources and stock of knowledge which are the  key factors towards an improved quality of life  and the country's economic progress and global excellence."  This Act provides for the establishment of congressional, city, and municipal libraries and barangay reading centers throughout the Philippines, appropriating the necessary funds thereof and for other purposes. Generally, a public library aims to provide information services to promote education of people of all sectors in the community to provide materials for wholesome reactions and useful use of leisure time of the people.  This means that the public library is mandated to serve not only the students and the professionals but is equally mandated to serve the street children, the out-of-school youth and the non-professionals.

Realizing this and the need for a central source of information at the city level, the Iligan City Public Library (ICPL) was founded as a project by the Rotary Club of Iligan in Rotary Year 1966-1967.  Since then, it has been in existence for this purpose.

## II. FRAMEWORK

The public library's most vital function remains as a prime repository of national heritage.  Its collection mirrors the national psyche and provides an identity common to a people, their way of life, ideas, and aspirations.  Its main obligation is to make national culture accessible to all classes of people in the society. This task includes the collection, organization, display, dissemination, and preservation of materials reflecting the national heritage but making the people better understand and appreciate this heritage.

Another important role played by the public library in enriching culture is promoting the use of the national heritage. Priority in acquisition is given to works written in the language and the vernaculars.  Works of local writers are also given preference in the library's acquisition program.  The library can

help elevate the national language for serious works at the same time in bringing valuable writings to the segment of the reading public, which would prefer it. Thus, the so-called local history collection, which is the incumbent function of the public library. A more specific purpose of a public library is to put together, preserve and administer books and related educational materials in organized collections, to promote through guidanc3 and encouragement, an enlightened citizenry and enriched personal lives (David, 1979) as cited in by (La Cerna, 2009).

In actual practice, utilization of library services is often selective maybe due to the method by which library services are delivered, inadequacy of library resources (which could be due to budgetary constraints), geographical location, inadequacy of manpower resources, and lack of community awareness or responsiveness to the services offered. Or maybe there is a failure or oversight on the part of the librarians to meet the very stated mission and vision for which the public library is being created.

To understand the process of librarianship, we must begin to devote greater effort to examining and re-examining societal needs as to the fountainhead for the services and materials of the library. Information needs of a society change in accordance with the development that is taking place in the nation. As a contributor towards national development, libraries should act as catalyst of change. One of the roles of libraries is to extend the benefits of global information resources to the local communities through the introduction of new technologies in libraries (Jaafar, 1996 as cited in by Fajardo, 2009). Until and unless the problems are tackled at the grassroots level, and unless the current trends in library servicing the cooperative ventures and networking be embraced into the mainstreams of library servicing, it is unlikely that the situation will improve and it is this light that libraries and librarians could continue to overcoming the problems through the intelligent use of information (Yaacob, 1996 as cited in by Yancey, 2011).

## III. OBJECTIVES OF THE STUDY

This study aims to assess the role of the Iligan City Public Library towards the Iligan City community as its users. It also intends to recommend strategies to solve or narrow the gap between the target and actual users of the Iligan City Public Library and to propose programs to reach out to the majority of the identified unreached sector of the community.

## IV. MATERIALS AND METHODS

To cover all the diverse sectors of the Iligan Community, the respondents were categorized as follows: children, students, out-of-school youth, professionals, non-professionals, senior citizens, handicapped, inmates, and n.e.c. ( or none elsewhere classified). Children below 4 years of age were not included since preparatory school age usually begins at 4. These were further classified into legitimate or target users and the actual users. Though Iligan City has quite number of manufacturing industries, the industrial workers' sector was excluded in this study because a portion of it is already reflected in the professional sector.

Since distance is one of the determinants of one's visit or patronage of a public library, the forty-four (44) barangays were first divided into two (2) categories: accessible and inaccessible. Then, selection of respondents was made from six (6) accessible barangays (Poblacion, Mahayahay, Saray-Tibanga, Tipanoy, and Ubaldo Laya) and three (3) inaccessible barangays (Mandulog, Dulag, and Digkilaan). Random samples of 20% from each sector of the actual public library users extracted and used as respondents of this study.

### Table A. Sectoral Distribution of Population

| Community Sectors | Target Users of Iligan City Public Library (ICPL) | | | | Respondents | |
|---|---|---|---|---|---|---|
| | * Legitimate N=313,291 (2012 Census) | % | ** Actual (n=8,397) | % | Patrons 20% of Actual Users | Non-Patrons |
| Children | 64,500 | 20.59 | 398 | 4.74 | 80 | 16 |
| Students | 55,450 | 17.70 | 7,248 | 88.46 | 150 | 50 |
| Out-of-School Youths | 17,900 | 5.71 | 53 | 0.63 | 11 | 5 |
| Professionals | 17,535 | 5.60 | 325 | 3.87 | 65 | 15 |
| Non-Professionals | 29,237 | 9.33 | 95 | 1.13 | 20 | 10 |
| Senior Citizens | 17,265 | 5.51 | 98 | 1.17 | 20 | 10 |
| Handicaps | 1,400 | 0.45 | 0 | 0 | 0 | 5 |
| Inmates | 500 | 0.16 | 0 | 0 | 0 | 5 |
| n.e.c. | 109,504 | 34.95 | | | | |
| **TOTAL** | **313,291** | **100%** | **8,397** | **100%** | **346** | **116** |

*Legend:*
n.e.c.    - none elsewhere classified

\*  - Taken from the 2012 Iligan City Socio-Economic Profile
\*\*  - Taken from the Users' Logbook of ICPL

Survey questionnaires and personal interview were the tools used in data gathering. The survey questionnaire consisted of awareness, patronage, and gauge of services against needs, other information sources, information needs, and library source. The personal interviews were made on some patrons of the ICPL, some members of different professional organizations, and other sources to determine the type of services they extended to the public. The daily sitting statistics was used in the data gathering.

From the daily loan and sitting statistics maintained by the ICPL, the following information were obtained: a) type of materials borrowed; b) subject inquiries, which enabled the researcher to determine the actual information needs of the ICPL users from the different sectors of the community. These

statistical records showed that the bulk of the ICPL users are students, most of which are from the nearby national high school and the prominent MSU-Iligan Institute of Technology. Questionnaires were distributed to the different sectors coming from the different barangays in the city. Of the 500 questionnaires fielded, only 642 were retrieved, utilized, and analyzed. The 2012 Iligan City Socio-Economic Profile from the City Planning and Development Office provided that data about the city's statistical profile.

## V. RESULTS AND DISCUSSIONS

**Table 1: Profile of Difference Between Legitimate and Actual Public Library Users**

| Community Sectors | Target Users | | | | |
|---|---|---|---|---|---|
| | Legitimate (N=313,291) | Percent | Actual (n=8,397) | Percent | Actual Against Legitimate |
| Children | 64,500 | 20.59 | 398 | 4.74 | 0.62 |
| Students | 55,450 | 17.70 | 7,428 | 88.46 | 13.40 |
| Out-of-School Youths | 17,900 | 5.71 | 53 | 0.63 | 0.30 |
| Professionals | 17,535 | 5.60 | 325 | 3.87 | 1.85 |
| Non-Professionals | 29,237 | 9.33 | 95 | 1.13 | 0.32 |
| Senior Citizens | 17,265 | 5.51 | 98 | 1.17 | 0.57 |
| Handicaps | 1,400 | 0.45 | 0 | 0 | 0 |
| Inmates | 500 | 0.16 | 0 | 0 | 0 |
| n.e.c. | 109,504 | 34.95 | | | |
| **TOTAL** | **313,291** | **100%** | **8,397 (2.69%)** | **100%** | **17.06%** |

Out of the total legitimate or target users (313, 291) the actual public library patrons constitute only 8,397 or 2.68% and from this percentage total of actual users, the biggest number of clients were the students. It should be noted that however their big patronage, they only represent 15.48% of the entire student population. It is still insignificant result which could be attributed to the fact that the schools where the students belong have their own school or academic libraries where they are the legitimate users.

The next bigger number of library patrons were the children with 398 which is 4.74% of the actual users and yet only 0.62% against the total (64,500) children population. At the city public library, there is a special section for the children. However, due to the teeming presence of high school and college students, the children's section was usually occupied even though the librarians did not reach out or orient parents to bring their children to enjoy the library's children's sources.

The professionals ranked third in its patronage of the public library constituting 325 or 3.87% actual users out of the total patrons of 8,397. Again, it should be noted that this number is only 3.13% of the total 17,535 professionals in Iligan City. In this study, statistics shows 0.63% (53 out of 8,397) patronage came from the out-of-school youth population. Aside from them,

the next least users were the non-professionals. They include the plain housewives, farmers, fishermen, drivers, vendors, etc. Information says that it is the third biggest sector in the community, yet there are only 95 (1.13% actual users) of the total (29,237) non-professionals population.

There was no patronage from the handicaps and the inmates, apparently because there was no special reach-out programs provided for them. The public library has the collections of Braille materials for the blind, however, there were no trained library personnel to put them into use, and hence, they just kept the materials unused.

In one hand, age has long been considered a retardant to library use. Older people used the library less than young people did as they reached toward retirement, much of their decline to visit the learning environment because some other priorities (*http:///www.statelibrary.dcr.state.nc.us/jnr/pldevv2.html*;
retrieved 2006). This could be the reason why there were only 1.17% (98) senior citizen users against its total (17,265) population. Another possible reason was the fact that the public library did not have much to offer to them like a music section, where the aged could listen to their old favorite tunes; the memorabilia corner where they could muse over; the senior citizen forum where they could while away their boring free

times at home; and the like, and if at all there is a faint semblance of this kind of service at the public library, not ever announced to the aged sector at all.

On the other hand, this profile is corroborated by the findings of (Afan, 1983) as cited in by (Oro, 2008) where the biggest users percentage-wise, of the public library were the high school students, followed by the college students, the children, the professionals and the last, the out-of-school youth. In connection further to the aforesaid findings, Muñasque's paper presented at the 7th Congress of Southeast Asian Librarians, disclosed that public library use is at best reaching only 7% of the population, a fact which does not speak well of public librarianship. This picture does not exclude in any way the public library of Iligan City, Philippines.

**Table 2: Awareness Profile of Non-Library Patrons**

| Community Sectors (Non-Patrons) | Respondents | Existence Yes No | Mandate Yes No |
|---|---|---|---|
| Children | 16 | 4 12 | 0 16 |
| Students | 50 | 22 28 | 18 32 |
| Out-of-School Youth | 5 | 2 3 | 0 5 |
| Professionals | 15 | 14 1 | 14 1 |
| Non-Professionals | 10 | 5 5 | 3 7 |
| Senior Citizens | 10 | 3 7 | 4 6 |
| Handicaps | 5 | 1 4 | 0 5 |
| Inmates | 5 | 2 3 | 1 4 |
| **TOTAL** | 116 | 53 63 | 40 76 |

As shown in the table, there is a wide gap in the profile of actual against legitimate or target users of the public library. In its existence, and of the mandate of Republic Act 7743 sources of data on this particular portion of the research are the 116 legitimate but non- patron respondents. For obvious reasons, the usual library clients are excluding. On mere awareness on the city's public library presence, almost half of the respondents replied positively (22 out of 50), while almost half of the professional respondents indicated its awareness. The least aware respondents were the handicaps and then inmates. Totally, there was an almost equal distribution of responses as their respondents' awareness on the existence of the public library as pointed by the findings of the survey.

Nevertheless, majority (76 or 65.55%) of them were not aware of the mandate of the Republic Act 7743. Obviously, the most informed sectors were the professionals and the students, while the least informed were the persons with disability or handicapped, the out-of-school youth, the inmates, and the children. Gozo (1994) as cited in by Nunag (1998) disclosed similar results that majority of the residents of her hometown

were not aware of the existence of their municipal and/or city public library.

**Table 3: Respondents' Reasons for Awareness of the Public Library Existence**

| Reasons | Frequency | Percent | Rank |
|---|---|---|---|
| 1. It is near my residence/office/place of work. | 206 | 51.63 | 1 |
| 2. Through a friend/relative/associate or other librarian/s. | 104 | 22.30 | 3 |
| 3. Others | 89 | 26.07 | 2 |
| TOTAL | 399 | 100% | |

The 399 respondents as to how they became aware of the public library's existence had cited several reasons. More than one-half of them (51.63% leaned about the city public library because it is located near their school, residence, office or place of work. This explains why most of its users or clients are the students from the nearby schools. This also shows that these clients are mostly from barangays within the vicinity of the public library. Others answered that they became aware of the public library because it is located along the road where it is visible to passersby, they learned about it through the radio or from their children who regularly researched at the said public library.

This would imply that in the absence of reach-out services of the public library was among the reasons why most of the legitimate or target users have not been aware of its existence.

**Table 4 : Respondents' Reasons for Unawareness of the Public Library Existence**

| Reasons | Frequency | Percent | Rank |
|---|---|---|---|
| 1. Have not heard about it/nobody told me about it | 9 | 16.99 | 2 |
| 2. I do not know what it is | 3 | 5.66 | 3 |
| 3. I though it is the library of the nearby public high school | 39 | 73.58 | 1 |
| 4. No answer | 2 | 3.77 | |
| TOTAL | 53 | 100% | |

The continuous presence of so many high school students from the nearby school which constitute 73.58% led to the people's expectation that such is a school library. In fact, some, it not most students of the said school shared the same opinion. While some (16.99%) did not hear about the existence of a public library in the city, 5.66% did not what it is all about. This should pause a big a challenge for the city public librarians. Massive

out-reach program to announce that the Iligan City Public Library is existed for the unreached clients, to justify the vision and mission for which it was created.  Sanchez (1976)  as cited in by  (Sardo, 2005) remarked that it is not enough that the government plan for the availability of information resources but users of information should be informed that they exist and should know how to obtain them.

**Table 5 :  Non-Patrons' Willingness Profile to Avail of Public Library Services Once Given Orientation**

|           | Frequency | Percent | Rank |
|-----------|-----------|---------|------|
| Yes       | 95        | 81.90   | 1    |
| No        | 18        | 15.52   | 2    |
| No answer | 3         | 2.58    | 3    |
| TOTAL     | 116       | 100%    |      |

Geographical accessibility from the target users' residence, school, or place of work is another factor that inhibits coming in to avail of the library resources.  The nature of library services in distant barangays or in the rural areas presents a unique challenge towards information service.  The major hindrance in catering to these other legitimate users is how to get the resources to the people who are wildly scattered.  Despite this imposing hindrance, 95 or 81.90% of the 116 non-patrons of the public library were still willing to avail of its library services when oriented of what their public library has for them.  This is a good indication of the people's thirst for information that can be quenched by the resources found in the library (INFLANET, 2000).

Considering the limited resources (logistically and manpower) of the public library, this restraining factor really poses a problem.  In fact, this is one of the reasons why the 18 respondents were not willing or were not interested to avail the public library's services even if they are oriented of the privileges as mandated by the Republic Act 7743.

**Table 6 :  Reasons of Non-Willing Legitimate Users to Avail of Public Library Services Despite of the Orientation**

| Reasons | Frequency | Percent | Rank |
|---------|-----------|---------|------|
| 1.   I am too busy/no time to go there | 7 | 38.89 | 1 |
| 2.   Too far from my school/residence/ place of work | 6 | 33.33 | 2 |
| 3.   I do not know how to read and write | 2 | 11.11 | 4 |
| 4.   Not interested | 3 | 16.67 | 3 |
| TOTAL | 18 | 100% | |

Being so busy thus having no time to go or visit a library was the reason of 38.89% of the respondents.  While 6 or 33.33% mentioned prohibitive distance, which makes it possible to go the public library, 16.67% manifested no interest at all.  The least reason was illiteracy.  These reasons for unwillingness should be

contained in order for these members of the community to become active users of the information sources (Galapin, 2000).

**Table 7 :  Non-Patrons' Reasons for Not Using the Public Library**

| Reasons | Frequency | Percent | Rank |
|---------|-----------|---------|------|
| *Policy Restrictions:* | | | |
| 1.   Not allowed inside/parents or teachers did not bring us there. | 10 | 8.62 | 5 |
| 2.   I am not allowed to borrow or bring home books. | 12 | 10.34 | 4 |
| 3.   Library hours do not suit my schedule. | 26 | 22.41 | 2 |
| 4.   Library collections/services are not suitable for my needs. | 3 | 2.59 | 9 |
| 5.   No orientation. | 40 | 22.41 | 1 |
| *Acquisition Policies:* | | | |
| 6.   No computer/limited on high technology information sources. | 15 | 12.93 | 3 |
| 7.   Negative attitude of librarians | 5 | 10.34 | 6 |
| 8.   Others. | 4 | 3.45 | 9 |
| 9.   No answers. | 1 | 0.86 | 10 |
| 4.   TOTAL | 116 | 100% | |

Policies are primarily established to serve as guidelines in the implementation of a goal or objective.  In a library, public library in particular, certain policies are also observed to help the librarians and the patronizing public.  It is not however the intention of library administrators to restrict the users' privileges in availing of the services which in the first place are there for them to make use of.  Table 7 presents the reasons why the 116 non public library patron respondents did not avail of its library services.

No orientation or non-awareness of the privileges stated in the mandate of Republic Act 7743 was the primary reason why the 40 or 34.49% respondents were not patronizing the public library.  Ranking second is  the library policy on library hours which do not conform with the 26 04 22.41% respondents' own schedule and third, is the non-availability of new high technology sources or access to internet.  This is attributed to the fact that with the information revolution, information needed should be made accessible at the easiest and fastest means (Apugan, 1998).  Provision for out-reach programs should be incorporated in the policies of the public library.  This refers to the library services which are extended beyond traditional library services and could even go out of the walls of the library building.  Mobile libraries

are the most effective out-reach program (Afan, 1983) as cited in by (Jaucian, 2003). It is the transportation of books to users by means of special vehicles- a car, a boat, a wagon, or a tricycle constructed for library purposes. This has been the recurring wish of the public librarians to have a book mobile. Due to financial and manpower constraints this remains unfulfilled wish. However, efforts have already been exerted and follow-ups with the National Library and other concerned agencies were constantly being made to transform the dream into reality. This will also benefit those who are too busy and have no time to visit the library and those who are located quite far from the library because library services will be brought to them. For the illiterates, adult education programs may not only concern interpreting cultural and recreation programs but it will also provide lifelong education to people (UNESCO, 2004).

In summary, reasons 1-5 all fall under policy restrictions. This contradicts Heintze's opinion that the public library should be "open for use on equal terms to all members of the community, regardless of occupation, the creed or race." At the public library "not being allowed inside" happens only when a would-be client, particularly students, is not able to present an identification card. This is necessary to safeguard library collections from unscrupulous users. Nevertheless, those who explain the necessity of their research yet could not present any form of identification are requested to log-in and are allowed to enter. This usually applies to out-of-school youth, the senior citizens, the unemployed, non-professionals, and sometimes the students. Another policy restriction is applied to lending out of library materials. Borrowers are required to apply for the city public library membership card to avail of the lending privileges. The city public library has a full sitting capacity of 100 users at a time. There were instances when clients, particularly students, came in droves that limit had been set – 100 students of the same school at a time. With numerous schools in Iligan, the city public library would really came out inadequate in terms of sitting capacity.

The library staff consists of 2 regular licensed librarians, 2 regular and 2 probationary library personnel which have different functions like the administrative, technical, readers', and periodical's services. There is also a clerk, who, aside from the routinely clerical duties, e.g. typing, filing, payroll preparation, etc. also man's the library checkpoint and sometimes substitutes as liaison officer. Another employee is the bookbinder who is at the same time the liaison officer. As such she is always out of the library processing papers at the city hall which results to a voluminous backlog in the binding of serials.
At present, the city public library has a book collection of not less than 12,00o volumes, a regular subscription of 3 titles of national newspaper, 1 tabloid, 2 titles of weekly magazines about international issues, 1 sports magazine, and 1 about agriculture. The library has also regularly receives free subscriptions from government agencies such as the Department of Science and Technology (DOST), IRRI, Commission on Population, etc. Aside from the printed materials, the city public library also has in its holdings of AV equipment such as television, sound system, and videotapes, on various livelihood programs.

Since the bulk of the city public library's clients are students, most of them usually look for copies of their assigned textbooks at the shelves. Failure to find them, they feel the inadequacy of their public library to provide their needs, not knowing that the public library is there only to augment and not to replace the functions of their own school or academic libraries. The city public library is only a division under the City Mayor's Office. As such, it only receives a portion of the budgetary allocation for the whole department. In spite of the inadequacies, however, the 95 or 81.90% of the non-patrons, still willing to avail the library's services made known the library services their felt-need.

**Table 8 : Actual Services Needed by Non-Patron Respondents**

| Needed Services | Frequency | Percent | Rank |
|---|---|---|---|
| 1. Educational toys for children. | 4 | 4.21 | 6 |
| 2. Film showing (educational, livelihood programs, entertainment). | 8 | 8.42 | 5 |
| 3. Flexible storytelling/puppet showing/library hours | 26 | 27.37 | 1 |
| 4. Liberal lending/admission policy. | 22 | 23.16 | 2 |
| 5. Accessibility to network information. | 15 | 15.79 | 4 |
| 6. Mobile library. | 18 | 18.95 | 3 |
| 7. Braille, sign language educational materials, etc. | 2 | 2.11 | 7 |
| **TOTAL** | **95** | **100%** | |

There is a very little difference in the number of respondents who requested the top 3 choices of needed library services: 1) *flexible library hours* which suggested that the regular hours of 8:30 am to 11:30 am and 1:30 pm to 5:30 pm, Monday to Friday be adjusted in such a way that those who cannot come on the scheduled library hours can still be accommodated; 2) *liberal lending/admission policy* in which referred to the No ID – No Entry" policy be tamed to allow (within the limit of the public library capacity) to see for themselves and make use of the library resources; and 3) *mobile library* which aims to reach far lung barangays and those who cannot come due to disabilities and other hindrances because the role of the public library concerns delivery of information to the whole community (Krishnan, 1996) as cited in by (Hernandez, 2010).

**Table 9 : Other Information Centers in Iligan City, Philippines**

| Information Centers | Technology Available | Updated Holdings |
|---|---|---|
| Academic Libraries | Computer Units | CD ROMS, Access to Internet |
| Special Libraries | Computer Units | Information on Product Operations/Journals/Legal Information/ Access to Internet |
| LRCs/School Libraries | Computer Units & other Audio-Visual Equipment | Visual Aids, Books on Academic Needs, Access to Internet |
| Philippine Information Agency | Computer Units & other Audio-Visual Equipment | CD ROMS, Serials, Books, Pamphlets on Government Thrusts |
| City Tourism Office | Computer Units | Brochures, Directories, Iligan History, Internet Access |
| Maranet | Computer Units | Internet Access |
| Computrade Phils., Inc. | Computer Units | Internet Access |
| Mobilcom | Computer Units | Teleconferencing, E-mail, Voice & Data Communication |
| Microtouch Computer System | Computer Units | CD ROMS, Access to Internet |
| Internet Cafes | Computer Units | Access to Internet |

The last factor that accounts for the difference in the profile of actual against the legitimate or targets public library users is the existence of other information centers within the city. Aside from the public library, there are other information centers in the city of Iligan which serve as alternative or sometimes the main source of information of researchers or information seekers.

They are the 1) Academic Libraries which is the primary source of information of students and faculty in the tertiary and graduate levels. In terms of collection, Mindanao State University-Iligan Institute of Technology has the biggest volume of materials considering that aside from its main library, it has also a library for every college or department. Aside from its collection of printed materials, it has also several computers with access to information networking. The students are allowed (subject to their rules and regulations) access to the internet for their research and printing for a minimal fee whenever is needed. They also have several CD ROMS which provide updated and fast retrieval of information. Other academic libraries with updated high technology holdings are the St. Peter's College, St. Michael's College, Iligan Capitol College, Lyceum of Iligan Foundation, and Iligan Medical Center College. They have computer units which are internet hooked, CD ROMS, and printed materials of varied disciplines;

2) Special Libraries which are maintained by the industrial plants to serve the product needs of their employees. They allow non-employees access to their materials when needed, especially to students whose researches are related to their product operation;

3) Learning Resource Centers/School Libraries which have the collections of Computer Units and other Audio-Visual Equipment and books intended for the young users. Some of these are the flip charts, flash cards, various toys, and educational games;

4) Philippine Information Agency (PIA) is a government entity which, as an information center, with these functions: a) to organize, mobilize, supervise, and sustain operations of the Community Development Information Centers (CDICs) in the area; b) to provide public with accurate, timely, and relevant information through print and broadcast media; c) to provide public information assistance through referrals to the concerned government agencies and non-government organization; d) to gather feedback on people's attitude, beliefs, values on government policies, programs, and projects, their needs and other matters affecting public life; e) to serve as the distribution center of information materials; f) to provide library services; g) to conduct communication skills training; and g) to provide and conduct audio-visual services on government programs and projects. It is also serves as venue for conference, dialogues, for training and seminars of government and non-government agencies. In this agency, they include in their collections the CD ROMS, various periodical, and books.

5) Public Information Office which is a section in the City Mayor's Office which is responsible for the dissemination of information on the various projects and activities of the city government. The office gives referral services to information seekers as to the proper department of the city government where the information could be obtained. Its collections include records of various activities being undertaken by the city government, especially at the City Mayor's Office.

6) City Tourism Office which is division in the City Mayor's Office, whose principal function is the promotion of the City of Iligan. It has in its collection brochures and directory of Iligan's history. Computers are used as communication equipment. Mode of services is through a guided tour around the city, especially to its different beautiful spots.

7) Maranet of MARATel, Computrade Phils., Inc., Mobilcom, and Microtouch Computer System are private and commercial information centers that provide access to information networking for a fee. Other features available teleconferencing, e-mail, voice and data communication. They also have CD ROMS that can be accessed by researchers, again for minimal fee.

8) Internet Cafés are providers of ranges of information which anyone can obtain. Anyone who craves for fast information will visit these one-stop-one- shop centers that provided the World Wide Web to their customers. Most cafes (if not all) provide services like desk publishing, encoding, photo scanning, computer-assisted design (CAD) and computer games. Moreover, one can send mails through the net using the electronic mail or-email and even free and unlimited text messages through websites like the *www.unimobile.com.* For the information seekers, instead of going to libraries, sometimes

with limited and/or outdated books, they simply go to the internet cafés, clicked the mouse and automatically find themselves within the portals of the US Library of Congress or they could choose to interview experts and chat them on any information of interest.

**Table 10 : Evaluation of Actual City Library Users on the their Success with the Library Services**

| Evaluation | Frequency | Percent | Rank |
|---|---|---|---|
| Always | 166 | 47.98 | 1 |
| Sometimes | 145 | 41.92 | 2 |
| Never | 35 | 10 | 3 |
| **TOTAL** | **346** | **100%** | |

Notwithstanding the earlier mentioned factors that account for the differences between the legitimate or target and actual public library users, the 346 patron-respondents fairly evaluated by library services extended to them by the city public library. When asked to evaluate the actual services in response to their actual needs, almost one-half (166 or 47.98) of the actual users manifested satisfaction on the services they are getting as they always find the answers to their queries from its resources or through referrals. Only 10% were never satisfied, yet they continue to go to the city's public library. The difference between the "always" satisfied and "sometimes" satisfied, however is very slight, (6.06%) yet this could motivate the public library management to reach out the other legitimate users. If the present form of library services rendered by the public library satisfies the currently served clients, then it would be fulfilling to extend services to the rest of its users (Acedera, 1981) as cited in by (Martinez, 2011).

## VI. CONCLUSIONS

With the data presented and analyzed, it is concluded that the unreached sectors of the Iligan City community are the handicaps or persons with disability and those sick in the hospitals, the inmates behind prison bars, and a very large portion of the non-professionals, the children, the out-of-school youth and the senior citizens. Since the very large portion of the ICPL's clients is students, most of their information needs are on subject matters relating to their academic research.

## VII. RECOMMENDATIONS

Based on the findings and conclusion of the study, the following strategies are recommended to narrow the gap between the actual and target users, taking cognizant of the presence of other information sources within the city. The focus is on the identified unreached sectors:

1) Reach-out Programs. This is primarily to reach all the 44 barangays of Iligan. The most effective out-reach program that can serve the greatest cross-section of the population is the book mobile. It will bring reading materials to the inmates and the reading handicaps, the out-of-school youth, the none=professionals (like the housewives and other)

and senior citizens who cannot come to the library for various reasons. Other forms of reach-out programs especially to the children, young adults, and out-of-school youth are storytelling, puppet shows, educational games, toys, realia, film showing, summer workshops, and reading clubs. For the other sectors like the professionals, researchers, etc., the current awareness and SDI will be very helpful;

2) Build Special Collections for the Unreached Sectors. The information should be available to the disabled. Braille for the blinds should be coupled with a trained staff for this to become effective, audio equipment and multi-media CD-ROMS. Sign language for the deaf mute or leisure reading materials in the vernacular which may be solicited and distributed for free to far flung barangays, the sick and inmates.

3) Computerization. This concerns all aspects of librarianship. Fast technical processing of materials means its immediate accessibility to its users. The widespread application of information technology tools should further enhance the role of libraries at least in facilitating a new function to transmit more information to greater and wider network users.

4) Establish Linkages with other Information Centers. With the presence of other information sources within the city, the IPCPL can initiate the effort and act as the center for other libraries or institutions with similar interests. As a starter, a union catalog may be prepared which can be the basis of referrals for materials not available within ones library. Later when the link has been established and institutionalized and all libraries or information centers are fully automated, inter-library cooperation through networking may be realized.

5) An In-depth Follow-up Study to Focus on the following:
   5.1 Student-Users' Profile
   5.2 Barangay-Users' Profile
   5.3 Library Services for the Illiterates
   5.4 Actual Information Needs Profile for Possible Funding Support

6) Facilities of the ICPL should Target to Meet the Users' Needs:
   6.1 Expand the library to accommodate more users
   6.2 Additional personnel to augment the present library staff
   6.3 Special materials and trained personnel for the handicaps and other unreached sectors
   6.4 Vehicle for the book mobile
   6.5 Full implementation of all the public libraries' enabling laws in the country

**APPENDICES**

**MINIMUM STANDARDS FOR PUBLIC LIBRARIES IN THE PHILIPPINES**
**Introduction**

<u>The Role of the Public Library</u>
The public library is catalyst in planning for community development and in the continuous education of the citizens of a nation. It serves as an impartial, non-partisan, and non-sectarian agency of information for all people.

Public library services should therefore be free and be made available to everyone throughout the country.

Public library service should aim to:

1. facilitate informal self-education
2. support and complement research in all fields of endeavors
3. provide bibliographic access to the country's information resources
4. provide wholesome recreation and beneficial use of leisure time of the people

**Public Library Service in the Philippines**
In the Philippines, public library service in discharged by the National Library which has a dual function, that of a National Library and that of a public library through its Public Libraries Division.

The Public Libraries Division of the National Library takes charge of the organization and supervision of all regional, provincial, city, municipal, and barangay libraries as well as bookmobile services all over the country. It also is responsible in the training and upgrading skills of field librarian as well as non-professional staff of public libraries throughout the country.

**RATIONALE**
Formulating of public library standards reflect concept of public library service and organization so as to stimulate new development and focus attention in the field of librarianship.

Standards are used as administrative guide in planning goals for development and setting directions for the future.

In formulating this minimum standards the aim is to propose a guide that will serve as challenge to those concerned to revitalize public libraries to meet demands and the realities of the present society.

Standard 1. Objectives of the Public Library

1.1. To provide library and information service responsive to the needs of the community.
1.2. To build within each library and information center about its respective community -- its resources, its history, its people, its customs and traditions, etc.

1.3. To develop with other libraries within each region or province a network op public library service with the regional library or in the lack of it, the provincial library as its center to facilities research and reference needs within the area.

**Standard 2.       Organization and Management**

2.1. Each public library shall operate under the direct management and supervision of a competent and professionally trained librarian.
2.2. The public library shall operate under the direct supervision of the National Library on matters that affect its resources and services.
2.3. The public library as a local government unit shall have the local executive of the government units as its immediate superior.
2.4. The public library shall be provided with reasonable budgetary appropriations annually to carry out plans and activities effectively.

**Standard 3.       Library Advisory Board**

3.1 A trisectoral Library Advisory Board shall be established composed of representatives for the civic, religious and government sectors.
3.2 The Library Advisory Board shall assist the librarian in the formulation of policies which aim to bring the library closer to its users.
3.3 The Library Advisory Board could organize a Friends of the Public

Library Club to support library projects and activities especially concerning material and financial resources.

**Standard 4.       Staff**

4.1. The public library system should be manned by qualified and professionally staff in order to render adequate service and serve as an effective center for culture and information.

4.2. Sufficient numbers of personnel should be hired to obtain quality service.

4.3. There should be clean out delineation of staff duties and responsibilities.

4.4. <u>Size</u>
4.4.1. The number and kinds of positions in a public library will depend on the population being served and the size of the collection.

4.4.2. As a minimum standard, regional, provincial and city libraries should at least have four professional and three supportive non-professional staff. On other hand municipal libraries should at least have one professional and one

clerical staff for a municipality lower than first class. First class municipalities should have at least 3 professional librarians and as many supportive staff as needed.

4.4.3. Since barangay libraries in a municipality are directly under the municipal librarian, 2 supportive staff should be the required minimum number of personnel.

4.4.4. The increase in the number of staff shall depend on the number of increase in population of the community served. For every increase of 50, 000 people in the community a corresponding increase of 1 professional and 1 supportive staff are suggested.

4.5. Qualifications

4.5.1. Professional librarian are individual with any of the following degrees:

4.5.1.1. Bachelor of Library Science or Information Science

4.5.1.2. Bachelor of Science in Library Science or Information Science

4.5.1.3. Bachelor of Science in Education major in Librar Science

4.5.1.4. Bachelor of Science in Education with Specialization in Library Science

4.5.1.5. Bachelor of Arts major in Library Science

4.5.1.6. Master of Library Science or Information Science

4.5.1.7. Master of Arts in Library Science or Information Science

4.5.1.8. Master of Science in Library Science or Information Science

4.5.2 They could be assigned any of the following titles depending on educational attainment, experience and available positions.

4.5.2.1. Superintendent of Libraries

4.5.2.2. Director of Libraries

4.5.2.3. Chief Librarian

4.5.2.4. Head Librarian

4.5.2.5. Supervising Librarian

4.5.2.6. Senior Librarian

4.5.2.7. Librarian

4.5.2.8. Cataloger

4.5.3. Supportive Staff

4.5.3.1. Technical staff – should either as BSE or AB minor in library

science. They could be appointed as junior librarians.

4.5.3.2. Clerical staff – should have taken exam special studies in Secretarial Science.

4.5.3.3. Library Aides – should at least have finished two years of college or have had at least two years experience working in a library:

4.6. Civil Service Eligibilities

4.6.1. Professional librarians are required to have had passed the Librarian or Supervising Librarian examination or Career Service Professional Examination, pending passage of the Professionalization Bill in Congress, in which case no librarian shall be appointed to professional position until properly licensed by the proposed Board for Librarians.

4.6.2. Supportive staff are required to have passed the sub-professional examination.

4.7. Salary

4.7.1. Salary is undoubtedly the major consideration which attraction an intelligent professional staff.

4.7.2. Heads of Libraries (Regional, Provincial, City & Municipal) are to be considered on the level of assistant corresponding to the position.

4.7.3. Other personnel follows accordingly.

4.8 Staff Development

4.8.1. To foster intellectual development and update knowledge and skills in librarianship it is necessary to send public librarians and other supportive technical personnel to seminars, conferences, and in-service training programs when necessary and budgetary appropriations should be set aside for this matter.

4.8.2. Scholarship grants should be given to deserving ones when available.

**Standard 5. Budget**

5.1. The library shall be provided with an adequate, realistic, annual budgetary appropriations of the local government unit to which it belongs.

5.2. The head librarian shall prepare the annual budget in consultation with local budget officer and shall exercise full control over its expenditures

accordingly to procedures followed by the local government unit and COA.

5.3. The library budget shall cover the following:

5.3.1. Personal Services

    5.3.1.1. Salaries of personnel

    5.3.1.2. Adequate funds for travel to attend seminars, conferences, etc. either held locally and / or abroad; to get book allocations from the National Library and other donors; to inspect and supervise subordinate libraries; to attend professional and officials meetings; to canvass books and other materials needed in the library.

    5.3.1.3. Allowances as maybe provided by the local government unit.

5.3.2. Operational expenses to include office and janitorial supplies; subscription to periodicals; ;purchase of additional books; printing and binding; seminar expenses; communication services; repair and maintenance of office equipment; other sundry expenses.

5.3.3. Capital Outlay to cover the cost of needed furnishings and equipment from time to time.

5.3.4. The Library budget shall be adjusted annually as the need arises.

## Standard 6.　Collection

6.1. The collection must reflect the objectives of the library and the needs of the community served.

6.2. It should include aside from books, periodicals, globes, maps, atlases pamphlets, clippings, various audio-visual materials like pictures, photos, charts, films, microforms, music scores, sound recordings, cassettes, tape reels, realias, dioramas, and other graphic materials.

6.3. Aside from the above, the library shall maintain a local history collection composed of materials about community, its history, resources, people, customs, traditions, etc.

6.4. The size of the book collection is dependent on the allocations given by

6.5. The National Library and the amount of budgetary appropriations available from the local government unit annually.

6.6. A minimum stack of 10, 000 volumes regardless of population is deemed appropriate for a regional, provincial, city and first class municipal libraries.

6.7. For municipal libraries lower than first class, a book collection of 6, 000 volumes is recommended while for barangay libraries 2, 000 volumes.

6.8. The head librarian shall responsible for the selection and acquisition of all library material which should be based on the educational, informational, cultural and recreational needs of the community.

6.9. Emphasis is placed on those materials which best foster the sound development of the individual at all age levels.

## Standard 7.　Physical Facilities

7.1. Building

7.1.1. Site

    7.1.1.1. The site of the building should centrally located within the community with provision for expansion for future growth.

    7.1.1.2. It should be accessible to library users by all means of transportation.

    7.1.1.3. In the development plan of the local government unit, it should be an integral part of an integrated cultural complex.

    7.1.1.4. In the event that the building is inaccessible to a great majority of the reading public, at least one bookmobile unit should be provided and more barangay libraries should be established.

    7.1.1.5. The building should as much as possible provide access to disabled.

7.1.2. Size

    7.1.2.1. The elements to considered in planning the size of the library building are the population or size of the community, the library collection , the size of the staff and budgetary appropriations.

    7.1.2.2. Even in communities where the size of the population suggests a library many times larger than the existing or planned library, budgetary appropriations may force limitation on the size of the building. It is therefore wise to include plans for expansion for the future.

    7.1.2.3. Each library should at least provide adequate space for bookshelves and reading areas, tables and chairs for library users, office tables and chairs for library personnel, workroom, multi- purpose room, storage, quarter for the personal needs of the staff and library furnishings and equipment.

7.1.2.4. Provision should be made for a minimum seating capacity of 100 per regional, provincial, city and first class municipal libraries; and at least 50 for other municipalities and 30 per barangay library.

7.1.2.5. Equipments and furnishing should be sufficient and adequate to generate a physical environment conductive for the pleasant and effective use of its materials and services.

7.1.2.6. Furniture should be functional and in harmony with the architecture of the building.

7.1.2.7. Equipment should be properly selected in such a way that will help in the efficient operation of the library activities.

7.1.2.8. Layout of equipment and furnishings should allow the smooth mobility of readers and materials.

7.1.2.9. Standards equipment and furnishings are as follows:

| | |
|---|---|
| Atlas Stand | Charging desk |
| Book display rack | Dictionary Stand |
| Bookshelves | Newspaper rack |
| Cabinets, Filing | Tables, Office |
| Card Catalog | Tables, reading |
| Carrels | Table, Typewriting |
| Chairs, Office | Typewriter |
| Chairs, reading | Various hardware Equipment (when necessary) |

## Standard 8.    Library Services

8.1. Library Services shall be provided with the highest degree of efficiency and integrity keeping in mind that the public library is a service agency of the government of the people.

8.2. The library shall reflect the needs of the community which shall include books, pamphlets, non-print as well as ephemeral materials classified and catalogued according to the standard procedures for easy retrieval.

8.3. Open shelves system shall be adopted to give library users free access to all materials in the collection except for some non-print materials which necessitates special handling.

8.4. The library shall provide wholesome materials for all types of readers in all age levels regardless of civic, cultural, ethnic, religious and political affiliations.

8.5. The library should collect local history materials for preservation and conservation.

8.6. Sufficient number of local newspapers and other periodicals should be acquired to keep the community abreast of national affairs as well as information on daily living.

8.7. The library should have a written statement of it's objectives as well as its functions which should be reviewed periodically to keep up with the times and needs of the community.

8.8. There should be a well-planned hours of service to meet the needs of the community and maximize use of library resources and facilities.

8.9. Circulation of books for home use should be for periods as liberal as the collection permits.

8.10. The library should initiate or organize group activities within the framework of its own program. These activities could be storytelling, puppet shows book discussions, play reading, poetry interpretation lectures, demonstrations, exhibits, etc.

8.11. To promote the effective use of the library by the community, the library shall offer the following services according to their resources and facilities capability

8.11.1    Reference and research services.

8.11.2    Circulation of books for home use.

8.11.3    Organizing a library for children.

8.11.4    Reading guidance for children and out-of-school youths.

8.11.5    Compilation of periodical clippings on various government thrusts and other important subjects.

8.11.6    Indexing of periodicals.

8.11.7    To search and supply information needed by officials and offices of the local government units.

8.11.8    To compile and index various public documents made available by the local government and to disseminate those needed by the public.

8.11.9    Extension of library services to outreach areas.

8.11.10    Interlibrary loans with other public and school libraries.

8.11.11    Organizing extension libraries.

8.11.12    Operating bookmobile service when available.

## Standard 9.  Reports and Inventory

9.1  The library shall accomplish monthly statistical report as required by the National Library as a measure of its activities and accomplishments and shall furnish a copy to the local government unit.

9.2  Annual narrative and statistical reports are to be prepared for comparative studies and evaluation of its program and activities, copies of which are to be furnish the local government unit and the National Library.

9.3   The library shall develop a monitoring system of its operations and procedures to assess and evaluate from time to time its efficiency and its effectivity as a service agency of the government.

9.4   An annual inventory of resources shall be made to determine their loss if any, quality and serviceability. Report of their conditions shall be submitted to the proper governing authorities.

Prepared by:
 Committee on Standards for Public Libraries.
 (Sgd.) PILAR R. PEREZ
 Chairman


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 Member


## IMPLEMENTING RULES AND GUIDELINES OF R.A. 7743
### Preliminary Article

Pursuant to Section 2.5. and 9 of R.A. 7743. An Act Providing for the Establishment of Congressional, City, Municipal Librarian and Barangay Reading Centers throughout the Philippines, and with the view of implementing effectively the provisions of said Act, the following rules and regulations are hereby adopted.


### Article I
### Definition of Terms
**Section 1.**          Terms of Reference

Barangay   -   the basic political unit which serves as the primary planning and implementing unit of  government policies, plans, programs, projects,  and activities in the community and as a forum wherein the collective views of the people may  be expressed, crystallized and considered, and where disputes may be amicably settled.

Barangay Reading Center  -   a public library located in an established and maintained by a  barangay and  caters primarily to the library and information needs of barangay residents.

City  - a political unit consisting of more urbanized and developed barangays and serves as a general          purpose government for the coordination and delivery of basic, regular and direct services and effective governance of the inhabitants within its territorial jurisdiction.

City Library   -   a public library located, established, maintained and supported by the city government  and primarily for the use of the residents of the city.

Congressional District  -  otherwise known as legislative district is a geographical unit of a province or city which is comprised, as far as practicable of  contiguous,  compact  and adjacent territory. Each city with a population of a least 250 thousand or province, shall have at least one representative.

Congressional district library –  a public library located within the congressional district established and maintained by the National Library  and  supported  by  the  incumbent congressman of the district and primarily for the use of the residents of the district.

Librarian  –  in the Philippine context, is any person who is bonafide holder of a license and a certificate of registration issued by the Professional Regulation Commission Board for Librarians in accordance with R.A. 6966.

Library   –  is a collection of books and similar material organized and administered for reading, consultation and study.

- a room, a group of rooms, or a building, in which a collection of books and similar material organized and administered for reading, consultation and study.

Municipality   –  a political units consisting of a group of barangays and serves primarily as a general purpose government for the coordination and delivery of  basic, regular and direct services and effective governance of the inhabitants within its territorial jurisdiction.

Public Library  –  in these Guidelines,  is a library located in, established and maintained by the barangay, municipality, city, province, or congressional district  as the case may be and serves or caters primarily to their respective constituents.


### Article II
### Establishment of Public Libraries and Reading Centers

**Section 2.**   A public library shall be established in every congressional district, city, and municipality in the country as a joint undertaking of the National Library, the Department of Interior and Local Government, the Philippine Information Agency, the local government unit and the citizens of the locality.  Likewise, a barangay reading center shall be established in every barangay in the country.

Each district library shall maintain, as  far as practicable is bookmobileunit which shall serve the library and information needs of far-flung in the district.


### Article III
### Library Staff

**Section 3.**   In order to ensure the effective and efficient operation of the library, it shall be manned by professionally trained personnel with a support staff. It shall be staffed initially with the following.


1. Congressional district library
a) Congressional district librarian

Educational requirement : M.A. in library Science degree or any Bachelor's degree major in Library Science.

Experience : preferably with 2 years experience involving library administration and  management.

CPCB Item and Salary grade : Librarian III, SG 18.

Training: 40 hours training in public library management and administration.

Eligibility requirements: Librarian's License.
b) Librarian I

Educational requirements : Any bachelor's degree major in library science.

Salary Grade: 10

Eligibility: Librarian's License
c) Clerk

Educational requirements: 2 – yr. Course
Eligibility: Sub-professional

CPCB Item and Salary grade: Clerk 1. SG. 3
    d) Utility worker (CONTRACTUAL)
    e) Librarian II (optional depending on the size of the library)
    Salary Grade: 14
    Eligibility : Librarian' s License


2. City Library :
a) Congressional district librarian
    Educational requirement : M.A. in library Science or any Bachelor's degree major in Library Science.
    Experience : preferably with 2 years experience involving library administration and management.
    CPCB Item and Salary grade : Librarian IV, SL 22.
    Training: 40 hours training in public library management and administration.
    Eligibility requirements: Librarian's License.


b) Librarian I
    Educational requirements: Bachelor's degree  in Library science or any degree major in LS. .
    Salary Grade: 10
    Eligibility: Librarian's License


c) Clerk
    Educational requirements: 2 – yr. Secretarial Course
    Eligibility :  sub-professional
    CPCB Item and Salary grade: Clerk 1. SG1


3. Municipal Library
3. 1 1st Class Municipalities
a.) Municipal Librarian
    Educational requirements: Any degree major  in Library Science
    Eligibility : R.A. 6956
    CPCB Item and Salary grade: Librarian III, SG18


3.2  2nd Class Municipalities
a.)    Municipal Librarian
    Educational requirements: Any degree major in Library Science
    Eligibility : Librarian's License
    CPCB Item and Salary grade: Librarian II, SG14


3.3  3 Class Municipalities and below:
a.) Municipal Librarian
    Educational requirements: Any degree major in Library Science
    Eligibility : Librarian License
    CPCB Item and Salary grade: Librarian I, SG10


4. Barangay Reading Center
a.) Barangay Reading Center In-charge
    Educational requirements: 2-yr., course of college education.
    Eligibility :  sub-professional

    **Section 4.** The number of staff in a public library may be increased as its services expand provided that such increase will be effected through a staffing pattern to be presented and duly

endorsed by the National Library to the Department of Budget and Management for approval.
    **Section 5.** Except for the Congressional District Librarian and staff whose appointments shall be issued by The National Library, all staff of the established city and municipal libraries and barangay reading centers shall be appointed and supervised by each local government unit through its chief executive (city mayor, municipal mayor, barangay captain) in coordination with their respective development council.

**Article IV**
**Role and Responsibilities of the National Library**
    **Section 6.**   a)   The National Library shall establish congressional district, city and municipal libraries and with the DILG, barangay reading centers for the next five years in accordance with the rules and regulations provided for in the law.
    b)   It shall provide books and other reading materials including government publications and library forms to public libraries which submit required reports regularly and promptly.
    c)   It shall orient and train newly appointed librarians primarily to make them aware of their responsibilities to the National Library, to their local government unit and to their library clientele.
    d)   It shall conduct regularly, seminars, workshops, in-service training programs to public librarians for professional growth and development.
    e) It shall receive and process application and subsequently appoint all congressional district librarians and staff and shall supervise and monitor their performance.
    f) It shall direct all congressional district librarians to come to Manila for periodical consultations, conference or meeting on issues/matters affecting the libraries under their jurisdiction.

**Article V**
**Role and Responsibilities of Local Government Units**
    **Section 7.** It shall be the duty and responsibility of every congressional district, city, municipality and barangay to provide the following:
    a)   Library appropriation. A regular annual library appropriation to be drawn from certain percentage raised from amusement tax, realty tax, and other sources of local income shall be allocated based on the budget estimate proposed by the head librarian;
    b)   A separate building or room of adequate size; sufficient number of chairs, reading tables, bookshelves, audio-visual equipment, and all other necessary equipment for the effective operation of the library;
    c)   An adequate number of professional ad non professional library staff;
    d)   An up-to-date and adequate collection of books, serials periodicals, newspapers and other library materials to augment the annual allocation of The National Library.

**Article VI**
**Role and Responsibilities of the Department of Interior and Local Government (DILG)**
    **Section 9.** It shall be the responsibility of the DILG to:

a) Assist in promoting the establishment of Congressional, City, and Municipal Libraries and Barangay Reading Centers nationwide;

b) Spearhead the organization of community reading clubs in every barangay;

c) Assist in evaluating needed requirements for accreditation of public libraries based on criteria and recommendation; and,

d) Assist in monitoring the progress of implementation of the Act specially barangay reading centers.

e) Network with various Foundation and organizations which donate books, magazines and other library materials and

f) Be responsible for the distribution to barangay libraries materials, books, etc., which may be solicited by The National Library, Philippines Information Agency of the Department of Interior and Local Government.

## Article VII
### Role and Responsibilities of the Philippines Information Agency (PIA)

**Section 10.** It shall be the duty and responsibility of the Philippine Information Agency (PIA) to:

a.) regularly provide the libraries with government documents that could be solicited for free;

b) provide Information Education and Communication (IEC) materials production assistance whenever funds are made available to PIA by the National Library and the Department of Interior and Local Government.

c) provide librarians with training on all aspects of communication information dissemination and,

d) make PIA Provincial Community Development centers serve as extension of provincial / municipal libraries for government oriented IEC materials.

## Article VIII
### Appropriation

**Section 11.** It shall be the responsibility of The National Library to include in its annual budget proposal starting in 1975 the amount of 1 million for each library to be established in a congressional district, the amount of five hundred thousand for a city library, three hundred thousand for a municipal library, and two hundred thousand pesos for a barangay reading center to be established. Provided that, the total amount proposed annually and for a period of 5 years shall be increased proportionally and shall be enough to fund for the total number of libraries to be established during each year in accordance with development plan. Subsequently, maintenance and operation thereof of these libraries shall be undertaken by their respective local government after the five-year period except for congressional district libraries which shall be maintained continuously by The National Library. However, The National Library shall continue to provide all these libraries with annual allocation of books and other library materials. Further, the appropriations for the establishment of barangay reading centers maybe integrated with the regular appropriations of the Department of Interior and Local Government (DILG).

## Article IX
### Memorandum of Agreement

**Section 12.** A memorandum of agreement (MOA) shall be executed between The National Library as the lead agency and the respective local government unit there a public library shall be established to define clearly the roles of the respective agencies and to ensure the sustainability or continued existence of the library even during a change of election local officials.

The DILG, represented by the Regional Director shall be made co-signatory of the local government unit in the MOA.

## Article X
### Library Board and Friends of the Library

**Section 13.** Local Library Board. A Local Library Board shall be organized in every public library to symbolize the democratic character of the library and shall be appointed by publicly elected officials. The Board shall act as advisory and policy-setting authority but can provide stability and continuity especially during changing times.

**Section 14.** Creation and Composition

a) There shall be establishment in every district, city, municipality or barangay a district city, municipality, or barangay library board respectively.

b) The composition of local library boards shall be as follows:

1) The Congressional district library board shall be composed of the incumbent Congressman as Chairperson; the Municipal Mayors of the District Library as members, and the District librarian as Secretary.

2) The City library board shall be composed of the city mayor as Chairperson; the chairman of the Committee on Education and Culture of the Sangguniang Panlunsod, the City Treasurer, the City Budget Officer, the representative of the pederasyon ng mga sangguniang kabataan in the sangguniang panlunsod, the elected president of the Friends of the City Library as members and the City Librarian as Secretary.

3) The Municipal Library Board shall be composed of the municipal mayor as Chairperson; the representative of the pederasyon ng mga sangguniang kabataan in the sangguniang bayan, the president of the friends of the Municipal Library, the Municipal Treasurer as members, and the Municipal Librarian as Secretary.

4) The Barangay Library Board shall be composed of the Barangay Captain as Chairperson; the Chairman of the Education Committee and representative of the youth in the Barangay Council, the barangay library in-charge, the Barangay Treasurer, the duly elected president of the Friends of the Library or book clubs, to present non-government organization (NGO), as members and the Barangay Reading Center in-charge as Secretary.

The performance of the duties and responsibilities of the above-mentioned officials in their respective local library board shall not be delegated.

**Section 15.** Functions of Local Library Boards. – The Congressional district, city, municipal or barangay library board shall:

a) Determine, in accordance with the criteria set by The National Library, the annual supplementary budgetary needs for

the operation and maintenance of library within the congressional district, city, municipality, or barangay as the case may be, and supplementary local cost of meeting such needs, which shall be reflecting in the form of an annual library board budget;

b) Authorize the treasurer as to disburse funds
pursuant to the budget prepared and in accordance with existing rules and regulations;

c) To serve as an advisory committee to the Sanggunian concerned on library matters – such as but not limited to the necessary for and application of local appropriations for public library purposes;

d) Create committees which shall advice local
library agencies on matters such as, but not limited to personnel selection and promotion, bids, and awards, grievances and complaints, personnel discipline, budget review, operations review and similar functions.

e) To find ways & means in increasing the book & non-book collections of the library and in improving the facilities of the library.

**Section 16.** Meetings and Quorum Budget Compensation and Remuneration

a) Meeting of the Board shall be held 2 times a year and shall be called by the chairperson. However, special meeting maybe scheduled as the need arises. A majority of all its members shall constitute a quorum. The District librarian, the city librarian or the municipal librarian, or the barangay reading center in-charge as the case may be, shall prepare the library budget concerned. Such budget shall be supported by programs, projects, and activities of the library board for the ensuing fiscal year. The affirmative vote of the majority if all the members shall be necessary to approve the budget.

**Section 17.** Compensation and Remuneration. – The co-chairman, and members of the congressional district, city or municipal library board shall perform their duties as such without compensation or remuneration. Members thereof who are not officials or employees shall be entitled to necessary traveling expenses and allowance chargeable against the funds of the local library board concerned, subject to existing accounting and auditing rules and regulations.

**Section 18.** Friends of the Public Library. The Local Library Board shall organize The Friends of the Public Library to support the projects and activities of the library especially those concerning financial support.

## Article XI
## Inter – Agency Committee

**Section 19.** Creation and Composition. An national inter – agency committee shall be organized to be composed of  a)  The National Library;  b) The Department of Interior and Local Government; c)  The Philippine Information Agency.

**Section 20.** Functions and Duties

a) The Inter – agency committee shall serve as the consultancy body to hasten the implementation of the Law.

b) It shall serve as the oversight committee which shall study recommend amendment of the Law to the proper body.

## Article XII
## Effectivity

**Section 21.** These herein Rules and Regulations shall take effect fifteen (15) days following the completion of  its publication in the official Gazette or in a newspaper of general circulation.

Done in the city of Manila this  __5th__ day of  __October___, 1994

(Sgd.) ADORACION M. BOLOS (Sgd.)RAFAEL ALUNAN, III
Actg. Director                       Secretary
The National Library                 Department of Interior &
                                     Local Government

(Sgd.) HONESTO ISLETA
Press Undersecretary and Officer-in-charge
Philippine Information Agency

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# IN SEARCH OF EMPLOYABILITY

# A case study of the hilly districts of Uttarakhand

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*Abstract-* When we talk about economic growth or development, the easiest way is deemed to be taken into consideration. Story for the development of the newly borne hilly state of Uttarakhand was no exception. Since its inception, the state's resources, natural for specific reasons, have been immensely utilized rather over utilized in the names of revenue generation, employment, development, growth and many such related terms. The present case tries to highlight the facts about the future problems which are bound to be there if and only if the localities, government bodies and other related bodies are concentrating only on tourism related activities for the above mentioned purposes. Alternate means, such as agribusiness horticultural exercises to be more precise, are already available in the area and can easily prove to be an excellent source of revenue generation for the hilly regions of the state if proper planning is carried out.

*Index Terms*- Agribusiness, development, employment horticulture, revenue, resource, tourism.

## I. INTRODUCTION

The state of Uttarakhand is divided into two regions—Kumaun and Garhwal. The state has 13 districts (four more have been declared recently) which are further split into sub divisions and development blocks. Since its inception, the state has shown growth in all the fields. But, this growth seems to confine only in the plains, the hilly regions being still deprived of development. The major lacuna felt was the prevailing inequality in geographical distribution and settlement. Industries in Uttarakhand have created about 2.8lakhs jobs but these are in plains and hence, most of the growth due to industrialization is confined to the plains only. More than 3|4th of Uttarakhand's population depends on agriculture specifically mountain agriculture. For physical, geographical and environmental reasons, the scope for agricultural policies based on modern inputs-intensive agriculture is severely constrained in the hilly regions. The state faces the challenges of promoting livelihoods to retain people through local employment and income generation and to enhance their quality of lives. At the same time, the hill districts of Uttarakhand have tremendous potential. The vast natural resources add to the state's attractiveness as an investment destination, especially for tourism and agriculture and forest based industries.

The present study aims at highlighting the needs of proper and optimum use of resources existing in this hilly state. What should be used, how it should be best used and when should it be used are some of the main concern of this study.

*Uttarakhand is the first state in the country to have created "**Tourist Development Board**" by legislation .Also it is the first one to be called an "**Organic State**".*

**Uttarakhand** formerly **Uttaranchal**, is a state in the northern part of India. It is often referred to as the Land of Gods due to the many holy Hindu temples and cities found throughout the state, some of which are among Hinduism's most spiritual and auspicious places of pilgrimage and worship. Known for its natural beauty and wealth of the Himalayas, the Bhabhar and the Terai, the state was carved out of the Himalayan and adjoining north-western districts of Uttar Pradesh on 9 November 2000, becoming the 27th state of the Republic of India.

Even before its inception as an independent state, Uttarakhand was the point of attraction for the tourists all over the world because of its inbound scenic beauty the state is enriched with. As expected the things gradually took their shape in the same way. Now, after 12 years of its formation, Uttarakhand has been enjoying all the benefits and offers from the state level as well as from the central level. Uttarakhand is the only hilly state in India which make its name in top ten tourist preferred state in India. The state witnessed a large number of tourist influx from all over, be it from neighbouring states or countries. The governments also left no stone unturned so as to make this state more attractive for the recreation lovers.

*Tourism is thought to be the principal source of revenue in the state of Uttarakhand.*

As per the data major source of earning of the people of Uttarakhand is through tourism. Ministry of Tourism of Uttarakhand is responsible for maintaining and generating revenue from tourism in the state. It is also the responsibility of tourism ministry of Uttarakhand to formulate plans for increasing revenue from tourism industry. The ministry has to decide the rules and regulations for the efficient working of the tourism industry.

Tourism ministry of Uttarakhand has created two tourism corporations for Garhwal and Kumaon region named as **Garhwal Mandal Vikas Nigam Limited and Kumaon Mandal Vikas Nigam Limited** so as to offer quality service to the tourists. Moreover, these two regions consist of most of the star tourist attractions. Through these corporations, the ministry of tourism of Uttarakhand is trying to woo more tourists in these regions by offering various tourist packages. These tourist packages range from pilgrimage, adventure sports to wildlife tours, etc. Tourists can book this on line. This is how it is adding up revenue to the state economy.

The ministry of tourism in Uttarakhand runs its own fleet of transport and offers accommodation in its own tourist rest houses. These generate more revenue to the state while to the tourists it gives satisfaction of being secure under the government roof. The functioning of Uttarakhand ministry of tourism is commendable for generating the highest revenue through tourism. Moreover, the ministry has indirectly helped the other industries of Uttarakhand such as small scale industries and *Gramodhyogs*. Tourists come and shop products of these industries thereby generating more revenue to the state. Due to increase in tourism, the hotel industry in Uttarakhand is on the rise. Hence, the hard work of the Tourism Ministry of Uttarakhand is paying off in the form of revenue that is earned by the state.

 **Leisure, adventure, and religious tourism** play a prominent role in Uttarakhand's economy, with the Corbett National Park and Tiger Reserve and the  nearby hill-stations ofNainital, Mussoorie, Almora, Kausani, Bhimtal and Ranikhet being amongst the most frequented destinations of India. The state also contains numerous peaks of interest to mountaineers, although Nanda Devi, the highest and best-known of these, has been off-limits since 1982. Other national wonders include the Valley of Flowers, which along with Nanda Devi National Park, form a UNESCO World Heritage Site.

To Uttarakhand, long called "abode of the gods" (*Devbhumi*), belong some of the holiest Hindu shrines, and for more than a thousand years, pilgrims have been visiting the region in the hopes of salvation and purification from sin. Gangotri and Yamunotri, the sources of both the Ganges and Yamuna fall in the upper reaches of the state and together with Badrinath (dedicated to Vishnu) and Kedarnath (dedicated  to Shiva)  form the Char Dham,  one of Hinduism's most  spiritual  and  auspicious  pilgrimage circuits. Haridwar,     meaning     "Gateway     to     God"     is     a     prime     Hindu     destination.     Haridwar     hosts the http://en.wikipedia.org/wiki/Kumbha_MelaKumbh Mela every twelve years, in which millions of pilgrims take part from all parts of the India and the world. Rishikesh near Haridwar is  known as the preeminent yoga centre of India. The state has an abundance of temples and shrines, many dedicated to local deities or manifestations of Shiva and Durga, references to many of which can be found in Hindu scriptures and legends. The architecture of most of these temples is typical of the region and slightly different from other parts of India. The ancient temples at Jageshwar (a complex of 124 temples in a deodar woodland) are historically the most prominent  for  their  distinct  architectural  features.  Uttarakhand  is,  however,  a  place  of  pilgrimage  not  only  for  the Hindus. Hemkund nested in the Himalayas is a prime pilgrimage center for the Sikhs. Tibetan Buddhism has also made itself felt with the recent reconstruction of Mindroling Monastery and its Buddha Stupa, touted as the world's highest, southwest of Dehradun.

The state has always been a destination for mountaineering, hiking and rock climbing in India. A recent development in adventure tourism in the region has been white water rafting and other adventures sports. Eco tourism, agritourism and rural tourism have also found new grounds in many villages of the state.

In the same line numbers of **education institutions** were seen to flourish producing a number of trained professionals to cater to this budding industry, the tourism industry.

 Below are given names of some of the institutions which took initiatives for producing human resource who could be aptly used in the tourism industry of the state in times to come:

*Amrapali Institute of Hotel Management*

*Centre For Mountain Tourism & Hospitality, Studies Srinagar Garhwal –*

*Blue Mountains College Of Hotel*

*Govt. Institute of Hotel Management & Catering Dehradun*

*Govt. Institute of Hotel Management & Catering (AICTE Approved) Almora, Uttaranchal*

*Graphic Era Institute Of Technology (AICTE Approved)*

*(Hotel Management & Catering Technology)*

*Institute of Media Management and Tech*

*National Institute of Hotel Management*

*RAM Institute of Hotel Management & Catering Tech.*

*Culinary College of Hotel Management & Catering Technology*

*IIAS School of Hotel & Tourism Management*

*Institute of Business & Hotel Management*

*Institute of Communication & Management*

Along with the above mentioned institutes, Kumaun as well as Garhwal Universities are also providing diploma and degree courses in the field of tourism. The State Government has been spending a lot on the **development of infrastructure** and **promotion o**f the tourism in the state in the recent years. Railways, roadways and airways are developed to link the state with the rest of the country and reduce travel time. Electrification of the remainder of the Delhi- Dehradun line will make travel faster. Air links are being developed and six airplane strips have been proposed in the hills by the government. Helicopters services should also be introduced; for these services, facilities for refuelling and hangers within the state have been proposed along with the installation of beacons at major helipads to allow operations during bad weather. These services will attract NRIs and wealthy travellers, increasing the number of tourists and resulting in development.

As a result and as expected **a large revenue** is also earned providing **employment opportunities** to the locals of the state particularly those who reside in the remote regions of the hills.

In spite of the fact that tremendous efforts are laid by the government ,on the face of it appears that there are many things which are still in pipe line, as far as tapping most from the tourism industry of Uttarakhand, even after more than a decade of the formation of the state

**Skill development is highly essential in this sector.**

To ensure that the benefits of local tourism actually reach the villagers, it is important to involve **women in restaurant activities, youths as drivers of taxis and guides, and local uneducated men as porters**. The supply of competent managers does not meet the demand for mid- and high-level managers and, even at the policy planning level, they are in short supply. There is a shortage of quality institutions and teachers to impart training to the new generation and to upgrade the skills required for foreign tourism. The level of education is quite good but there are a large number of unemployed educated youth in the hills. There is an immediate need to improve the communication skills of personnel in the hospitality industry. There is a similar requirement for organizing local training of personnel employed at front offices, housekeeping, food production, restaurant services, travel agencies, etc. These training programmes can be organized off-season. To meet the manpower requirements of the accommodation sector alone, the state should set up at least one training institute without any further loss of time. Skills in English and other languages should be given high priority.

*In a nut shell it could be concluded that there is a need to develop human resources and hold capacity building training programmes.*

It is a fact that tourism stimulates the economy and induces the so called "**multiplier's effect**" i.e. jobs are created ,capital is accumulated and local workers are employed .The huge amount of money spent in the tourism industry makes the economy extremely dependent on the revenue out of this sector .*In this array the facts that unorganized tourism practices are harming the ecology in multiple ways, deforestation, waste disposal in improper ways, trail degradation to name a few out of a number of ways. The society is also facing certain severe after effects, by showing locals different "modern" ways of living. It would be appropriate to say here that revenue through tourism activities could be one part of the balanced economy as all the resulting activities should be able to provide long term economic benefits.*

**NOW the question arises that with this ever increasing rate of tourists' influx and deteriorating care and concern for misbalance in the ecology**(*from all sides i.e. tourists, locals as well as government bodies)* **how long can the economy of Uttarakhand be dependent on this very source of employment and revenue generation?**

Alarming situation is round the corner. People have to pay attention towards alternate sources of revenue generation which already exist in the state's economy but are less bothered, rather less discussed about. One such option which is taken care of, though at a very low scale is that of **agribusiness** .Ironically Uttarakhand is referred to **as organic state** but efforts seem to be less in really symbolizing this very name.

Apart from hunting opportunities in the tourism sectors, agribusiness could also prove to be a good option for the entrepreneurs of the hilly regions of Uttarakhand.

## II.   CHALLENGES FOR THE STATE

The major challenge which is face by Uttarakhand is that most of the region , around 92.57 is covered by hills, hence leaving a very small section i.e.7.43% for farming practices. The initiations from the government's side could act as motivational factors for the farmers who find it just hopeless cultivating small farmlands with practically no facilities (like irrigation etc) available. Further, calamities in the form of natural disasters (floods, droughts, landslide, hailstorm etc) also dishearten the farmers to a large extent. Effective, well planned strategies are the need of the hour to generate the very essential economic balance in the state of Uttarakhand.

The locals either join the army and paramilitary or migrate in large numbers from the mountain areas to the cities and towns all over the country in search of employment. Their families are left behind and are dependent on remittances sent by these members employed outside the region. This phenomenon has earned the region the sobriquet of a 'Money Order Economy'. Male outmigration from the region has occurred on a significant scale and this can be seen from the fact that the overall sex ratio for the state in 2001 was

964 females per 1000 males, while in 8 of the 13 districts (all in the mountain area) it exceeded 1000. Even the men who don't migrate in search of work do not work in the fields. They are constantly in search of work in off-farm occupations. A significant consequence of this pattern of migration and male preference for off-farm employment is the lack of quality manpower in the agricultural sector.

<div align="center">III.   PREVAILING OPPORTUNITIES</div>

In order to change this situation of economic and social backwardness in the rural mountainous regions of Uttarakhand, it is important to adopt a **strategy based on long term planning** that will take steps to counter all the problems described above. However, given the fiscal and administrative constraints of the state, it is more sensible to identify a few sectors at a time and attempt vigorous development in these sectors before moving on to other sectors. The first step in such a strategy is to identify those sectors that are impeding the growth process in these areas and those sectors in which this region has a comparative advantage. The current condition of the infrastructure sector is clearly a constraint on the development in this area and must be the focus of the strategy for inclusive growth.

The most important types of infrastructure necessary for the development process in these areas are irrigation, electricity and roads. The potential for developing these sectors in Uttarakhand is significant. Minor irrigation projects based on tanks and reservoirs are possible in those areas that are not covered by canal or stream irrigation as these areas receive normal to heavy rainfall during the year. The Mountain Rivers provide an ideal opportunity to generate large quantities of hydroelectricity. As far as roads are concerned, the current infrastructure is highly inadequate and hence there is both scope and necessity for large investments in this sector.

**The horticulture sector** is eminently suitable for the hill areas. The climate of these regions allows a variety of fruits and vegetables to grow in this area. Moreover, the hill areas are capable of growing off-season vegetables that have a great demand in the plains. A related advantage for Uttarakhand is its relative proximity to Delhi and other north Indian urban centres that have an increasing demand for fruits and vegetables. The hill areas have a comparative advantage in the production of horticultural products including fruits and vegetables. However, the farmers in these regions will be able to take full advantage of this only when these products are not only produced but also marketed efficiently. In a broad sense, marketing would consist of all post-harvest activities including the collection of farm products from the field, processing and packaging of the product, storing and warehousing of the product, identifying prospective markets where the product can get the highest price and finally, transporting the product to these markets. Unfortunately, the small farmers in the hill areas are incapable of carrying out most of these activities on their own for a number of reasons:

1. The relatively small size of each farmers produce and the distance of their villages from roads and mandis makes the process of marketing their products too costly to be profitable.
2. They do not have easy access to storage and warehousing facilities.
3. Finally, they do not have ready access to information about potential markets for their produce.

As a result of this lack of marketing facility, a large part of the total horticultural crops produced by the state of Uttarakhand is wasted each year.

*Clearly, there is a crucial need to develop an efficient marketing infrastructure in order to make it remunerative for the small mountain farmers to grow cash crops including fruits and vegetables.*

The farmers in the hilly regions should be encouraged **to shift from the cultivation of cereals to the cultivation of horticultural products** as this sector has vast potential.

- The varied climate of the region makes it an ideal location for growing temperate, subtropical and tropical fruits that fetch a high value in the domestic urban markets and international markets.
- The climate also allows these regions to grow off-season vegetables that get a high price for these in the plains.
- Most importantly, the consumption pattern of the average Indian is shifting toward fruits and vegetables and hence the demand for these products is going to increase over time.

*Unfortunately, despite these advantages, the horticultural produce is not providing the farmers with higher incomes, due to the absence of necessary infrastructure, institutions and incentives.*

There are three types of institutions that the government needs to create or strengthen for this purpose:

1. A **Horticultural Marketing Board** that will help, particularly the small and marginal farmers, to grow horticultural crops and market them at remunerative prices.
2. Strengthen the **farmers cooperative associations** and encourage them to corporatize themselves so that they can employ professionals to help them market their products.
3. Allow and encourage **contract farming** between farmers and fruit and vegetable retailing firms, so that the role of the middlemen can be minimized.

It must be understood that while the first institution, i.e. the marketing board, should primarily target the poor and marginal farmers, the medium and large farmers can use the second and third type of institution more effectively. It may be useful at this stage to point out, that though the state has declared that it is an "Organic State", it will be useful to the farmer only when the produce can be marketed at a higher price with the help of organic certification. The second set of policy initiatives have to deal with the provision of various types of infrastructure facilities necessary for the development of the sector. An effective network major and minor roads and ropeways need to be built to enable the collection and transport of horticultural produce to markets and make this process less costly. In order to provide irrigation in the rain fed areas, rainwater harvesting has to be developed and small and medium sized

reservoirs for the collection of rainwater have to be built. Electric pumps can be used to lift water to the farms at higher attitudes, while sprinklers and drip irrigation should be encouraged for the efficient use of water. Warehouses and cold storages for the preservation of the fruits and vegetables have to be built in the hill areas as well as in the major markets of the country. Agro processing units need to be encouraged through public-private partnerships both in the hills and in the southern plains of the state.

The problems of inadequate information about best crops and best practices that are faced by farmers are crucial to the development of horticulture. The planning for horticultural development has to include a continuous process of scientific market analysis that will determine the most remunerative crop or group of crops for a particular region. The institutions for the dissemination of knowledge about these crops and the scientific methods of horticulture have to be strengthened. There is the related issue of the supply of appropriate inputs for these best practices to the farmers. These inputs have to be supplied at appropriate times from outlets that are in the nature of one-stop shops that are within a reasonable distance of such villages and farms from where the farmer can get all kinds of agricultural inputs under one roof.

Certain measures are suggested to summarize the whole story keeping into strong consideration the economic development of the hilly districts of Uttarakhand state:

## <u>Hill Districts Development Plan(suggestive)</u>

| | |
|---|---|
| **Almora •** | Diversify agricultural products to include fruits (apples), spices (ginger), and herbal/medicinal plants<br>• Develop minor irrigation projects to facilitate agricultural diversification<br>• SSIs based on wool<br>• Impart training in design in the handloom sector<br>• Develop leisure and nature tourism. For example, areas such as Ranikhet and Kausani have not been explored |
| **Bageshwar •** | Diversify agricultural products to include off-season vegetables and fruits (peas, cabbage, beans, tomato and potato). The traditional crop, bhatt, is important. Promote plantation of tea, chillies, turmeric and other herbal plants.<br>• Fodder and grazing land is an asset that can be used to meet demand from neighboring districts.<br>• SSIs and agro-based industries for jams and pickles. Khadia in cosmetic products.<br>• Promote leisure and nature tourism |
| **Chamoli** | • Religious tourism to the Valley of the Flowers, Hemkunt Sahib, Badrinath, and Kedarnath. Other types of tourism to Nanda Devi National Park, river rafting, and rock climbing.<br>• Poultry and wool-based industry<br>• Agriculture diversification towards herbal and medicinal plants, pulses, and off-season vegetables<br>• Develop forest resources: Jatropha plantation for bio-fuel, bimal trees for the cosmetics industry, and forest-based handicrafts |
| **Champawat** | • Diversify agricultural products to include medicinal and aromatic plants, ginger and other spices, and organic fruits and vegetables<br>• Forest products: Ringal-based products by local artists |
| **Pauri Garhwal** | • Poultry and wool-based development: Sheep<br>• Diversify agricultural products to include herbal and medicinal plants, pulses, bee-keeping and mushroom cultivation<br>• SSIs and agro-based industries: Bamboo and fiber development, and jatropha-based bio-diesel.<br>• Start a medicinal plant-based pharmaceutical industry<br>• Bimal and rambans fiber for handicrafts and furniture<br>68 |

| | |
|---|---|
| **Pithoragarh** | • Poultry and wool-based development: Goat-rearing<br>• Diversify agricultural products to include litchi, herbal and medicinal plants, garlic and spices.<br>• SSIs and agro-based industries- Bamboo, ringal and fiber development, and furniture production from forest products<br>**Rudraprayag** • Religious tourism to Kedarnath; adventure tourism like river rafting, rock climbing<br>• Diversify agricultural products to include herbal and medicinal plants, haldi and coriander.<br>• SSIs and agro-based industries: Bio-fuel, bamboo plantation, and traditionally-grown mandua for bakery products<br>• Forest-based industry |
| **Tehri Garhwal** | • This district is rich in irrigation facilities; thus, agricultural diversification towards fruits and vegetables, spices, pulses, herbal and aromatic plants using a cluster approach combined with proper market development can be very successful.<br>• SSIs and agro-based industries: Food-processing industry, forest-based industry, fruit- and vegetable-processing industry.<br>• Training and innovation to add value to small enterprises.<br>• Nature tourism and adventure tourism in Devprayag. |
| **Uttarkashi** | • Religious tourism to Gangotri, Yumunotri, etc.<br>• Diversify agricultural products to include fruits and vegetables, apple orchards, tea plantations, and aromatic plants<br>• Development of sheep- and goat-rearing, and wool-based industry<br>• Nature and leisure tourism |

## IV. QUESTIONS BASED ON THE CASE

1. If the entrepreneur of the study area wants to stick to his old profession of tourism , what measures would you suggest for concepts like ecotourism to him?

2. Analyse the conditions of the natural resources, like water source, existing in the region as a result of uncontrolled tourism activities.

3. Suggest alternate means of revenue generation present in the hilly regions of Uttarakhand.

4. What according to you is the best way of economic development for the state-money order economy or self employment? Why? Explain

5. What would be your suggestions for materializing the name "Organic State "for Uttarakhand?

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# EFFECTING EMPLOYEE ENGAGEMENT FACTORS

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*Abstract-* The paper deals with the factors which influence employee engagement. This paper is based on the reviews of the previous old paper. The paper is based on the secondary data .The source of the information has been taken from the previous articles, journals, text books on the employee engagement. The descriptive method is used to explain the factor of employee engagement. The paper focuses only the factors like feedback, Rewards, Reorganization, and Leadership etc. which influence the Employee Engagement.

*Index Terms*- Employee engagement, Feedback, communication, leadership.

## I. INTRODUCTION

In recent years, there has been a great deal of interest in employee engagement. Along with engaged technology and streamlined work processes gaining employee's discretionary effort, so called engagement, may be one of the most effective ways to improve productivity and improve business results. In India, career opportunities are a key driver of employee engagement, clearly reflecting the ambitions and aspirations of a restless and demanding workforce that is keen to ride the growth wave. As a result, organizations that are able to manage employees' career aspirations and provide them with opportunities for growth and development will have a more engaged workforce.

Mercer an HR consultancy firm conducted a study covering employees from 22 countries to identify trends and perceptions at workplace. The study notes that the base pay was an important driver, employees across Asia assign very high ranks to workplace factors like type of work and promotion opportunities. Workers in France and India cited the type of work as the strongest driver of engagement. Employees across the world consider a healthy work life balance an important driver of engagement, excepting the workers in India and China.

In today economic downturn situation, organization started to look into its people asset –internal employee so that they can utilize the human asset to sustain the competitiveness in the industry. Employees who are engaged in their work and committed to their organizations give companies crucial competitive advantages - including higher productivity and lower employee turnover (Robert, 2006).

Employee Engagement is the extent to which employee commitment, both emotional and intellectual, exists relative to accomplishing the work, mission, and vision of the organization. Engagement can be seen as a heightened level of ownership where each employee wants to do whatever they can for the benefit of their internal and external customers, and for the success of the organization as a whole.

While it is possible to measure engagement itself through employee surveys, this does not assist in identifying areas for improvement within organizations. There are a range of factors, known as drivers that are thought to increase overall engagement. By managing the drivers, an organization can effectively manage engagement levels of its employees

## II. ORIGIN

Kahn (1990) was the first researcher to posit that engagement means the psychological presence of an employee when executing his organizational task. Kahn tried to discover the psychological Circumstances essential to justify moment of individual engagements and individual disengagements amid employees in diverse conditions at work. He applied the observation techniques and interviews to accomplish a qualitative research of individual engagements and disengagement at work of 16 counselors of a summer camp and 16 employees of an architectural firm. He established that individuals portray upon themselves to a changeable extent at the same time as executing job roles with the obligation of presence; cognitively, emotionally and physically in different tasks they carry out; noting that the employees could decide to retreat or disengage from their job roles and organizational tasks.

Employee engagement, also called worker engagement, is a business management concept. An "engaged employee" is one who is fully involved in, and enthusiastic about their work, and thus will act in a way that furthers their organization's interests. According to Scarlett Surveys, "Employee Engagement is a measurable degree of an employee's positive or negative emotional attachment to their job, colleagues and organization that profoundly influences their willingness to learn and perform at work"

According to the Gallup the Consulting organization there are there are different types of people:-

Engaged--"Engaged" employees are builders. They want to know the desired expectations for their role so they can meet and exceed them. They're naturally curious about their company and their place in it. They perform at consistently high levels. They want to use their talents and strengths at work every day. They work with passion and they drive innovation and move their organization forward

Not Engaged---Not-engaged employees tend to concentrate on tasks rather than the goals and outcomes they are expected to accomplish. They want to be told what to do just so they can do it and say they have finished. They focus on accomplishing tasks vs. achieving an outcome. Employees who are not-engaged tend to feel their contributions are being overlooked, and their potential is not being tapped. They often feel this way because they don't have productive relationships with their managers or with their Coworkers. Actively Disengaged--The "actively disengaged" employees are the "cave dwellers." They're "Consistently against Virtually Everything." They're not just unhappy at work; they're busy acting out their unhappiness. They sow seeds of negativity at every opportunity. Every day, actively disengaged workers undermine what their engaged coworkers accomplish.

### III.   HR ROLE VITAL IN KEEPING EMPLOYEE ENGAGEMENT HIGH

Today organizations have become lean. That is due to the market conditions and new business processes coming into play. We find the new organizational set up has led to leaving some of the executives over worked. The Pareto principle seems to still stick around - 'the vital few and trivial many is' plaguing organizations even now.

This means that only 20 per cent of the work force in a company is fully and actively engaged and the rest are in different levels of engagement. Employee engagement remains an area that throws up new challenges to managers. Why does this happen, should be the question every manager must analyze and implement solutions that can bring a turnaround in the mind set of those employees who are not actively engaged.

The reasons for teams and people in them not delivering their best can be many. These reasons may also vary from time to time. So it is necessary that the HR manager monitors teams and individuals by interacting with each team's manager. HR plays a very crucial role in keeping the employees engaged. A survey has revealed that only a four percent of HR senior managers concentrate on employee engagement. But on the other hand 90 per cent of these managers were highly concerned about 4.

**Figure 1: Factors and Outcomes of Employee Engagement**
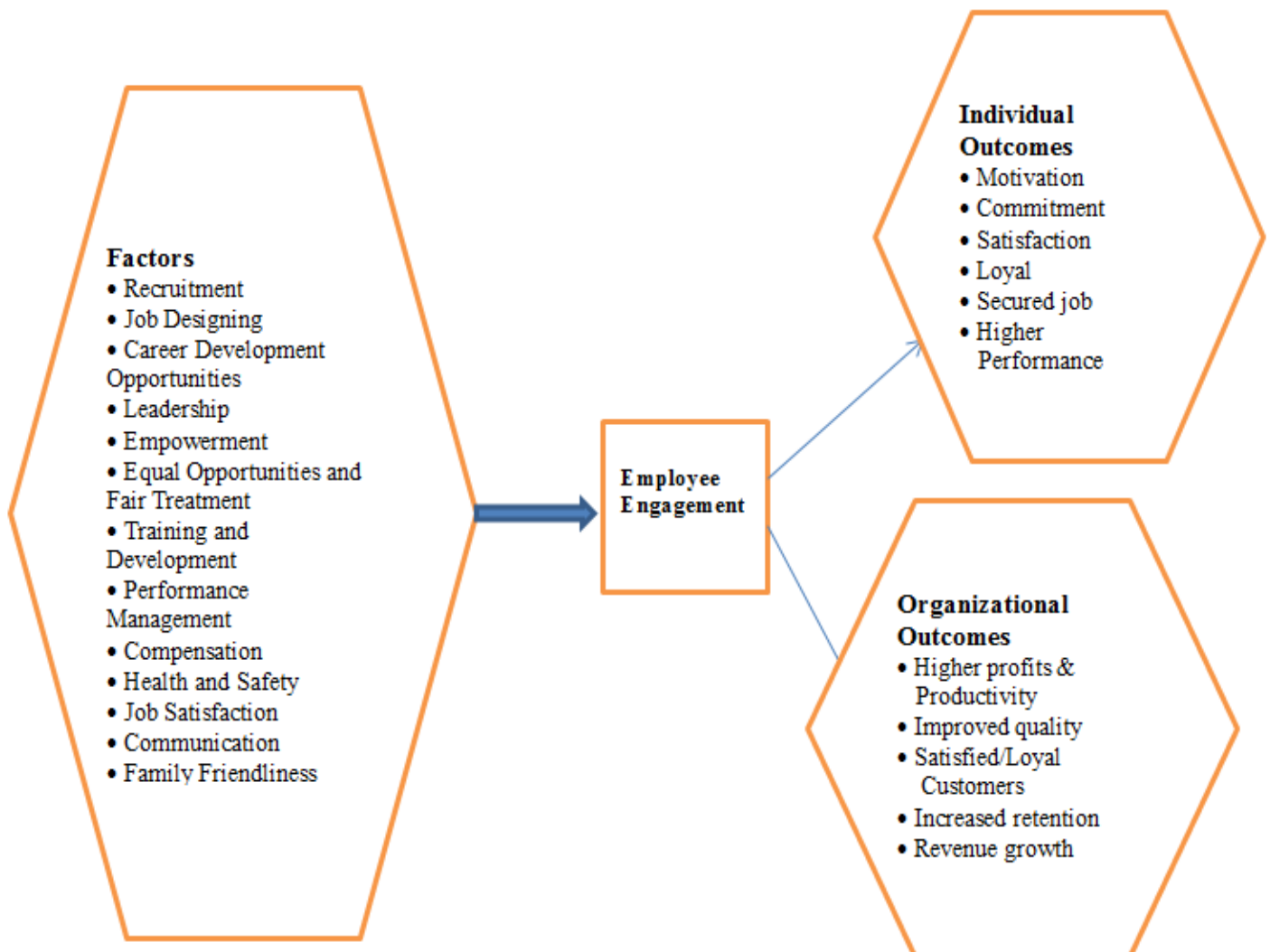
## IV. FACTORS LEADING TO

*Source from Bijaya Kumar Sundaray 2011,* **Employee Engagement: A Driver of Organizational Effectiveness,** *European Journal of Business and Management, ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online) Vol 3, No.8, 2011*

## V. EMPLOYEE ENGAGEMENT

Studies have shown that there are some critical factors which lead to Employee engagement. Some of them identified

**Recruitment:** The recruitment and selection process involves identifying potential employees, making offers of employment to them and trying to persuade them to accept those offers. The messages organization conveys while seeking to attract job applicants also can influence future employees' engagement and commitment. While recruiting employees for desirable jobs, organizations enhance their engagement (by maximizing the person-job fit) and commitment (by providing growth and advancement opportunities to employees in return for their loyalty). To enhance engagement organizations identify those candidates who are best-suited to the job and to organization's culture.

**Job Designing:** Job characteristics encompassing challenge, variety and autonomy are more likely to provide psychological meaningfulness, and a condition for employee engagement. Job becomes meaningful and attractive to employee as it provides him variety and challenge, thereby affecting his level of engagement.

**Family Friendliness:** A person's family life influences his wok life. When an employee realizes that the organization is considering his family's benefits also, he will have an emotional attachment with the organization which leads to engagement.

**Health and Safety:** Research indicates that the engagement levels are low if the employee does not feel secure while working. Therefore every organization should adopt appropriate methods and systems for the health and safety of their employees.

**Job Satisfaction:** Only a satisfied employee can become an engaged employee. Therefore it is very essential for an organization to see to it that the job given to the employee matches his career goals which will make him enjoy his work and he would ultimately be satisfied with his job.

**Employee perceptions of job importance** –"An employee's attitude toward the job's importance and the company had the greatest impact on loyalty and customer service than all other employee factors combined."

**Employee clarity of job expectations** - "If expectations are not clear and basic materials and equipment are not provided, negative emotions such as boredom or resentment may result, and the employee may then become focused on surviving more than thinking about how he can help the organization succeed."

**Career advancement/improvement opportunities** - "Plant supervisors and managers indicated that many plant improvements were being made outside the suggestion system, where employees initiated changes in order to reap the bonuses generated by the subsequent cost savings."

## VI. CONCLUSION

It is found that no single or specific type of factor will be suiting the person or the Industry .So it is very much important that all the factors must be considered in doing the employee engagement. Communication is very much important in every sector, leader, compensation, Rewards & Recognition is important for development of employee engagement. The human being are more of subjective in the way they think and execute the work, the change is the only one factor that is constant among the human beings.so all custom made factor is not their which influence the employee engagement. It keeps on changing on time to time and industry to industry.

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# Prevalence of Landscaping as a Means of Passive Cooling in Hot Climates: a Case Study

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*Abstract-* Landscaping can improve the micro climate of the immediate surroundings of a building; by modifying the microclimate around a building making the building sustainable. Yola has a very hot climate which makes it necessary to have mechanical cooling systems in the buildings but due to power shortage and the need to conserve energy, it becomes necessary to have proper landscaping, since the hotter weather occupies the major part of the year. This research is trying to find out whether there is prevalence of proper landscaping to enhance passive cooling in Yola especially within Modibbo Adama University of Technology (MAUTECH) Yola. Literatures were reviewed to analyze and determine existing conditions of buildings while physical observation of surroundings and the climatic data was also gotten from meteorological stations taken into consideration with data recorded over a period of time. A large number of buildings and their immediate surroundings were designed without the provision of landscaping. Landscaping is major aspect of passive cooling technique in which if Architects and Designers apply to buildings whether they are new or retrofitted buildings, would enhance and maintain the comfortable internal conditions as well as the immediate environment.

*Index Terms*- climate; landscaping; passive cooling; sustainable & shading

## I. INTRODUCTION

This paper is all about landscaping which can be used to enhance a passive cooling system. The use of vegetation to shade a house is a cooling technique that can be very effective. A well-placed plant can deliver effective, cool shade, as well as add to the aesthetic value of a building. As well as shade, plants are also effective for cooling because they absorb the heat. Since leaves are generally dark and coarse they reflect very little light, they make ideal solar radiation controllers. Photosynthesis is the way plants convert light into nourishment. During photosynthesis, a process known as evapo-transpiration occurs, in which large amounts of water vapour escape through the leaves. The water vapour cools the air passing by it, thus providing a source of cool air for the building [1].
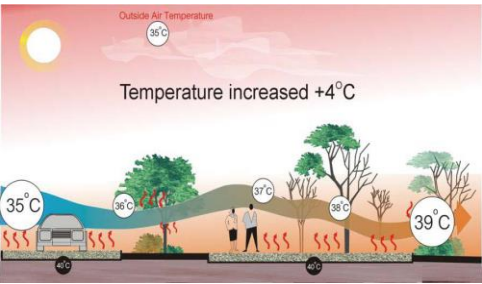
Strategic planting of trees, shrubs and vines about a building and on structures such as pergolas and beam overhangs can, along with urban form, help to modify the microclimate. When correctly applied, the need for internal and external shading devices can be greatly reduced. Selective planting can shade not only windows and other apertures but also whole facades and roofs, reducing conductive as well as radioactive heat gains. [1]Also stated that by using deciduous trees and vines shading is provided only when needed. Through the use of evergreens, shading can be provided year-round. Vegetation can also be used to reduce ground reflection and, through evapotranspiration, the ambient air temperature. Evergreen shrubs and ground cover are useful for preventing or reducing reflection from roads, paved areas and buildings. Evergreens are also effectively used as wind barriers. Deciduous species are particularly suitable for temperate climates. The shading effect of vegetation depends heavily on the plant type (trees, shrubs or vines), species, and age. These factors define the leaf type and the density of the vegetation. In the case of deciduous plants, the density changes from season to season.

[1]records that vegetation affects the internal temperature and cooling load of buildings in various ways as follows: Tall trees and pergolas situated a short distance from walls and windows will provide shade without significantly reducing ventilation; Vines on walls and high shrubs close to walls will provide shade but also reduce the wind speed next to the walls;

The air temperature adjacent to the building's external façade is decreased, thus reducing conductive and infiltration heat gains; Vegetative ground cover around a building reduces reflected solar radiation and long wave radiation emitted toward the walls from the surrounding area, thus lowering the solar and long wave heat gain; Vegetation on the eastern and western sides of a building can provide effective protection from solar radiation. During peak summer days the average temperature of walls shaded by trees or a combination of trees and shrubs can be reduced by up to 150K. Planted courtyards can provide a store of coolness in a building. The

courtyard acts like a well of cold air, as the cool air of the desert night sinks and is trapped in the courtyard, providing a reservoir of coolness during the day. All the rooms opening into the courtyard benefit from this coolness [2].

Table 1 Temperature increase and decrease [3]



| | |
|---|---|
| Too much hard surfaces like concrete paving and asphalt increases heat gain. | Vegetation and trees in particular effectively shade and reduce heat gain. They increase humidity level. They also cause pressure differences thereby increasing and decreasing air speed or directing air flow. They can, therefore, direct air into a building or deflect it away. |

## II.  IDENTIFY, RESEARCH AND COLLECT IDEA

Yola has a tropical climate which is that of the hot semi-humid type. The characteristics of the climatic elements are explained below:

A.       Wind:The dominant wind direction between 2004 and 2010 is North West (NW) according to [4].

B.       Temperature:Air temperature characteristics are typical of the West African Savannah climate. Temperature in this climatic region is high almost throughout the year because of high radiation income which is relatively evenly distributed throughout the year. However there is usually a seasonal change in temperature as depicted in table 1.0. There is a gradual increase in temperature from January to April. The seasonal maxima usually occur in April. There is a distinct drop in temperature at the onset of rains due to the effect of cloudiness. A slight increase after the cessation of rains (October to November) is common before the onset of harrmattan in December when the temperature drops further. Maximum temperature reaches up to 40 °C particularly in April while minimum temperature can be as low as 18°C between December and January (Table 1.0). Mean monthly temperature is 27.8°C.

C.       Relative Humidity: The seasonal variation in RH of the site is shown in Table 1.0 Between January and March RH is extremely low (20-30%). It starts increasing as from April and reaches the peak (about 80%) in August and September. This is due to the influence of the humid maritime air mass which covers the whole state during this time. Relative humidity starts to decline again as from October following the cessation of rains.

D.       Sunshine:The monthly distribution pattern (Table 1.0) shows that the period from January to April has a mean monthly sunshine hour of 220. There is a decline in sunshine hours between May and September due to increasing cloudiness all over the state. The mean during this period is about 207 hours. The mean sunshine hours increases again to 255 for the period between October and December. The amount of sunshine hours is 2750per annum.

E.       Evaporation:the monthly distribution of pan A evaporation in Yola. The rate of evaporation is generally high in Yola due to the high insolation. The monthly distribution pattern is similar to that of sunshine and Temperature which show significant decrease during the rainy season.

Table 2Average Climatic Conditions in Yola (Latitude 09° 16') [5]

| MONTH | T max °C | T min °C | T mean °C | R.H % | R'fall mm | Evaporation mm | Sunshine |
|---|---|---|---|---|---|---|---|
| JAN | 33.9 | 18.4 | 26.1 | 30 | 0 | 269.5 | 234 |
| FEB | 37.0 | 20.4 | 28.7 | 27 | 0 | 294.6 | 217.0 |
| MAR | 39.4 | 27.3 | 29.3 | 33 | 4.8 | 334.9 | 205 |
| APR | 39.6 | 26.9 | 33.3 | 44 | 40.3 | 282.0 | 224 |
| MAY | 36.6 | 25.4 | 31.0 | 58 | 138.8 | 209.5 | 238 |
| JUN | 33.9 | 24.2 | 29.1 | 69 | 127.2 | 142.0 | 222 |
| JUL | 31.4 | 23.4 | 27.4 | 79 | 192.5 | 138.8 | 184 |
| AUG | 30.9 | 23.4 | 27.2 | 79 | 215.2 | 134.4 | 187 |
| SEP | 31.2 | 23.2 | 27.2 | 77 | 147.4 | 115.4 | 202 |
| OCT | 33.8 | 23.2 | 28.5 | 66 | 42.1 | 160.7 | 248 |
| NOV | 35.5 | 19.7 | 27.6 | 44 | 2.7 | 226.4 | 263 |
| DEC | 34.3 | 18.1 | 26.2 | 34 | 0 | 262.0 | 255 |
| YEAR | | | | | 910.8 | | |

Source: authorsfield work (2011)

Twenty buildings were selected within Modibbo Adama University of Technology Yola to access their effectiveness in applying passive cooling. Various landscaping techniques will be used to analyze the case studies stating the extent to which these techniques are applied. A score will be allocated to show how effective these techniques are as shown below:

Table 3 selected photographs of buildings used for the various case studies



*Computer Department*

*Administrative Block*

*Geology Department*

*Senate Building*

|  |  |  |  |
|---|---|---|---|
| *Geography Department* | *Demonstration* | *Biotech Complex* | *Sch. of Mgt. & Info Tech* |
|  |  |  |  |
| *Lecture Theatre 3&4* | *Library* | *Architecture Department* | *Abuja* |
|  |  |  |  |
| *Lecture Theatre 1&2* | *School of Science* | *Clinic* | *Student Centre* |

Source: authorsfield work (2011)

Table 4 Extent to which landscaping is applied with the respective score.

| EXTENT TO WHICH LANDSCAPING IS APPLIED | SCORE |
|---|---|
| VERY HIGH | 5 |
| HIGH | 4 |
| MODERATE | 3 |
| LOW | 2 |

| VERY LOW | 1 |
|---|---|
| NOT AVAILABE | 0 |

Source: authorsfield work (2011)

The landscaping techniques to be considered are shown below with acronyms assigned to each variable to simplify data tabulation; these variables were examined in each case study to know the extent to which they are applied.
F.          Landscaping using plants:Shading with trees on all façade (TR SHD E); Shading with trees on all façade (TR SHD W); Shading with trees on all façade (TR SHD N); Shading with trees on all façade (TR SHD S); Shading with lawns on all façade (LWN E); Shading with lawns on all façade (LWN W); Shading with lawns on all façade (LWN N); Shading with lawns on all façade (LWN S). Higher ratio of vegetation cover to hard surfaces such as concrete paving tarred roads, sand (VEG COVER).

## III.  RESULTS

    From the case studies, a summary of the various applied techniques of passive cooling, their performance rating, whether they perform well or not are shown in Tables 5.0. The prevalence of some landscaping techniques is indicated in table 5.0. It will be observed that shading with trees on all the facades has a mean score of 2. Use of green lawn on all facades has a mean score of 1 as there is a few trace of grass lawn. Trees are few and scattered while absent in some structures. According to [1], during peak summer days the average temperature of walls shaded by trees or a combination of trees and shrubs can be reduced by up to 150K. Climbing vines can reduce the temperature by up to 120K. Looking at the combined landscaping techniques no building scored up to 50%, the highest score was from only two buildings with only 38% which is not good. Shading especially with plants is one of the most important passive cooling techniques as it can eliminate the need for the other techniques if properly applied. According to [6], when a building's internal and solar gains are sufficiently reduced, a *lean acclimatization concept* can be developed. Direct sun can generate the same heat as a single bar radiator over each square meter of a surface. Shading can block up to 90 percent of this heat [7]. All the buildings have either tarred road, concrete paving, sand or a combination of all these landscape elements with few traces of grass lawn in some cases. This modifies the micro-climate by making it hotter since these hard surfaces absorb solar radiation and reflects it to the building. Trees are few and scattered while absent in some structures.

According to [2], trees can reduce air temperatures around them by up to 5°C. Directly underneath trees the cooling is even better – up to a huge 14°C cooler.

## IV.  DISCUSSION

Yola's climate has a diurnal range of 7-8 high mass construction can cause thermal discomfort unless carefully designed, well shaded and insulated. High thermal mass paving materials like stone, cement or ceramic pavers, gravel, bitumen accumulate heat while the sun is on them, and radiate that heat back at night, heating up the air over them both during the day and for some time after sunset. Some of these materials have reflective tendencies, reflecting sunlight up into nearby windows. Groundcover and low growing plants do not store heat, instead having some cooling effect on nearby air by shading the soil beneath them and transpiration. Architects should keep paths and driveways shaded, or at least far enough away from the building that they can't reflect much heat and light into it, and plant groundcover at the base of walls.Desirable wind direction in Modibbo Adama University of Technology (MAUTECH) Yola is South-West trade winds so a short deflector on the lee side of the fenestrations will divert some breeze into the building.

Also an undesirable wind like the North-East trade winds blowing at an angle to a building can be turned away by a deflector on the windward side of a fenestration. Trees and shrubs on the east and west can be a great way to reduce heating during sunrise and sunset, providing shade during all but the middle few hours of the day.

Table 5: Case studies showing green landscaping performance

| | BUILDING | TR SHD W | TR SHD E | TR SHD N | TR SHD S | LWN W | LWN E | LWN N | LWN S | VEG CVR | TOTAL SCORE 45 | % SCORE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | PG SCHOOL | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | **13** | **29%** |
| 2 | OBA ADETONA HALL | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | **17** | **38%** |
| 3 | ADMIN BLOCK | 2 | 2 | 0 | 2 | 1 | 1 | 1 | 1 | 1 | **11** | **24%** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | SENATE BUILDING | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | **17** | **38%** |
| 5 | GEOGRAPHY DEPT | 0 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 3 | **16** | **36%** |
| 6 | DEMO SECONDARY SCHOOL | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | **9** | **20%** |
| 7 | BIOTECH COMPLEX | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | **11** | **24%** |
| 8 | SCHOOL OF MGT & INFO TECH | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | **9** | **20%** |
| 9 | LECTURE THEARTRE 1&2 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | **11** | **24%** |
| 10 | ARCH DEPT | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | **9** | **20%** |
| 11 | KABIR UMAR HALL BLOCK E | 2 | 2 | 2 | 0 | 1 | 1 | 1 | 1 | 1 | **11** | **24%** |
| 12 | ABUJA HALL | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | **15** | **33%** |
| 13 | LECTURE THEARTRE 3&4 | 2 | 2 | 3 | 0 | 1 | 2 | 3 | 0 | 1 | **14** | **31%** |
| 14 | SCHOOL OF SCIENCE | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | **2** | **4%** |
| 15 | CLINIC | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | **4** | **9%** |
| 16 | STUDENT CENTRE | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 1 | **12** | **27%** |
| 17 | GEOLOGY DEPT | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 1 | **12** | **27%** |
| 18 | COMPUTER | 3 | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 1 | **12** | **27%** |
| 19 | CHEMISTRY DEPT | 3 | 3 | 0 | 2 | 0 | 0 | 0 | 0 | 1 | **9** | **20%** |
| 20 | LIBRARY | 3 | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 8 | 18% |
| | MEAN | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 11 | 25% |
| | SD | 0.97 | 0.94 | 1.04 | 0.92 | 0.48 | 0.56 | 0.7 | 0.49 | 0.54 | 2.0 | 8.5 |

Source: authorsfield work (2011)

A canopy of trees with a lower level of shrubs and bushes, a wall or fence, to block low-angled rays is most effective. Architects should lay more emphasis on getting climatic data, carryout extensive site analysis and also learn from performance of existing buildings within the area before embarking on their design. It is very important for them to use winter and summer sunrise/sunset points for the site latitude to decide the appropriate length and placement oftree lines on the east and west facades.

## V. CONCLUSIONS

The paper attempted to establish the extent to which landscaping is used to enhance passive cooling techniques are applied in MAUTECH Yola which revealed that Architects have knowledge of passive cooling techniques but they concentrate more on aesthetics and functionality. Vegetation and trees in particular effectively shade and reduce heat gain. They increase humidity level. They also cause pressure differences thereby increasing and decreasing air speed or directing air flow. They can, therefore, direct air into a building or deflect it away. Plants, shrubs and trees absorb radiation in the process of photosynthesis.

As a result they actually cool the environment. Trees can be used to cut off the east-west sun. Too much hard surfaces like concrete paving and Asphalt increases heat gain and therefore should be minimized around the building. Plants cool air temperatures as their leaves cast shade which makes air beneath them cooler as it is not heated directly by sunlight. They also cool air temperatures by transpiration which is releasing water from pores underneath leaves which cools relatively dry air by evaporation. In order to benefit

from this this effect is to have ventilation pathways – the pathways air travels into a building either by directly blowing in or by suction – pass through a garden belt, a mix of trees and shrubs.

This should not too dense; otherwise a windbreak effect will result. The effect to aim for is shade rather than a wall of plants [17] Building clients should also be educated on the importance and benefits of passive cooling especially with green landscape elements as it will enhance users comfort and cut down energy cost from mechanical cooling.

## VI.   CONCLUSION

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

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