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Towards the alignment of business and IT in insurance company

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Abstract- The relationship between business and IT is a constant theme in both academic and industrial circles for more than 30 years. Aligning Business and Information Technology (IT) is generally seen as an important component of the foundation to optimize business performance. Due to constant changes in both the IT world and in modern business, working on an alignment of business and IT is becoming increasingly important.

The aim of this paper is to offer an approach to solving the alignment problem of IT and business complex in the company, with particular emphasis on applications in the field of insurance industry. The cause of alignment problem lays primarily in different abstraction levels of business and IT concepts [9]. In order to solve this problem, this paper proposes the construction of Enterprise Architecture (EA) [25], which connects models of the organization and its business processes to software architecture models and an implementation environment. The first layer of this architecture is a Business architecture that is defined here as the map of comprised business processes, and is a concretization of contemporary business models in the field of enterprise architecture. Concretization is done here in the context of the insurance company, and is the basis for the definition of the other layers of the architecture.

Index Terms- ACORD, Business and IT Alignment, Enterprise Architecture, NGOSS, Process map.

I. Introduction

The insurance industry operates in an uncertain business environment that is changing rapidly. Uncertainty of operations is, among other things, caused by the following facts:

- New technologies are becoming available,
- Requests for new services are coming everyday,
- New and increased competition appears daily.

Insurance companies usually can not quickly adapt to such radical changes. The reason for this lies primarily in the fact that most have outdated enterprise architecture that can be difficult and slow to change. The variety of new services that this company should provide under a very rapid growth in market demand, the constant emergence of new technologies, require adequate changes in the development of information system (IS) as well as changes in the way of performing business. New business models need to be developed through complex and comprehensive electronic communication with all types of partners (e-business), a new approach to IS development should be based on a service-oriented architecture (SOA) and the use of packaged software products and services provided by other companies or independent software vendors.

Thus the objectives of development of insurance companies are usually implemented through the general approach for the development of complex distributed systems and specific international initiatives and standards, in the field of service-oriented business. Despite all efforts, a complex problem of alignment of business and IT, [3, 4, 36, 41], usually is not fully resolved in practice. IT services cannot fully meet the business requirements, i.e. IT is not aligned with business. The problem arises due to different levels of abstraction between the business and IT services (applications). In fact, there is no compliance of levels of abstraction, since the level of abstraction of the implemented IT is low, while business steadily has requirements to automate a high level of business abstractions. An example of the high level of business abstraction is an End-to-End process, which contains a number of chained activities, [14]. On the other hand, IT typically provides services that represent the lower levels of abstraction that can automate individual activities or activities of the parts of the process. For example, bidding, invoicing, contracting, etc.

In the last thirty years, the more general EA approach has been proposed, [5, 29, 37, 38, 39, 42], each of which has its advantages and disadvantages, and they are complementary to each other, [35]. It turned out that the existing EA approaches are not sufficient to cover the domain of companies providing ICT services. Thus, in the telecommunications sector in the last decade appeared The New Generation Operating System and Software (NGOSS). NGOSS program develops international association Telemanagement Forum, and it is an EA for telecom domain [23, 32].

The organization ACORD (Association for Cooperative Operations Research and Development), formed by the insurance companies all over the world, in the 2006 defined development strategy of the business architecture of insurance companies - EA (Enterprise Architecture). The main result of this activity is the ACORD Framework - a framework that provides the architectural basis of insurance companies to faster and easier prepare and implement the changes necessary for a successful

business in a dynamic market, [21]. ACORD framework offers insurance companies a robust, detailed, consolidated, and a complete set of models that support business process innovations, transformations and improving their efficiency.

In this paper, the direction of possible solutions of above mentioned alignment problem is given, through the incorporation of: EA, NGOSS and ACORD approaches. Combining them the methodological framework for the development of a flexible insurance industry domain EA has been achieved.

The following section provides an overview of the literature that has had an impact on the motivation and approach to EA in this paper. The third section gives a brief presentation of the results of the analysis of the current state in the case study of an insurance company, which pointed out the basic characteristics and problems of current business. The fourth chapter presents the main contribution of this paper, through the definition of an insurance company's business architecture. Finally, the fifth section provides an overview of achieved and plans for future work.

II. LITERATURE REVIEW

This section gives a brief overview of the literature, which has had the most influence on this study, whose results are partly shown in this paper. Review is separated in two parts, the first related to the alignment of business and IT (BIA) and the other to Enterprise Architecture (EA).

A. *Business and IT Alignment*

A key factor for the success of the company in a dynamic environment is effective and efficient IT support of business strategy and processes. The paper [36] concludes that in most companies IT and business are not aligned and that it remains a constant concern. Despite the importance of this problem, in the literature still remains unclear definition and in practice the unclear application of this concept. Consultants and IT companies use this concept in ambiguous and often different directions.

The most accepted framework of alignment is given in [22], which is defined by the model for the conceptualization and the strategic management of information technology (called the Strategic Alignment Model). This model describes the BIA in two dimensions (Figure 1), [36]. Strategic coupling (strategic fit) has external focus, directed towards the business environment and internal focus, directed towards administrative structures. The second dimension, functional integration separates business and IT. Along with these dimensions, the model defines four fundamental domains: business strategy, information technology strategy, organizational infrastructure and processes, and infrastructure and information technology processes. These domains should be harmonized in order to achieve alignment. From this model, four perspectives of alignment were derived with specific implications for management practices (Strategy Execution, Technology Transformation, Competitive potential and Service level) [22].

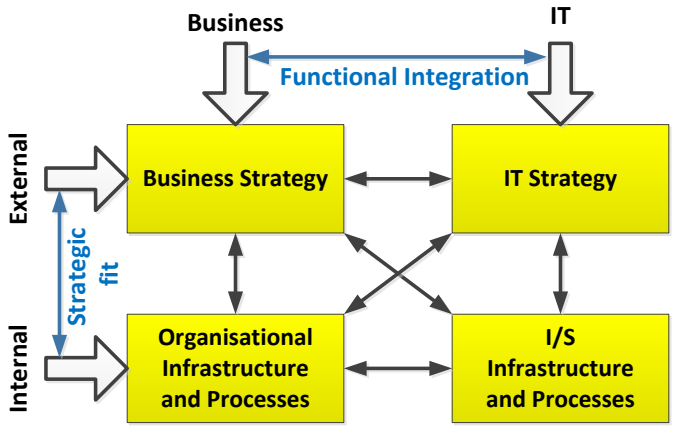

Figure **1**: The 'Strategic Alignment Model' [36]

The paper [8] starts with a thesis that IT strategy usually depends on the business strategy and the alignment of both strategies improves their strategic plans. That paper presents an overview of strategic importance of business and IT alignment, and suggests the use of EE (Enterprise Engineering) approach to achieve this alignment. The necessary components for modeling IT strategy and increase the alignment of business strategy and IT have been identified. According to the EE approach the specific building blocks are defined and a new phase of life cycle required for the incorporation of IT strategy in the EA framework.

In [3], a literature review is conducted and the framework is proposed, useful for evaluating different approaches to the alignment problem. Referring to the results of some studies that have addressed this issue, it was noted that the performance of the business and IT is firmly connected and that the company can not be competitive if their business and IT strategy are not aligned. These studies are oriented at different levels of abstraction, from the operational to the strategic. Strategic alignment occurs when goals, activities and processes of the business organization are in harmony with the information system that supports them, [7]. On the other hand, the functional level of analysis of the existing alignment between business processes and software systems is essential in order to optimize the effectiveness of software support, [3].

In [40], a framework for the specification of requirements, oriented towards company objectives is presented, taking into account the organizational context and that should enable IT department to better understand the business objectives of the organization, with the aim that the IT system better meet business expectations. The process of managing the procurement of automotive company is presented as a case study to illustrate the approach.

B. *Enterprise Architecture (EA)*

EA is a comprehensive approach to modeling organization architecture. At first, it only applied to application development but after that, it became a framework for modeling the entire enterprise. In his paper [42], the author has presented challenges

and vision for enterprise architecture for the next twenty years. Challenges were related to manage complexity of distributed systems. Zahman EA was multiple perspectives approach.

Zahman EA has had a major impact on the first attempt of the U.S. Department of Defense to create an EA. This effort is known as the Technical Architecture Framework for Information Management – TAFIM, [39]. TAFIM EA gave promise of technical projects to be better aligned with business needs. Consequently the US Congress passed an act in 1996, also known as the Information technology Management Reform Act, [6]. In April 1999, the CIO Council, which was formed by CIOs (Chief Information Officer - responsible for major iT) from the main state institutions has launched a project called the Federal Enterprise Architecture Framework – FEAF, [37]. New ideas in this paper were related to segmentation architecture in large enterprises. FEAF, in 2002, was renamed in FEA - Federal Enterprise Architecture.

TAFIM is then submitted to The Open Group, and thus transformed into a standard known as The Open Group Architecture Framework (TOGAF), [29, 38]. In 2005, EA FEA was dominant in the public sector, while GARTNER dominated in the private sector, [5, 11].

EA approaches, discussed above, are very different. The answer to the question "Which approach is best for a particular company," is ambiguous. In [35] a comparison of these approaches is performed using 12 criteria, giving score of 1-4 (4 is the best score). According to this comparison, none of EA approaches that are compared is complete, each of them has its advantages and disadvantages and they are complementary.

However, it appears that previously presented approaches to EA are not sufficient to cover the domain of companies providing ICT services. Thus, in the telecommunications sector in the last decade appeared The New Generation Operating System and Software (NGOSS) program. NGOSS program develops international association Telemanagement Forum, and it is an EA for telecom domain, [23, 32].

NGOSS is a reference architecture for the telecommunications industry, [32]. It contains a set of frameworks which represent the generic classification scheme for design of a complex domain as the telecom domain, [18, 23].

A framework for business processes - eTOM (Enhanced Telecom Operations Map) defines all major business processes within and outside the company, [12-17].

The framework related to the company information - known as SID (Shared Information and Data Model) provides a comprehensive general information model for performing telecom activities in the company, [32, 33].

A framework for system integration - known as TNA (Technology Neutral Architecture) defines the basic principles for the development of NGOSS solutions. Architecture is intentionaly called "Technology - neutral" because it does not define the implementation [20].

Framework for applications - known as TAM (Telecom Application Map) is designed to be used by all participants in the software chain of telecom company. eTOM provides a framework for telecom processes and TAM framework for telecom applications, [19].

Telemanagement Forum changed the name NGOSS industry standard to Frameworx. All events related to the further development of this industry standard for the telecommunications, members of TMF associations can follow through the website, [23].

The organization ACORD (Association for Cooperative Operations Research and Development), is formed by the insurance companies all over the world, in 2006 defined development strategy of the business architecture of insurance companies - EA (Enterprise Architecture). The main result of this activity is the ACORD Framework - a framework that provides the architectural basis of insurance companies to faster and easier prepare and implement the changes necessary for a successful business in a dynamic market, [21].

ACORD framework offers insurance companies a robust, detailed, consolidated, and a complete set of models that support business process innovation, transformation and improving their efficiency. The five basic components of the model are, [24] : (1) The common vocabulary of terms that exist and are used in insurance ecosystem - Business Dictionary. The main purpose of this dictionary is to improve communication through standardization of business terms names and unambiguous mutual understanding of work teams; (2) Model of functionalities that are basic in business of insurance companies - Business Capability Model. This model provides multilevel decomposition of field of business up to the level of business processes. The business functions are located on the upper levels of the hierarchical decomposition and include all the standard features found in insurance companies; (3) Information model that is the reference model for the implementation of enterprise applications of insurance companies - Information Model . This is the most detailed model that represents a conceptual overview of the insurance industry. It is based on UML (Unified Modeling Language) and covers all functional areas of the company and ensures the communication of other XML, EDI and XBRL standard forms with ACORD standards; (4) Data model specifically designed to meet the needs of enterprise data architecture of insurance companies - Data Model. It represents the logical level of entity-relationship model and is used primarily as the basis of a physical model of relational database model for data warehouse; (5) Comprehensive model of components that form business processes with a detailed definition of the interface and service in the entire chain of value creation in insurance companies - Component Model.

In [25], EA is defined as a set of concepts and practice, based on a holistic view of the system, the principles and the common language and long existing disciplines of engineering and

architecture. The paper sets the EA as the architecture of the whole company, including its IT. It also describes the ontology necessary for holistic definition and representation of architecture and highlights the significant challenges faced by IT professionals, educators and researchers. Finally, it is emphasized that EA is one of the most critical tools for the success of the organization and will take on an increasingly important role as the requirements for speed, agility, synergy, efficiency, quality and complexity are escalating.

III. FEATURES AND PROBLEMS OF CURRENT OPERATION OF INSURANCE COMPANY

The methodological approach for the development of a flexible EA for the insurance industry, which is proposed in this paper, has two main steps: analysis of the current state of the company and defining the new architecture of the organization. Enterprise architecture has four layers: business architecture, application architecture, data architecture and technological architecture. In this section we briefly present the results of an analysis of the current state in the case study of an insurance company, [31], and in the next section, business architecture as the first layer of the new architecture is defined.

In the step of the current state analysis, business procedures and business documents are studied, and interviews with the heads of organizational units were conducted. After, IT supports of business processes in the company were analyzed. The result was precise and detailed specification of the company's business, [31]. Below are the basic characteristics of an existing business.

Business is not sufficiently well defined. Technological procedures are the most often, well-defined and documented for the current mode of operations. However, there is a tendency that they slowly change and adapt to the rapid changes required. Business processes are not formally specified in a standard notation such as, e.g.. BPMN (Business Process Model and Notation), [28], which would create the conditions for their proper automation by the IT sector.

System technologies are fragmented. In the company, there are different software products from different manufacturers: operating systems, data management, programming languages, different user interfaces, different applications, and so on. Fragmented solutions in the current mode of operations, are the constraint in the implementation of business processes.

Fragmentation of business processes. Many business processes are very fragmented and often isolated in organizational units. Business processes are adapted to the existing fragmented IT solutions and this is one of the reasons for their fragmentation. In the company, there is no system for business process management (workflow engine) as the technological foundation for the implementation of the business processes, which is another reason why the processes are not automated end-to-end.

Problems of business adaptation. Fragmented processes and system technologies, significantly affect the capacity to adapt to change. It is, for example, seen clearly in the moments of launching a new product or inability to respond to new competitive products.

High costs. Due to the above, operating costs are inevitably higher with a very inefficient processes and a low level of End-to-End process automation. Financial investments in the IT sector are high. Nevertheless, the IT sector usually does not give the required results; IT services cannot meet the business needs of the company.

Meeting the needs of top management. Company's IT system usually can not meet the needs of top management, such as: management of objectives, management of plans, performance management, etc. Because it requires IT services to be at a much higher level of abstraction. The overall conclusion of the analysis of the current state is that the business and IT are poorly integrated, developed in isolation, which leads to problems of business and IT alignment.

IV. DEFINING BUSINESS ARCHITECTURE

Business of companies dealing with insurance is very complex. In order to overcome this complexity and to define business processes, which are many, the standard models for the domain of insurance defined NGOSS and ACORD are used. A model presents a pattern to specify the operations of the company, which is engaged in service-oriented businesses in the insurance industry. According to these models, the processes in the company firstly are classified by similarity at the highest level and then through gradual decomposition detailed specifications are obtained. Thus, business insurance company at the first level of classification consists of three major functional areas (Figure 2):

- Enterprise Management
- Development Management
- Operation Management

Enterprise Management refers to joint activities of the company. This area is a common part not only in companies engaged in insurance industry but in many other ones. Development Management and Operation Management are the core of insurance companies business. For each of these areas a process class can be further defined, representing so-called functional domains. They are unique in the system (only one is defined). These functional domains according to the NGOSS also called "horizontal processes". In addition to the functional domains, the so-called "vertical processes" or processes end-to-end are defined. They are defined in terms of the point of view of users of the company and in the exercise of passing through horizontal processes (different functional domains).

Figure 2 shows the three major functional areas and functional domains (horizontal processes) dividing these two areas. In addition, it shows the vertical (end-to-end) processes.

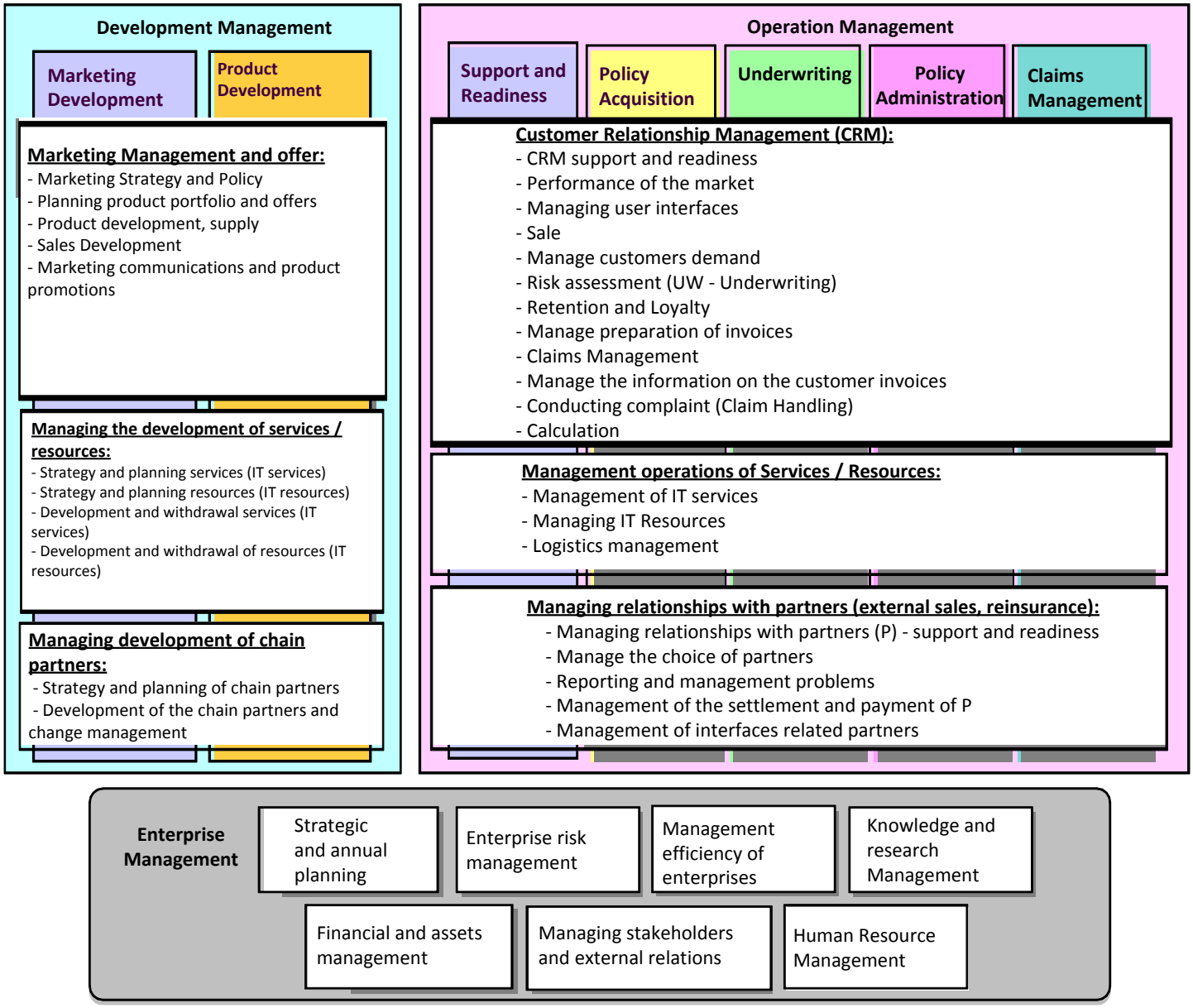

Figure 2: Process map of insurance company (starting level)

Enterprise Management includes the following functional domains:

- Strategic and annual planning
- Enterprise risk management
- Management efficiency of enterprise
- Knowledge and research management
- Financial and assets management
- Managing stakeholders and external relations
- Human Resource Management

Development Management includes the following functional domains (horizontal processes):

- Marketing management
- Management of development Service/Resource
- Managing development of chain partners.

Operation Management includes the following functional domains (horizontal processes):

- CRM – Customer Relationship Management
- Management operations of Service/Resource
- Management of relationships with Suppliers / Partners.

End-to-end processes related to the field of Development Management are classified into two major groups:

- Marketing development
- Product development.

End-to-end processes pertaining to Operation management, are classified into five major groups:

- Support and readiness,
- Policies cquisition,
- Underwriting,
- Policy administration,
- Claims management.

Business processes are formally defined in order of their automated transformation in accordance with MDD approach [30]. One of the major problems in modeling and specification of business processes is the communication of business experts with software engineers. It is therefore of utmost importance, the choice of a common language and a methodology for modeling business processes. The most graphically oriented languages for business process modeling are BPMN 2.0 (*Business Process Model and Notation*) [2, 28], UML activity diagrams, [27], EPC (*Event-driven Process Chain*) [10, 34], IDEF3 (*Integrated DEFinition for Process Description Capture Method*), [26], and Petri nets, [1] . Version 2.0 of BPMN modeling language for business processes has a very rich set of concepts and provides several different types of diagrams to express the choreography and orchestration at different levels of abstraction and in this study BPMN, [31], has been used.

V. CONCLUSION

This paper points out the problems, the insurance companies are faced with and that are a direct consequence of outdated and inflexible business architecture not allowing for easy and fast changes. In order to solve these problems, the main features of insurance companies business are defined. These features relate to business processes and IT supporting them. Starting with premise that *IT and Business Alignment* is of essential importance, an approach for solving the alignment problem is given and necessary initial conditions are given. First of these conditions is defining the Enterprise Architecture, here following the general TOGAF approach, [29] and two domain approaches, suitable for insurance companies (NGOSS, [18] and ACORD, [24]).

This paper defines the business architecture using the map of insurance company business processes, by applying the abstractions of classification and decomposition. A kind of concretization of the above mentioned approaches is performed in the context of the insurance company. Three categories of functional areas and functional domains (horizontal processes) are identified, in what are divided two of these areas, i.e. core business. In addition, the vertical processes i.e. end-to-end processes, are defined.

From this basic specification of enterprise architecture, given in this paper, one can see that the business in insurance companies is very complex. Complex operations require the construction of a complex information system for its automation and support. To build such an information system it is necessary to define the multilayer application architecture, which is planned for future work. In addition, it should be noted that the complexity of business arises from its multi-dimensional nature. Namely, the division of business to the functional domains is only one view of the business. End - to - end processes represent a completely different view of the business that is orthogonal with respect to functional domains. Besides, new dimensions, such as: funkctional domains, end-to-end processes, for certain class of services, etc.

Complex business architecture characterized by different concepts, such as the functional domains, the end-to-end processes, subdomains and functionality, non functional requirements, and so on. The software architecture (application architecture) must support all of these different concepts. Diverse business requirements dictate different categories of software that software architecture should contain.

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Dominant Malaria Risk Factors in Keerom Papua, Indonesia: A Prospective Cohort Study Analyzed by Multivariate Logistic Regression

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***Abstract*- Introduction:** Keerom regency is the most prevalent malaria in Papua (17.7%). The control program launched since 1963 were not able to decrease the prevalence. It is necessary to find out the dominant malaria risk factors in order to enhance the malaria control program.

Methods:

A prospective cohort prognostic study followed 606 subjects for three months to find out the malaria dominant risk factors. Prior to finding the dominant risk factors, bivariate analysis using chi square and multivariate logistic regression were used in this study.

Results:

Among 15 identified risk factors (namely sex, age, ethnic group, education, duration of stay at Keerom, nutritional status, socio economic status, forest activity, drug prevention, using insecticide, using insecticide treated nets, night time activity, animals around the house, the distant of breeding places and health centers from house), only 6 risk factors considered as dominant risk factors. The dominant risk factors are socio economic status (RR 1,430 95% CI 1,025- 1,995), night time activity (RR 1,624 95% CI 1,030-2,561), sex (RR 1,543 95% CI 1,116-2,133), forest activity (RR 0,587 95% CI 0,369-0,943), nutritional status (RR 1,405 95% CI 1,017-1,941) and duration of stay at Keerom (RR 2,519 95% CI 1,462-4,340).

Conclusion:

There were 6 risk factors considered as dominant risk factors in Keerom. Hopefully this finding could be used to enhance the malaria control program in Keerom.

***Index Terms*-** Dominant risk factors, malaria

I. Introduction

Indonesia was considered has the highest malaria prevalence and incidence in South East Asia. The population at risk was 31,427,995 out of 244,420,912 people or 12.86% and causing Malaria Mortality Rate of 0.83/100,000. This number posted Indonesia as the third country after Timor Leste (4.90/100,000) and Myanmar (2.40/100,000). This condition could be understood since the Annual Parasite Incidence of Indonesia was $4.37^0/_{00}$. compared to Timor Leste and Myanmar which has the Annual Parasite Incidence of $43.93^0/_{00}$ and $10.21^0/_{00}$ respectively [1]

Based on clinical finding, the national prevalence of malaria in Indonesia was 2.85%. This prevalence mainly contributed by 3 provinces namely West Papua (26.1%), Papua (18.7%) and East Nusa Tenggara (12.0%). A survey conducted by Ministry of Health showed the average prevalence in Papua was 65.5% (diagnosed clinically) or 18.7% (smear examination). Among the 29 regencies in Papua, Keerom showed the highest prevalence (82.1% clinically and 17.7% smear examination) [2, 3].

The purposes of this study are to find out the dominant malaria risk factors in Keerom in order to enhance the malaria control in Keerom. As much as possible literatures from all over the malaria countries were used to collect the risk factors so they could be used to find out the dominant risk factors in Keerom.

II. Methods

A prospective cohort study for 3 months was done. The data were analysed with bivariate and logistic regression in order to find out the main malaria risk factors.

Study area:

The study was carried out at Keerom Regency, Papua, Indonesia. Keerom with 46,282 inhabitants is located in the southern part of Jayapura which is the capital of Papua [4]. Keerom is divided into six districts (Web, Senggi, Waris, Arso, Arso Timur, Skanto). The regency is located in low land area 4 m above sea level. The climate and weather are homogeneous all over Keerom. Hence, climate and weather are not considered having any influences in this study.

Subjects:

Twenty five blocks census and 10 families in every block census were chosen randomly from 6 districts. The average number of family member is 4.289, so that the number of subjects chosen was around 1.000. However a total of 777 subjects were able to collect in this study.

A questionnaire inquiring for malaria risk factors was administered and physical and smear examination for malaria were done to all subjects (including collection of body weight, height and urine test for β HCG). The positive malaria subjects were excluded from study and the remaining (606 subjects) followed for 3 months for prospective cohort study.

Those considered as malaria risk factors are sex, age, ethnic group, education level, duration of stay at Keerom, nutritional status, socio economic status, forest activity, drug prevention, using insecticide, using insecticide treated bed nets, night time activity, animals around the house, the distant of breeding places and Health Centers from house.

There are many ethnics group who lived in Keerom. Some of them are local people with several tribes and the others are ethnics who came from other part on Indonesia. For simplicity the ethnics in Keerom was divided in two ethnics group, the Papuans (the local people) and Non Papuans (from other part of Indonesia).

The nutritional status in this study was measured by age (0-5; 6-17 and 18+ years), weights and heights according to WHO and Blössner et al [5, 6]. Therefore in this study ages was grouped into this manner. Nutritional status was defined as poor (under nourished and overweight) and normal. People in poor nutritional status prompt to easily getting malaria.

The socio economic status in this study defined as the amount of expenses per person per month with the cut off value of IDR.280000 or $23.3 [7].

The education was influencing malaria occurrence as shown in Sulawesi (Indonesia), some countries in Africa and Vietnam [8-11]. Thang divided the education level to None, Primary school and Secondary school or higher. These levels of education were used in this study as well.

Statistical analysis:

Data were double entered, checked and cleaned. The data set analyzed with Statistical Product for Service Solutions (SPSS) version 19. Descriptive statistics and chi-square test were used to test for significant difference ($p<0.05$). A logistic regression was used to carry out a multivariate analysis for the malaria risk factors.

Ethical consideration:

The study was approved by the ethical committee of Faculty Medicine Hasanuddin University, Makassar, Indonesia. The fundamental principles of ethics in research on human participants were upheld throughout the study. The research procedures were disclosed to the participants and informed consent was sought from them or their legal representatives. Nobody was coerced into the study and if individuals wished to withdraw, they were allowed to do so without prejudice.

III. Results

There were 777 people in the study, but after checked their malaria condition with blood smear examination, 171 people excluded from the study. The cohort started with 606 negative smear examination people who were then followed up for 3 months to check their malaria condition again.

Among the 606 participants (Table 1), 72.4% were represented by Non Papuans and mostly above 18 years of age. Keerom is new developed regency and inhabited by 76.6% people who stayed no longer than 2 years. Most of the people worked as government officials especially the Non Papuans and only 23.1% as forest workers either as peasant or hunter. People whose living expenses under IDR.280000 were 25.9% and the rest considered living above the poverty line. In total 32.2% of the population were in poor nutrition status (under nourished and overweight). Keerom still a remote area surrounding with jungle, accordingly only 8.1% people have night time activity.

The environment factors in relation with malaria occurrence were the distant of breeding places and the distant of Health Center to house. The distant of breeding places that was less than 500 m from housing (22.8%) considered at high risk. Similarly the distant of health center more than 500 m (23.4%). More than half population (67.3%) used ITN (Insecticide Treated Nets) and few additional people were sleeping without bed net. As commonly happens, animals around the house could protect against mosquito bite especially the zoophilic anopheles and in turn could prevent malaria occurrence. Without understanding of this knowledge more than half people in Keerom breed their animals around their house (56.3%).

Most people have negative blood smear examination after 3 months followed up (80.2%) the additional people (19.8%) were positive. This finding slightly higher than the results of the former survey conducted in Keerom (17.7%) [3]

To find out the dominant malaria risk factors, a bivariate and multivariate analysis was done. The bivariate analysis showed that 10 out of 15 risk factors have $p < 0.05$ (Table 2). Those with $p< 0.05$ could be further analyzed by backward stepwise multivariate logistic regression. However, only 6 risk factors considered as the main risk factors connected to the malaria occurrence (Table 3).

IV. Discussion

Keerom is a new regency and gave a plenty opportunities for works. Many people came to Keerom from other part of Papua and Indonesia for work. Almost all of them were susceptible to malaria and have no immunity at all. Therefore malaria prevalence in Keerom was very high. Several efforts have been done to control, however the prevalence still very high. The last survey done in this area reveal the prevalence of 17.7% [3]. The main effort to eliminate malaria in Keerom was media campaign, prevention against mosquito bite such as insecticide, ITN (Insecticide Treated Nets) and Indoors Residual Spraying.

Some aspects have to be taken into consideration in choosing risk factors analyzed in the study. In addition the risk factors have to be chosen statistically and based on the literatures. There were 10 out of 15 risk factors could be found using chi square test as shown in Table 2.

If female factor considered as reference, it showed that male likely 1.543 times having malaria than female. This finding was correspond to the former study in Papua [3].

The Papuans commonly practicing subsistence agriculture and exploit forest product, yet the Non Papuans who are transmigrated from Java mostly work as government official and as peasant in the forest. The Papuans is more resistant to malaria than the Non Papuans [12]. This condition was in relation with the duration of stay in endemic area and the immunity against malaria. Accordingly people who were stayed longer than 2 years in Papua were more resistant to malaria than those who were stayed less than 2 years [13]. In this study, ethnic groups considered as a risk factor. Non Papuans has higher prevalence than Papuans. It could be understood since the Non Papuans, who came from non-endemic area, has low immunity against malaria than Papuans unless they already stayed longer in Papua [12].

Duration of stay in Keerom has a big influence in malaria occurrence as shown in Table 2. This finding very much correspond to the study of Barcus et al [13] where immunity to malaria is the main factor influencing malaria occurrence.

The other risk factor was education level. The education level together with knowledge and behavior gave a big contribution to malaria occurrence [8, 9, 11]. The lower education level should have the higher malaria prevalence, but this study showed the other way round (Table 2). This situation could be happened since many others factor influenced the malaria occurrence in Keerom and have to be analyzed further.

Many studies showed that nutritional status influenced the malaria occurrence and vice versa [14, 15]. Poor nutritional status prompts to high occurrence of malaria than the normal nutritional status, as shown in this study (Table 2) and correspond to the former study in Papua [3].

The other risk factor is socio economic status. There is a relationship between malaria and socio economic status [15-17]. In Vietnam and some other countries the main malaria risk factor was poverty [11, 17]. In this study the lower socio economic status more likely to have malaria occurrence 1.430 times than the higher socio economic status (p=0.038).

According to Thang, malaria prevalence was higher in people who have forest activity [11]. In this study we found that the prevalence was lower in people who have not forest activity. Since Keerom is newly developed regency, many people from non-endemic area came for works, many forests were opened to find more space and many people live near the forest. Accordingly this situation caused a high prevalence of malaria. This situation could influence the relation between forest activity and malaria occurrence in Keerom.

The above explanation could also explain why the night time activity and not using ITN have a lower prevalence in this study and why this study not correspond to the former study by Abdella and Safeukui-Noubissi [10, 18].

The last factor included in the bivariate analysis was breeding places distant. In this study we found that the breeding place distant was a malaria risk factor similar to study by Alemu and Barbieri [19, 20].

The bivariate analysis and logistic regression eliminated those 10 risk factors and the remaining 6 factors considered as main risk factors namely sex, socio economic status, night time activity, forest activity, duration of stay and nutritional status.

V. Conclusions

There are 6 dominant malaria risk factors in Keerom. Hopefully these 6 risk factors could be used to enhance malaria control program in Keerom.

Authors' contributions

All the authors participated significantly in the analysis, drafting of the manuscript and writing the final version of the paper. BS conceptualized the study. NN, AA and AN contributed towards the statistical analysis.

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Table 1 Baseline characteristic of the study population

	Study population n = 606	n	%
1	Ethnic groups		
	- Non Papuans	439	72.4
	- Papuans *)	167	27.6
2	Sex		
	- Female	328	54.1
	- Male*)	278	45.9
3	Age groups		
	- 0-5 years	18	3.0
	- 6-17 years	81	13.4
	- >18 years *)	507	83.7
4	Duration of stay		
	- < 2 years	464	76.6
	- > 2 years *)	142	23.4
5	Education level		
	- None	76	12.5
	- Primary school	207	34.2
	- Secondary school or higher *)	323	53.3
6	Socio economic status (based on the expenses per person per months		
	- < IDR.280,000	157	25.9
	- > IDR.280,000 *)	449	74.1
7	Forest activity		
	- Yes	140	23.1
	- No *)	466	76.9
8	Night time activity		
	- Yes	49	8.1
	- No *)	557	91.9
9	Drug prevention		
	- No	378	62.4
	- Yes *)	228	37.6
10	Using insecticide		
	- No	335	55.3
	- Yes *)	271	44.7
11	Using Insecticide Treated Nets (ITN)		
	- No	198	32.7
	- Yes *)	408	67.3
12	Animals around the house		
	- No	265	43.7
	- Yes *)	341	56.3
13	Nutritional status		
	- Poor	195	32.2
	- Normal *)	411	67.8
14	Distant to breeding places		
	- < 500 m	138	22.8
	- > 500 m *)	468	77.2
15	Distant to health services (health centers)		
	- > 500 m	142	23.4
	- 250-500 m	132	21.8
	- < 250 m *)	332	54.8
16	Blood smear examination		
	- Positive	120	19.8
	- Negative	486	80.2

*)Reference

Table 2 Risk factors, bivariate analysis

Variables	Blood smear examination				p value	RR	95% CI	
	Positive		Negative				Min	Max
	n	%	n	%				
Sex								
Male	68	24,5	210	75,5	**0,008**	1,543	1,116	2,133
Female*)	52	15,9	276	84,1				
Age								
0-5 y	4	22,2	14	77,8	0,804			
6-17 y	18	22,2	63	77,8				
>18 y*)	98	19,3	409	80,7				
Ethnic groups								
Non Papuans	95	21,6	344	78,4	**0,006**	1,446	0,966	2,163
Papuans*)	25	15,0	142	85,0				
Education level								
None	11	14,5	65	85,5	**0,016**			
Primary school	31	15,0	176	85,0				
>Secondary school*)	78	24,1	245	75,9				
Duration of stay								
≤2 years	107	23,1	357	76,9	**0,000**	2,519	1,462	4,340
>2 years*)	13	9,2	129	90,8				
Nutritional status								
Poor	48	24,6	147	75,4	**0,041**	1,405	1,017	1,941
Normal*)	72	17,5	339	82,5				
Socio economic status								
< IDR.280000	40	25,5	117	74,5	**0,038**	1,430	1,025	1,995
> IDR.280000	80	17,8	369	82,2				
Forest activity								
Yes	18	12,9	122	87,1	**0,019**	0,587	0,369	0,934
No*)	102	21,9	364	78,1				
Drug prevention								
No	72	19,0	306	81,0	0,549	0,905	0,653	1,254
Yes*)	48	21,1	180	78,9				
Using insecticide								
No	57	17,0	278	83,0	0,056	0,732	0,531	1,008
Yes*)	63	23,2	208	76,8				
ITN								
No	30	15,2	168	84,8	**0,045**	0,687	0,471	1,001
Yes*)	90	22,1	318	77,9				
Night time activity								
Yes	15	30,6	34	69,4	**0,048**	1,624	1,030	2,561
No*)	237	34,8	445	65,2				
Animals around the house					0,754	1,053	0,763	1,453
No	54	20,4	211	79,6				
Yes*)	66	19,4	275	80,6				
Breeding places distant								
≤500 m	38	27,5	100	72,5	**0,009**	1,572	1,125	2,196
>500 m*)	82	17,5	386	82,5				
Health centers distant								
>500 m	30	21,1	112	78,9	0,898			
250-500 m	26	19,7	106	80,3				
< 250 m*)	64	19,3	268	80,7				

Table 3 Backward stepwise logistic regression of the malaria risk factors

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Socio economic status(1)	.389	.257	2.298	1	.130	1.476	.892	2.442
	Night time activity(1)	.717	.358	4.009	1	.045	2.049	1.015	4.136
	Sex(1)	.599	.216	7.665	1	.006	1.820	1.191	2.780
	Education level			1.979	2	.372			
	Education level (1)	-.271	.386	.495	1	.482	.762	.358	1.624
	Education level (2)	-.359	.263	1.864	1	.172	.699	.417	1.169
	Forest activity(1)	-.363	.321	1.280	1	.258	.696	.371	1.305
	ITN(1)	-.325	.257	1.594	1	.207	.723	.437	1.196
	Breeding places distant(1)	.238	.267	.791	1	.374	1.268	.751	2.141
	Nutrition status(1)	.631	.229	7.582	1	.006	1.880	1.200	2.947
	Duration of stay(1)	1.091	.331	10.848	1	.001	2.977	1.555	5.698
	Constant	-2.747	.391	49.447	1	.000	.064		
Step 2[a]	Socio economic status(1)	.483	.234	4.266	1	.039	1.621	1.025	2.563
	Night time activity(1)	.753	.355	4.498	1	.034	2.124	1.059	4.262
	Sex(1)	.597	.216	7.641	1	.006	1.817	1.190	2.774
	Education level			2.274	2	.321			
	Education level (1)	-.311	.383	.660	1	.417	.733	.346	1.552
	Education level (2)	-.377	.261	2.080	1	.149	.686	.411	1.145
	Forest activity(1)	-.402	.318	1.599	1	.206	.669	.359	1.247
	ITN(1)	-.303	.256	1.398	1	.237	.739	.447	1.220
	Nutrition status(1)	.613	.228	7.231	1	.007	1.846	1.181	2.885
	Duration of stay(1)	1.120	.330	11.527	1	.001	3.066	1.606	5.855
	Constant	-2.722	.390	48.838	1	.000	.066		
Step 3[a]	Socio economic status(1)	.492	.233	4.453	1	.035	1.635	1.036	2.583
	Night time activity(1)	.721	.351	4.229	1	.040	2.057	1.034	4.090
	Sex(1)	.614	.215	8.150	1	.004	1.848	1.212	2.816
	Forest activity(1)	-.537	.305	3.107	1	.078	.584	.322	1.062
	ITN(1)	-.332	.250	1.755	1	.185	.718	.439	1.172
	Nutrition status(1)	.562	.225	6.260	1	.012	1.754	1.129	2.724
	Duration of stay(1)	1.210	.325	13.869	1	.000	3.354	1.774	6.340
	Constant	-2.902	.373	60.399	1	.000	.055		
Step 4[a]	Socio economic status(1)	.479	.232	4.243	1	.039	1.614	1.024	2.546
	Night time activity(1)	.725	.352	4.252	1	.039	2.064	1.037	4.112
	Sex(1)	.608	.214	8.042	1	.005	1.837	1.207	2.796
	Forest activity(1)	-.652	.292	4.979	1	.026	.521	.294	.924
	Nutrition status(1)	.564	.224	6.326	1	.012	1.757	1.132	2.726
	Duration of stay(1)	1.219	.324	14.123	1	.000	3.384	1.792	6.391
	Constant	-2.978	.370	64.941	1	.000	.051		

a. Variable(s) entered on step 1: Socio economic status, Night time activity, Sex, Education level, Forest activity, ITN, Breeding places distant, Nutrition status, Duration of stay.

English Vocabulary Learning Strategies Employed by Thai Tertiary-Levels Students with Different Genders and Levels of Vocabulary Proficiency

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Abstract- The present study aims to examine the vocabulary learning strategies employed by Thai-tertiary level students with different genders (female/male) and levels of vocabulary proficiency (high , moderate and low) . The VLS questionnaire was employed to elicit the data from 905 Thai EFL students studying in the Northeast of Thailand. Data analysis involved descriptive statistics, an Analysis of Variance (ANOVA) and the chi-square test. The results revealed that students' gender and vocabulary proficiency level affected their overall VLS use, use of VLSs by the category and the individual strategy levels. The variation patterns of students' VLS use were found in relation the two variables**.**

Index Terms- vocabulary learning strategies, gender, vocabulary proficiency

I. INTRODUCTION

In the sphere of second language learning, vocabulary is an indispensable part of the four language skills. Without vocabulary, the skills of language learning including reading, writing, speaking and listening may not be successfully achieved (Zhi-liang, 2010). Mastery of vocabulary is very important for L2 learners as vocabulary can support them when they communicate in the target language. L2 learners who lack vocabulary knowledge may find it difficult to find the right words to communicate in the target language. They may, however, express their meaning with gestures and mere sounds. English vocabulary skill is considered a necessary skill that students studying at the tertiary level need to be equipped with, since so many textbooks and journals assigned to be read are written in English. According to Baba (2009), L2 learners are aware that their limited vocabulary will hinder a good quality of writing. They perceive the importance of vocabulary knowledge to their writing performance. When language learners are assigned to write a composition, vocabulary is a necessary tool for them to complete the task. If the learners have enough vocabulary items in their repertoire, they will be able to choose the right words to convey the meanings and their ideas in writing. Therefore, L2 learners need to have sufficient vocabulary knowledge so that they can perform at levels that are required for them to succeed.

"Vocabulary learning is one of the major challenges that foreign language learners face during the process of learning a language" (Ghazal 2010, p. 84). It is a continual process of encountering new vocabulary items in meaningful and comprehensible language contexts (Harmon, Wood and Kiser, 2009). Further, it is a more complex process than simply memorising the meanings of words because it encompasses seeing, hearing and using words in meaningful contexts (Bintz, 2011; Daniels and Zemelman, 2004). In the context of English teaching in Thailand, some Thai EFL students are taught to repeat the English words spoken and memorise the words' spelling and meanings in a teaching method which seems to be passive (Khuvasanond, Sildus, Hurford and Lipka, 2012). This may account for the inadequacy of vocabulary knowledge among some Thai secondary school students, which is then passed on through their tertiary-level education. However, there are other students who can tackle the vocabulary problems on their own. They seem to have sufficient vocabulary knowledge and are considered better English language learners. For these students, vocabulary learning strategies (VLSs) may help facilitate their vocabulary learning; as has been asserted by Nation (2001), a large and rich vocabulary can be acquired with the help of VLSs.

In the context of instruction in English as a foreign language in Thailand, a small number of research works have been carried out to investigate the students' VLS use. One research work conducted by Intaraprasert (2004) is considered a preliminary exploratory investigation into the types of VLSs that have been reported without any variables taken into account. Other research works by Siriwan (2007) and Suppasetseree and Saitakham (2008) have been carried out to examine whether the students' VLS use is related to a limited number of investigated variables. No empirical research work in the area of VLSs has been carried out in a wider context as in a tertiary level. The present study seeks to fill out the gaps by examining how tertiary-level students of different genders and levels of vocabulary proficiency deal with their vocabulary learning. Specifically, the present study aims to answer 1) What is the frequency of the VLSs reported being employed by tertiary level students of different genders and levels of vocabulary proficiency and 2) Do the students' choices of VLSs vary significantly according to two investigated variables? If they do, what are the main patterns of variation?

II. RESEARCH ELABORATION

A. Terms Used in the Study

-Vocabulary Learning Strategies (VLSs)

The term 'vocabulary learning strategies' refers to any set of techniques including actions or mental processes that Thai students studying at the tertiary level report employing in order to facilitate their vocabulary learning with the purpose of enhancing their vocabulary knowledge.

-Tertiary-Level Students

The term 'tertiary-level students' refers to undergraduate students who have been studying in a regular programme provided by the four types of institutions which are the institutions offering formal education mainly for the tertiary level. They are public/autonomous public university, private college/ university, Rajabhat University and Rajamangala University of Technology.

-Students' Vocabulary Proficiency

The term 'students' vocabulary proficiency' refers to the students' vocabulary proficiency test scores which were rated as high, medium and low proficiency. The students' test scores were obtained through the researcher-constructed vocabulary proficiency test.

B. Participants

As the population under this study was the students studying in the four different types of institutions (33 institutions) offering education for the tertiary level in the Northeast of Thailand, a stratified random sampling was employed to ensure that students studying in different types of institution would not be excluded. A total of 905 students from 11 out of 33 institutions participated in the study. The distributions of students within gender were 261 female and 644 male students. In regard to the levels of students' vocabulary, the 'Third Technique' suggested by Madsen (1983) was employed to classify the students into high, moderate and low vocabulary proficiency levels based on the scored obtain through the vocabulary proficiency test. In this technique, the students' test scores were divided into three equal groups, the top scoring third, the middle scoring third and the bottom scoring third. Thus the proportion of the participants with high, moderate and low proficiency was well balanced as 302, 295,308 students, respectively.

C. Instrument

In the present study 2 research instruments were employed; the VLS questionnaire and the vocabulary proficiency test. In the questionnaire, a 4 point rating scale in which 'never' was scored as 1, 'sometimes' was scored as 2, 'often ' was scored as 3 and 'always or almost always' was scored as 4, was employed to collect the data. The main VLS items were modified from Intaraprasert (2004) and Siriwan (2007). A few VLS items were modified from Schmitt (1997), Pemberton (2003) and Wink & Adulh (2007). 40 strategies altogether were singled out from the VLSs proposed by the scholars mentioned above. Some were adopted without modification (16 items), while the others were adapted (24 items). Alpha Coefficient (α) was used to estimate the internal consistency of the questionnaire. The reliability estimate based on 905 students of the whole set of VLS items was .94. Reliability was also estimated for VLS items in each of three analytic categories; DMV, EKV and RKV. Based on 905 students, these reliability measures were .81,.88 and .86. Therefore, the reliability estimate of the whole set of VLS items as well as the items in each of the categories was considerably higher than the acceptable reliability coefficient of .70, which is the rule of thumb for research purpose (Fraenkel and Wallen, 2000).

With regard to the vocabulary proficiency test (VPT), Thornbury (2007) has suggested that to construct any vocabulary test, the various aspects of word knowledge must be involved. The VPT was designed to assess students' vocabulary knowledge in as many aspects as possible, for examples, word association, synonym, antonym, polyseme, vocabulary in contexts of sentences, paragraphs, and entire passages. In the VPT, a variety of test formats was designed to assess the students' vocabulary proficiency level, i.e., multiple-choice, matching the right meaning, finishing the sentence, word substitution, multiple-choice paraphrasing and gap-filling. In selecting the acceptable test items of the VPT, the content validity, test reliability, level of difficulty and the power of discrimination of the test items were taken into consideration. In terms of the content validity, the VPT was accepted by 5 experts in the field of English language teaching as appropriate to be used to assess the students' vocabulary proficiency level in terms of the test formats and test tasks.

In order to check the test reliability, level of difficulty and the power of discrimination of the test items, the draft of VPT containing 77 items were administered to 180 students whose characteristics were similar to those who subsequently participated in the main stage. Split-half method was employed to estimate the test reliability of the VPT. The result of the split-half procedure was 0.78 which was above the acceptable criterion of 0.7 for test reliability as suggested by Fraenkel and Wallen (2000). In relation to the level of difficulty and the power of discrimination of the test items, the "Third Technique" as mentioned earlier was employed to measure the item difficulty and the power of discrimination of the test items in the VPT. Only the test items which met the criterion value of 0.20-1.00 for the level of difficulty and 0.20-0.80 for power of discrimination as suggested by Garrett (1996, cited in Castillo, 1990) were accepted to be used as final test items in the VPT. 66 out of 77 test items were acceptable; however, 60 items were needed to be used in the test the students' vocabulary proficiency.

E. Procedure

The VLS questionnaire, as well as the VPT was administered to 905 participants from 11 educational institutions. The VPT was administered first, followed by the VLS questionnaire.

F. Analysis

Data obtained through the VLS questionnaire were analysed at three different levels: 1) overall VLS use; 2) use of overall VLSs by the three main categories, including the Discovery of Meaning or Other Aspects of Vocabulary Items (DMV), the Retention of the Knowledge of Newly-Learned Vocabulary Items (RKV) and the Expansion of Knowledge of Vocabulary (EKV); and 3) use of 40

individual VLSs. Descriptive statistics (mean and its S.D.) was employed to describe the students' VLS use for two levels; overall VLS use and use of overall VLSs by the category level. An analysis of variance (ANOVA) was performed to assess the overall mean frequency score of the strategy used in relation to 1) gender and 2) vocabulary proficiency. If there was a situation in which the researcher obtained significant differences among the variables with more than two levels, like levels of vocabulary proficiency, then the post hoc *Scheffe's test* was performed to pinpoint which pair was significantly different. The chi-square test was performed to examine the significant variation patterns in students' reported VLS use at the individual VLS level by genders and levels of vocabulary proficiency. For the chi-square test facilitated by SPSS program, the responses of 1 and 2 ('Never' and 'Sometimes') were consolidated into "low strategy use" category, while the responses of 3 and 4 ('Often' and 'Always' or 'Almost always') were consolidated into "high strategy use" category.

III. FINDINGS

Findings are presented according to the three different levels of data analysis; the overall VLS use, use of VLSs by the three main categories and use of individual VLS use. Each of the three levels is presented in according to students' gender and level of vocabulary proficiency, respectively.

3.1 Variation in the Students' Reported Overall VLS Use

Table 1. Summary of the Students' Reported Overall Reported VLS Use

Variable		Number	Mean	S.D.	Sig. Level	Variation Pattern
1.Gender	Female	644	2.29	.40	P<.001	Female > male
	Male	261	2.17	.44		
2.Vocabulary Proficiency	High	302	2.44	.39	P< .001	High>Moderate, High>Low
	Moderate	295	2.20	.38		
	Low	308	2.13	.40		

As indicated in Table 1, the frequency of students' overall VLS use varied significantly according to gender. The mean frequency scores of female and male students were 2.29 and 2.17, respectively. That is, the female students reported employing VLSs significantly more frequently than their male counterparts in overall VLS use. In respect of the vocabulary proficiency level, the ANOVA results reveal that the frequency of students' overall VLS use varied significantly according to this variable. The results of post hoc Scheffe's test reveal that students with high vocabulary proficiency employed VLSs significantly more frequently than those with moderate and low proficiency levels with the mean frequency scores of 2.44, 2.20 and 2.13, respectively. However, no significant differences in the use of VLSs were found between those whose vocabulary proficiency levels were moderate and low.

3.2 Variation in the Students' Reported Use of VLSs by the Three Categories

Table 2. Variation in the Students' Reported use of VLSs by the DMV, RKV and EKV Categories according to Gender

Strategy Category	Female (n=644)		Male (n=261)		Sig. Level	Variation Pattern
	$\bar{x}$	**S.D.**	$\bar{x}$	**S.D.**		**Pattern of Variation**
1) DMV	2.52	.49	2.41	.52	P<.01	Female > male
2) RKV	2.12	.41	2.01	.46	P<.01	Female > male
3) EKV	2.36	.43	2.23	.46	P<.001	Female > male

Table 2 reveals that significant variations were found according to gender. Female students reported employing VLSs significantly more frequently than their male counterparts in all three categories.

Table 3. Variation in the Students' Reported use of VLSs by the DMV, RKV and EKV Categories according to Levels of Vocabulary Proficiency

Proficiency Level	High (n=302)		Moderate (n=295)		Low (n=308)		Sig. Level	Variation Pattern
Strategy Category	$\bar{x}$	**S.D.**	$\bar{x}$	**S.D.**	$\bar{x}$	**S.D.**		
1)DMV	2.72	.48	2.41	.47	2.34	.47	P<.001	High>Moderate, High>Low
2)RKV	2.25	.42	2.04	.40	1.97	.43	P<.001	High>Moderate, High>Low
3)EKV	2.50	.43	2.26	.42	2.21	.43	P<.001	High>Moderate, High>Low

The ANOVA results in Table 3 present significant differences in the mean frequency scores of students' use of VLSs in all three categories according to the students' vocabulary proficiency levels. The results of post hoc Scheffe's test indicate that students with high vocabulary proficiency employed VLSs significantly more frequently than those with moderate and low vocabulary proficiency

levels in DMV, RKV and EKV categories. However, no significant differences in the use of VLSs were found between those with moderate and low vocabulary proficiency levels in all three categories.

3.3 Variation in the Students' Reported Use of Individual VLSs

Table 4. Variation in the Students' Reported Use of Individual VLSs according to Gender

Individual VLS use	**% of high use** (3 or 4)		**Observed** x^2
Used more by female (12 VLSs)	**Female**	**Male**	
1.EKV7 Attending classes of every module regularly to expand knowledge of vocabulary items	81.2	74.3	$x^2 = 5.34*$
2.DMV5 Using a dictionary to discover the meaning or other aspects of vocabulary items	70.7	49.0	$x^2 = 37.84***$
3.EKV13 Singing or listening to English songs to expand knowledge of vocabulary items	64.3	55.2	$x^2 = 6.53*$
4.DMV6. Asking friends to discover the meaning or other aspects of vocabulary items	55.2	47.5	$x^2 = 4.69*$
5.EKV15 Practicing vocabulary translation from Thai into English and vice versa to expand knowledge of vocabulary items	50.2	42.1	$x^2 = 4.78*$
6.RKV 8 Associating pictures to vocabulary items to retain knowledge of newly-learned vocabulary items	45.2	36.8	$x^2 = 5.36*$
7.DMV7 Asking teachers to discover the meaning or other aspects of vocabulary items	42.1	34.9	$x^2 = 4.03*$
8.EKV4 Studying vocabulary section in one's textbook to expand knowledge of vocabulary items	39.0	29.5	$x^2 = 7.21**$
9.EKV10 Watching English programme channels or listening to English radio programmes to expand knowledge of vocabulary items	37.7	29.5	$x^2 = 5.51*$
10.EKV11 Surfing the Internet especially the websites for vocabulary learning to expand knowledge of vocabulary items	37.0	24.5	$x^2 = 12.92***$
11.EKV 6 Doing extra English exercises or tests from different sources, such as texts, magazines, internets, etc. to expand knowledge of vocabulary items	32.9	24.1	$x^2 = 6.77**$
12.RKV 14 Recording the words/phrases one is learning and playing them to oneself whenever one has some spare time to retain knowledge of newly-learned vocabulary items	18.6	8.8	$x^2 = 13.47***$
Used more by male (1 VLS)	**Male**	**Female**	
1.RKV 4 Looking at real objects and associating them with vocabulary items to retain knowledge of newly-learned vocabulary items	32.2	24.1	$x^2 = 6.29*$

Note : *P<.05, ** P<.01, *** P<.001

Table 4 reveals that a greater percentage of female students reported significantly higher use of 12 VLSs than their male counterparts. Meanwhile, a greater percentage of male students reported significantly higher use of 1 VLS than their female counterparts. It is *'Looking at real objects and associating them with vocabulary items to retain knowledge of newly-learned vocabulary items'* (RKV 4).Among the 13 VLSs of which significant differences were found according to gender, 2 VLSs were reported high frequency of use by more than 50 percent of the female and male students. These include *'Attending classes of every module regularly to expand knowledge of vocabulary items'*(EKV7), (DMV 5) and *'Singing or listening to English songs to expand knowledge of vocabulary items'*(EKV13).

3.4 Variation in the Students' Reported Use of Individual VLSs

Table 5. Variation in the Students' Reported Use of Individual VLSs according to Levels of Vocabulary Proficiency

Individual VLS use	% of high use (3 or 4)			Observed x^2
Used more by Hi>Mo>Lo (Positive 27 VLSs)	Hi	Mo	Lo	
1.EKV 7 Attending classes of every module regularly to expand knowledge of vocabulary items	87.4	77.3	73.1	$x^2=20.21***$
2.DMV5 Using a dictionary to discover the meaning or other aspects of vocabulary items	76.2	62.4	54.9	$x^2=30.95***$
3.EKV13 Singing or listening to English songs to expand knowledge of vocabulary items	76.2	56.5	52.3	$x^2=41.53***$
4.DMV 4 Surfing the Internet to discover the meaning or other aspects of vocabulary items	74.5	54.6	50.6	$x^2=41.26***$
5.EKV 12 Watching an English-speaking film with subtitles to expand knowledge of vocabulary items	69.9	48.4	45.8	$x^2=42.07***$
6.DMV 6 Asking friends to discover the meaning or other aspects of vocabulary items	66.2	49.5	43.8	$x^2=33.06***$
7.EKV 15 Practicing vocabulary translation from Thai into English and vice versa to expand knowledge of vocabulary items	61.9	42.7	39.0	$x^2=36.83***$
8.DMV 2 Guessing the meaning from contexts, such as a single vocabulary, grammatical structure of a sentence to discover the meaning of vocabulary items	58.3	32.9	27.9	$x^2=67.14***$
9.EKV 3 Studying vocabulary items from advertisements, public relations, notices, traffic signs, etc. to expand knowledge of vocabulary items	57.9	47.5	45.5	$x^2=10.91**$
10.DMV 3 Guessing the meaning from contexts, such as pronunciation and real situation to discover the meaning of vocabulary items	55.6	37.3	33.4	$x^2=34.95***$
11.RKV 8 Associating pictures to vocabulary items to retain knowledge of newly-learned vocabulary items	52.6	39.7	36.0	$x^2=18.1***$
12.EKV 10 Watching English programme channels or listening to English radio programmesto expand knowledge of vocabulary items	48.0	29.2	28.9	$x^2=31.76***$
13.EKV 4 Studying vocabulary section in one's textbook to expand knowledge of vocabulary items	47.7	32.2	28.9	$x^2=26.38***$
14.RKV 7 Connecting newly-learned vocabulary items to one's previous learning experience to retain knowledge of newly-learned vocabulary items	45.7	26.1	20.5	$x^2=50.03***$
15.RKV 9 Associating the target word in English with a word that sounds similar in Thai language to retain knowledge of newly-learned vocabulary items	45.7	34.2	29.2	$x^2=18.73***$
16. RKV 5 Using new words in writing	43.4	20.3	19.8	$x^2=54.45***$
17. RKV 6 Associating newly-learned vocabulary items with previously-learned ones to retain knowledge of newly-learned vocabulary items				$x^2=35.86***$
18. RKV 12 Using vocabulary items to converse with teachers of English or native speakers of English to retain knowledge of newly-learned vocabulary items				$x^2=61.24***$
19. DMV 8 Asking other people or native speakers of English to discover the meaning or other aspects of vocabulary items	41.1	22.7	21.4	$x^2=19.76***$
20.RKV13 Memorising with or without a word list to retain knowledge of newly-learned vocabulary items	38.1	16.6	13.6	$x^2=21.44***$
21. EKV2 Reading different types of different English printed material e.g. leaflets, brochures, textbooks, or newspapers	36.4	23.4	21.8	$x^2=21.12***$
22 RKV 11 Using vocabulary items to converse with friends to retain knowledge	36.1	22.4	21.1	$x^2=25.25***$
	35.4	21.4	21.1	$x^2=17.78***$
	34.4	24.1	16.9	$x^2=11.27**$

of newly-learned vocabulary items				
23. EKV1 Playing English games, such as scrabble, crossword puzzles to expand knowledge of vocabulary items	33.8	21.4	20.5	x^2=35.78 ***
24. RKV 10 Reviewing previous English lessons to retain knowledge of newly-learned vocabulary items	30.8	21.4	20.1	
25. RKV 1 Saying or writing the word with its meaning repeatedly to retain knowledge of newly-learned vocabulary items	24.5	13.2	7.5	

Table 5. Variation in the Students' Reported Use of Individual VLSs according to Levels of Vocabulary Proficiency (cont)

Individual VLS use	% of high use (3 or 4)			Observed x^2
Used more by Hi>Mo>Lo (Positive 27 VLSs)	Hi	Mo	Lo	
26. RKV 17 Grouping words together according to the similarity of meanings, pronunciation, spelling or any other aspects that can link the words to be grouped together to retain knowledge of newly-learned vocabulary items	24.2	13.9	13.0	x^2=16.52***
27. RKV 2 Saying vocabulary items in rhymes to retain knowledge of newly-learned vocabulary items	15.2	10.5	8.8	x^2=6.68*
Mixed :Used more by Hi>Low>Mo (9 VLSs)	Hi	Lo	Mo	
1.DMV 1 Guessing the meaning by analysing the structure of words (prefixes, roots and suffixes) to discover the meaning of vocabulary items	52.0	32.1	28.8	x^2=40.22***
2.DMV 7 Asking teachers to discover the meaning or other aspects of vocabulary items	46.4	38.6	34.9	x^2=8.50*
3.EKV 8 Learning words through literature, poems and traditional culture to expand knowledge of vocabulary items	42.4	19.5	17.6	x^2=58.81***
4.EKV11 Surfing the Internet, especially the websites for vocabulary learning to expand knowledge of vocabulary items	39.1	32.1	28.8	x^2=7.38*
5.EKV 6 Doing extra English exercises or tests from different sources, such as texts, magazines, internets, etc. to expand knowledge of vocabulary items	38.7	27.9	24.4	x^2=15.84***
6.EKV14 Listening to English lectures, presentation, or English conversation to expand knowledge of vocabulary items	37.1	21.4	20.0	x^2=28.01***
7.RKV4 Looking at the real objects and associating them with vocabulary items to retain knowledge of newly-learned vocabulary items	36.4	23.1	19.7	x^2=24.28***
8.RKV 14 Recording the words/phrases one is learning and playing them to oneself whenever one has some spare time to retain knowledge of newly-learned vocabulary items	20.9	14.0	12.5	x^2=8.95*
9.EKV 9 Taking an extra job or getting trained by the companies where one can use English, such as tour offices, hotels, etc.	19.2	9.4	8.1	x^2=20.52***

Note : *P<.05, ** P<.01, *** P<.001

The chi-square results in Table 5 reveal that the significant variations in students' use of 36 individual VLSs which were found according to vocabulary proficiency level can be presented into two main patterns of variation: 27 VLSs as 'positive' and 9 VLSs as 'mixed'.

The first variation is positive or 'Hi>Mo>Lo'. This pattern indicates that a greater percentage of students with high vocabulary proficiency reported significantly higher use of 27 VLSs than those with moderate and low vocabulary proficiency levels. Among 27 VLSs of which significance differences were found, 11 VLSs were used to retain knowledge of newly-learned vocabulary items (RKV), 9 VLSs were used to expand knowledge of vocabulary (EKV) and 7 VLSs were used to discover the meaning or other aspects of new vocabulary items (DMV). Of the 27 VLSs with significant differences as positive variation pattern, 4 VLSs were reported with the high frequency of use by more than 50 percent of students with high, moderate and low vocabulary proficiency levels. They were *'Attending classes of every module regularly to expand knowledge of vocabulary items'*(EKV 7)*,'Using a dictionary to discover the meaning or other aspects of vocabulary items'* (DMV 5),'*Singing or listening to English songs to expand knowledge of vocabulary items'*(EKV 13) and *'Surfing the Internet to discover the meaning or other aspects of vocabulary items'*(DMV 4).

The second variation pattern is mixed or 'Hi>Lo>Mo'. This pattern indicates that a greater percentage of students with high vocabulary proficiency reported significantly higher use of 9 VLSs than those with low and moderate vocabulary proficiency levels. Among 9 VLSs of which significance differences were found, 5 VLSs were used to expand knowledge of vocabulary items (EKV), 2

VLSs were used to retain knowledge of vocabulary (RKV) and the other 2 VLSs were used to discover the meaning or other aspects of new vocabulary items (DMV).

IV. Discussions

Use of VLSs and Gender

In the context outside Thailand, gender differences have been taken into consideration to study in relation to students' VLS Use. Many previous research studies found the relationship between students' gender and their VLS use (Gu, 2002; Catalan, 2003; Marttinen, 2008; Si-xiang, 2009; Zhi-lang, 2010; Cengizhan, 2011 and Alhaysony 2012). In the Thai context, gender differences have received little attention as a factor that might affect students' VLS use. In the present study, students' gender is one of the key factors that is shown to have affected students' VLS use. The findings reveal that female students employed VLSs significantly more frequently than their male counterparts in overall VLS use, the three main categories and the individual strategy level. The findings are consistent with Siriwan (2007) who discovered that female students in Thailand employed VLSs with greater frequency than their male counterparts.

The first possible explanation can be made based upon the innate characteristics of female and male brains. Females and males are of equal intelligence; however, they are likely to operate differently as they seem to use different parts of their brains to encode memories, sense emotions, solve problems and make decisions (Zaidi, 2010). According to Zaidi (2010), certain characteristics in the brain play important roles in female and male learning processes and language development. Regarding the regions of the brain that play important roles in visual processing and storing language and personal memories, apart from being bigger in volume, the frontal and the temporal areas of the cortex are more precisely organised in female's brain. This contributes their better language learning and predisposes female students as a whole to be more strategic vocabulary learners than their male counterparts.

Another possible explanation might be attributable to the female and male cognitions. Males and females have different cognitive profiles (Baron-Cohen, Knickmeyer, and Belmonte, 2005). Concerning a visual link to learning, male learners tend to rely more on pictures and moving objects for word connections than female learners (Gurain, 2006). One VLS which is directly related to visual connections is, *'Looking at real objects and associating them with vocabulary items to retain knowledge of newly-learned vocabulary item'* (RKV 4). Not surprisingly, it was found in the present study that male students reported employing this VLS significantly more frequently than their female counterparts. On the other hand, females were found to be better than the males in verbal skill (Baron-Cohen et al.,2005) Some VLS items in the VLS questionnaire rely on the students' verbal skill, such as *'Saying or writing the word with its meaning repeatedly, 'Saying vocabulary items in rhymes, 'Singing or listening to English songs'.* The better verbal skill in female than male students which is used in vocabulary learning may explain why females employed a greater variety and a higher frequency of VLSs than their male counterparts.

A popular belief is that females are better L2 learners than males. If so, it probably resulted from the development of more effective social interaction skills and strategies in female than male students (Hall, 2011). The VLS, '*Asking teachers to discover the meaning or other aspects of vocabulary items'* was employed significantly more frequently by female students than their male counterparts at individual strategy level. There are other strategies that rely on the students' social interaction skill, such as *'Using vocabulary items to converse with friends', Using vocabulary items to converse with teachers of English or native speakers of English', 'Asking other people or native speakers of English for the meanings or other aspects of vocabulary item's'.* The more effective social interaction skills and strategies in female than males could be another possible explanatory factor for the observation that females employed more variety and at a greater frequency of VLSs than their male counterparts.

More possible explanation for the significant differences that were found is the linkage between gender difference and learning style. Learning styles may result from personal disposition, choice, previous learning experience and are not wholly innate and not completely fixed (Hall, 2011). Females show a higher preference for auditory learning styles (Sabeh et al., 2011). Males are likely to learn less by listening. Many VLSs in the present study rely on aural skills, such as *'Watching English programme channels or listening to English radio programmes*', *'Watching an English-speaking film with subtitles', 'Recording the words/phrases one is learning and playing them to oneself whenever one have some spare time', 'Listening to English lectures, presentation, or English conversation'.* Auditory-oriented learning style preferred by female students might be the explanatory factor that contributes the more variety and greater frequency of VLSs that are used.

We might say that VLSs play a significant role in assisting students to develop vocabulary skills and gender differences are obviously connected to the differences between male and female use of VLSs. English language teachers need to understand and be aware of the differences between female and male VLS use and their unique development in vocabulary learning processes. For example, male students might not be able to gain greater benefits from vocabulary learning processes that require verbal repetition, cooperative learning, oral and aural practices as much as female students. However, practice with visual connections needs to be introduced and supplemented for male students as they seem to respond better with this learning process.

Use of VLSs and Vocabulary Proficiency

Vocabulary knowledge has received attention by previous researchers as a factor influencing students' VLS use. Considerable research works support the link between students' vocabulary knowledge and their VLS use. (Siriwan, 2007; Lachini, 2008; Hamzah, Kafipour and Abdullah, 2009; Kafipour, Yazdi, Soori and Shokrpour, 2011; Waldvogel, 2011; and Tilfarlioglu and Bozgeyik, 2012). The findings of these previous studies have revealed the differences in VLS use between students with high and low vocabulary knowledge. The findings of the present study are consistent with the previous research works mentioned above in that students with high and low vocabulary knowledge reported employing VLSs differently. The possible factors are discussed below;

The first possible explanation is that the students who already have a high vocabulary proficiency are presumably more motivated. According to Ushioda (2008), good language learners are motivated. Motivation is dealing with 'what moves a person to make certain choices, to engage in action, and to persist in action' (p.19). In the present study, a greater percentage of students with high vocabulary proficiency reported high use of 36 VLSs than those with moderate and low vocabulary proficiency. This implies that high vocabulary proficiency students are likely to have personal motivation that drives them to engage in actions or behaviors regarding vocabulary learning and persist in these actions or behaviors more frequently. Students' motivation has also been found to be positively correlated with their VLS use (Fu, 2003; Marttinen, 2008). Motivation is considered one of the three essential variables on which good language learning depends (Rubin, 1975). In the present study personal motivation is assumed to be one of the factors that drive high vocabulary proficiency students to employ VLSs significantly different from moderate and low vocabulary proficiency ones.

Another possible explanation for the higher use of VLSs by students in high-proficiency group is their learning style. 'Learning styles are moderately strong habits rather than intractable biological attributes, and thus they can be modified and extended' (Reid, 1987, p.10). Chapelle and Roberts (1986) point out that good language learners are flexible to adapt their learning style to the needs of a given situation or task, while less successful language learners are less likely to adapt when specific need arises and more likely to persist with a particular style. It can be clearly seen by the VLS use at the individual VLS level that students with high vocabulary proficiency seem to be more adaptive in employing techniques or strategies to deal vocabulary items than those with moderate and low vocabulary proficiency levels.

More possible explanation is the high awareness of vocabulary learning of students in a high-proficiency group. When taking a closer look at the individual VLS level, it was found that a greater percentage of students with high vocabulary proficiency than those with moderate and low vocabulary proficiency levels try to put themselves in an environment where they can learn vocabulary items, such as *'Playing English games, such as scrabble, crossword puzzles to expand knowledge of vocabulary items'* (EKV1), *'Using vocabulary items to converse with teacher of English or native speakers to retain knowledge of newly-learn vocabulary items'* (RKV 12), and '*Taking an extra job or getting trained by the company where one can use English to expand knowledge of vocabulary item'* (EKV 9). Moreover, the high-proficiency studentss try to make use of the resources, including human and material resources to help facilitate their vocabulary learning. It can be seen that a greater percentage of students with high vocabulary proficiency level than those with moderate and low vocabulary proficiency levels reported significantly higher use of the VLSs, for examples, *'Asking friends to discover the meaning or other aspects of vocabulary items*' (DMV6), '*Asking teachers to discover the meaning or other aspects of vocabulary items*' (DM6), *and 'Surfing the Internet to discover the meaning or other aspects of vocabulary items* (DMV4). The high awareness of vocabulary learning in high-vocabulary proficiency students might provoke their high frequency and a variety of VLSs that are used.

V. CONCLUSIONS AND IMPLICATIONS

The present study examined the VLSs employed by Thai-tertiary level students. It was found that genders affected the students' three levels of VLSs use. The results may shed some lights in terms of gender that gender-based VLS strategy training should be taken into consideration. English language teachers should supplement instructions to their male students with strategies dealing with picture-reliance, visual connections as they respond well with these learning skills. The female students should be encouraged to use VLSs that make full use of oral, aural and social skills as they have high possibility of success in learning with these skills. In terms of vocabulary proficiency, it was found that levels of vocabulary proficiency affected the students' three levels of VLS use. The high-proficiency group reported employing VLSs significantly more frequently than the moderate and low-groups. The two latter groups should be encouraged to be aware of how VLSs can help them increase their vocabulary, moreover, they should be motivated to make use of the resources including human and material resources to help facilitate their vocabulary learning. In addition, they should be introduced to be more adaptive when dealing with the vocabulary items.

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Monitoring the Biomass Production in Two Venerid Clams

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Abstract- The biometry, biomass production, density and the sex ratio of two edible venerid clams, *Paphia malabarica* and *Meretrix casta* and the hydrologic parameters of the clam beds of Ashtamudi Estuary were monitored for one year. The results of the study indicated that the density and distribution of these clams were influenced by salinity. The largest Paphia clams were obtained in November and the Meretrix clams in April. In *P.malabarica* the tissue mass production increased from July to December and in *M.casta* from April to December. In both species the male and female sex ratio was found to be 1:1. The *P.malabarica* was denser than *M.casta* in the estuary. Increased biomass production, percentage edibility and nutritional values were recorded highest during the monsoon season (June-September) indicating the best time for harvest to keep the fishery sustainable.

Index Terms- Biometry, biomass production, density, *M.casta, P.malabarica*, sex-ratio.

I. Introduction

Molluscs are soft bodied, heterogeneous groups of organisms inhabiting a wide variety of environment. Clams are one of the important varieties of molluscs. These are commercially important from the point of view of its nutritional value and as sentinel organism reflecting the environmental pollution. The density and distribution of these organisms are controlled by seasonal changes in environmental factors. The sustainability of the clam fishery depends on the management of wet land and the prudent harvesting practiced there. Despite the fact that advanced researches have been initiated towards problems related to fishery, scant attempts have been made to monitor biomass production in edible venerid clams. Two commercially important venerid clams, *Paphia malabarica* and *Meretrix casta* were selected for the study. These are two important clam species, forming vast beds in the estuaries of Malabar Coast (South-West coast) in India. The clams were exploited from the estuary throughout the year with a ban in fishery from November to February.

The present work was carried out to study the biometry, biomass production and sex ratio in two edible clams, *Paphia malabarica* and *Meretrix casta* in the Ashtamudi Lake and the hydrologic factors affecting their density and distribution.

II. Materials and methods

1.1. Area studied

Ashtamudi Lake, located in Kollam district, is the second largest estuarine system in Kerala, India. It has a water spread area of about 32 km^2. The lake is located between latitude 8° 53´-9°2´ N and longitude 76°31´ – 76°41´E. The main basin is about 13 km long and the width varies from a few 100 m to about 3 km. The estuary remains connected to the Arabian Sea throughout the year.

1.2. Clam collection and analytical methods

Random monthly samples were collected from the clam beds of the estuary for a period of one year. The clams collected were transported to the laboratory and kept in aerated habitat water for twenty four hours for defecation. Thirty clams were taken monthly for biometric measurements. Hundred randomly selected clams were sacrificed monthly to observe reproductive state and to determine the sex ratio. Quadrate (0.25m X 0.25m) samples were taken monthly from the estuarine bar mouth to the upper reaches to analyse the density and distribution of the clams.

1.3. Biometric measurements

Length, breadth and depth of individual clams were measured using vernier callipers with 0.01mm accuracy. The distance between the anterior and posterior extremities of the shell in a direction parallel to the ventral margin was recorded as the total length. The distance between the umbo and the ventral margin in a direction perpendicular to the anterior-posterior axis was recorded as breadth. The greatest distance between the outer surfaces of the two valves when they are kept closed together was recorded as depth. The measurements were expressed in centimetres.

The total weight, wet meat weight, dry meat weight, and shell weights were determined to the nearest 0.01mg in an electronic balance. The total weight or the live clam weights were determined after washing off sediment particles adhering to the shell. The clams were cut opened tissue was removed from the shell, washed with distilled water, wiped with tissue paper and weighed. The weights were recorded as the wet weight. The clam meats separated from the shells were kept in hot air oven at 80°C until constant dry weight was obtained. After removing meat the shell weights were recorded. All the weights were expressed in grams. The volume of whole organism and shell were measured to nearest 0.1 ml using displacement method (Quale and Newkirk, 1989). Percentage edibility was estimated by adopting the method of Venkatraman and Chari (1951). Number of individuals per square meter was noted as density.

1.4. Hydrologic parameters

The hydrologic parameters such as salinity, dissolved oxygen, pH and temperature were estimated by standard methods. Salinity was determined by Mohr-Knudsen argentometric titration method (Strickland and Parsons, 1968), Dissolved Oxygen fixed *in situ* was analysed in the lab following modified Winkler's method (Strickland and Parsons, 1968). p^H was measured immediately after collection using a portable p^H meter . Temperature of the water was recorded using a mercury filled Celsius thermometer.

The results were subjected to suitable statistical analysis using statistical package for the Social Sciences (SPSS 20.0 version).The correlation analysis was conducted to determine correlation between the hydrologic parameters and the biological parameters. The Analysis of Variance (ANOVA) was carried out to determine the variance in the mean values of physico-chemical parameters and biological parameters of two clam beds. The sex ratios were tested using chi square test. All statistical procedures were carried out at 5% level of significance.

III. Results

The temporal variations in the hydrologic parameters of the clam-beds during the study period are represented in figures 1 to 4. The average monthly values in salinity (Figure 1) of the *Paphia* bed ranged between 10.515 ppt to 31.195 ppt and in the *Meretrix* bed it was found to vary between 10.793 ppt to 29.295 ppt. The values of dissolved oxygen (DO) (Figure 2) in the Paphia bed showed variation from 2.245 to 7.185 mg/l where as in the Meretrix bed it varied from 3.597 to 10.179 mg/l. The P^H values of water (Figure 3) ranged between 7.8 – 8.36 in the Paphia bed and 7.6 – 8.35 in the Meretrix bed. The temperature ranged between 26° C and 31° C in both the clam beds (Figure 4). Correlation studies revealed that the salinity has highly significant negative correlation with dissolved oxygen (-0.456) and water p^H (-0.216). The density of *Paphia malabarica* exhibited significant positive correlation with salinity (0.218).The dissolved oxygen of the clam beds showed highly significant positive correlation with water p^H (0.518) and negative correlation with temperature (-0.248). The dissolved oxygen showed significant positive correlation with density of *Meretrix casta* (0.228) and significant negative correlation with density of *Paphia malabarica* (-0.227). The temperature of water indicated highly significant negative correlation with p^H (-0.328). The analysis of variance showed no significant variation in the values of salinity, p^H and temperature between sites. ANOVA revealed significant variations in the mean values of dissolved oxygen between sites ($p<0.001$).

The Figure 5 depicts the density (number/m^2) of the two clam species in the estuary. The density of clams exhibited a steady increase from December to May. The clam density decreased from June to October. The maximum density was recorded in May and the minimum in October-November. The clam *Paphia malabarica* was denser than the clam *Meretrix casta* in the estuary.

Results of the biometric measurements of *Paphia malabarica* and *Meretrix casta* are represented in figures 6 to 8. In Paphia the maximum value in total weight (9g) was recorded in July and the minimum value (5.27g) was recorded in March. Where as in *Meretrix casta* the maximum weight recorded was 20.504g in April and the minimum weight of 7.179 g in December. The highest wet tissue weight of 2.412 g was recorded in *Paphia malabarica* in August and for *Meretrix casta* it was 3.765 g in April. The lowest values of wet tissue in Paphia were recorded in February 1.196 g and in Meretrix it was 1.593 in March. The values of dry tissue weight ranged between 0.625 g in March and 1.93g in July in the case of Paphia. In *Meretrix casta* the weight of dry tissue ranged between 0.689 g in February and 1.604g in April (Figure 6). The total volume values ranged between 2.605 ml in March and 5.573 ml in July in Paphia and in Meretrix it varied between 4.383 ml in December and 12.43 ml in April. The shell volume values in *Paphia malabarica* ranged between 1.33 ml in March and 2.97 ml in July .Where as in the case of *Meretrix casta* it varied between 2.04 ml in December and 6.52 ml in April (Figure 6).

The values of height, length, width (Figure 7) revealed that in *Paphia malabarica* the smallest clams were recorded in December and the largest clams in November whereas in *Meretrix casta* the largest clams were obtained in April and the smallest clams in December. The maximum value of percentage edibility in *P.malabarica* was recorded in August (31.5) and for *M.casta* it was (26.01%) in December. The minimum percentage edibility value of 20.67% *(P.malabarica*) and 16.76% *(M.casta*) were obtained in February (Figure 8).

Table Iand Table II represents the sex ratio in *Paphia malabarica* and *Meretrix casta* respectively. In both the species the male and female sex ratio was found to be 1:1.

IV. Discussion

The two venerid clams, *Paphia malabarica* and *Meretrix casta* , forms vast clam beds in Ashtamudi Lake. Both these estuarine clams were found to tolerate a wide range in salinity. *Paphia malabarica* bed is distributed up to the barmouth whereas the *Meretrix casta* occupies the middle region of the estuary. Similar pattern in distribution of two clams in the estuary were reported earlier (Appukuttan *et al*., 2002). During the S-W and N-E monsoon seasons, when salinity was low, more shells were present in the collection of both the species. This showed that lowering of salinity by fresh water intrusion due to heavy rain caused mortality of clams. This indicates that both clam species prefer higher salinity.

The biometric measurements showed that in both the clam species all measurements were found to increase from April to November. Largest specimens were observed during November in the case of Paphia whereas the largest Meretrix species were observed in April. On observing the tissue mass production, it was evident that in *Paphia* the biomass production is increased from July to Decmber. This season correlated with gametogenesis in *Paphia malabarica*. In *Meretrix casta* tissue mass production was found increasing from April to December. The increased wet and dry tissue weight during the reproductive season reflects the accumulation of biochemical nutrients in the body. When population density is considered, the *Paphia malabarica* population is denser than *Meretrix casta*. The best time to harvest *Paphia malabarica* remains during monsoon season (June-September). It coincides with higher caloric value, high condition index and high percentage edibility (Ampili and Shiny,2012). Kumari *et al*. (1977) observed higher values of

protein content in *Meretrix casta* from the estuary during monsoon indicating harvest season. In bivalve species, best term for harvesting is just before spawning period when condition index is at peak (Peharda *et al*., 2007). Yildiz *et al*. (2011) observed that the Oyster *Ostrea edulis* showed seasonal variation in the condition index, meat yield and biochemical composition. He also opined that the ideal period for their harvest is from April to August when the condition index was maximum.

Observations on the sex ratio in both the species showed that the male and female sex ratio was found to be 1: 1, that is the males and females are equally represented in the population. This shows that the populations are in equilibrium where in inbreeding and competition for mates does not occur. This also indicates that even if a portion of the potential spawning stock is left in the population, there will still be fertilization. Eventually this recruitment will translate into recovery of stocks provided that sustainable exploitation of the resources is practiced in the area.

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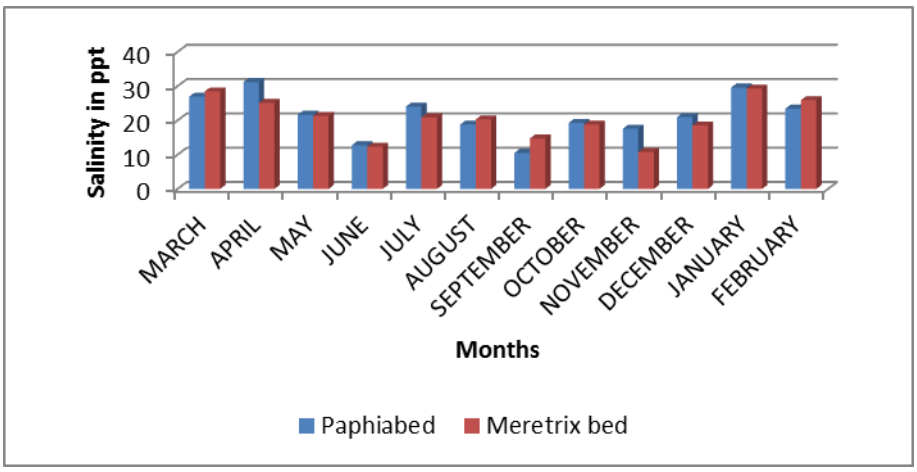

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Figure 1: Salinity variations in the clam beds

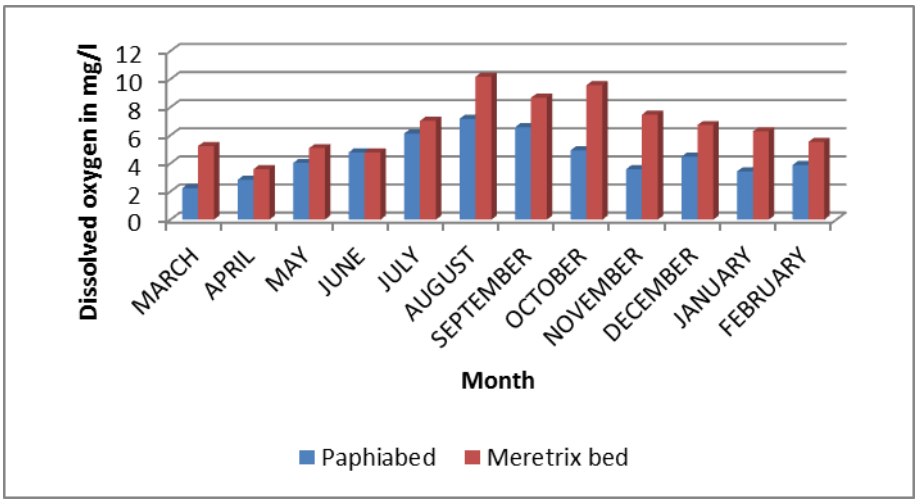

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Figure 2: Dissolved oxygen variations in the clam beds

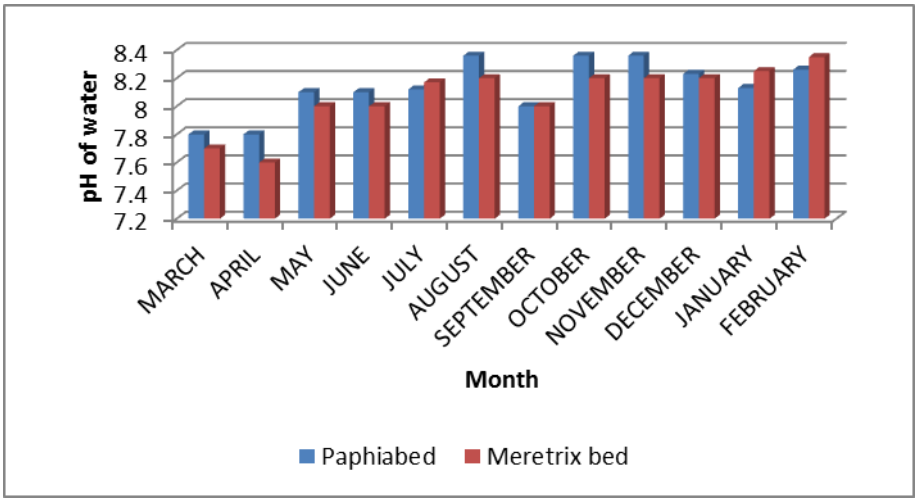

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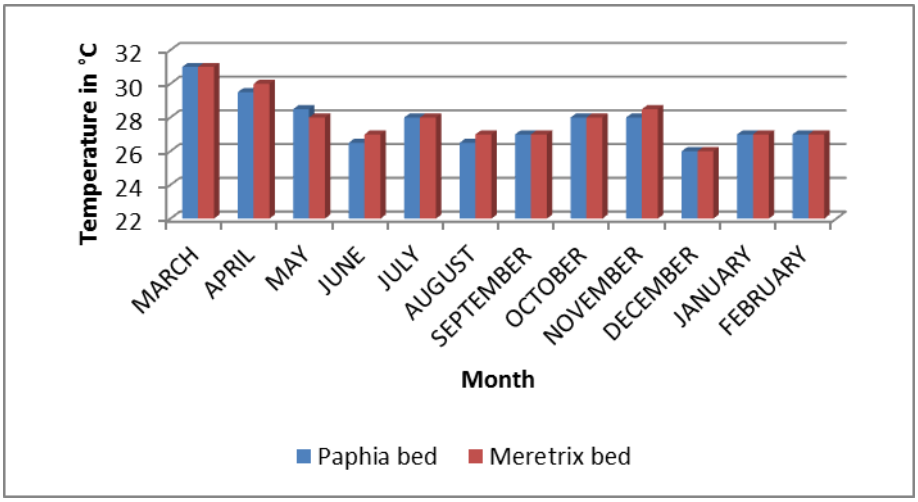
Figure 3: Variations in the water p^H of clam beds



P<0.01

Figure 4:Variations in the water temperature of clam beds

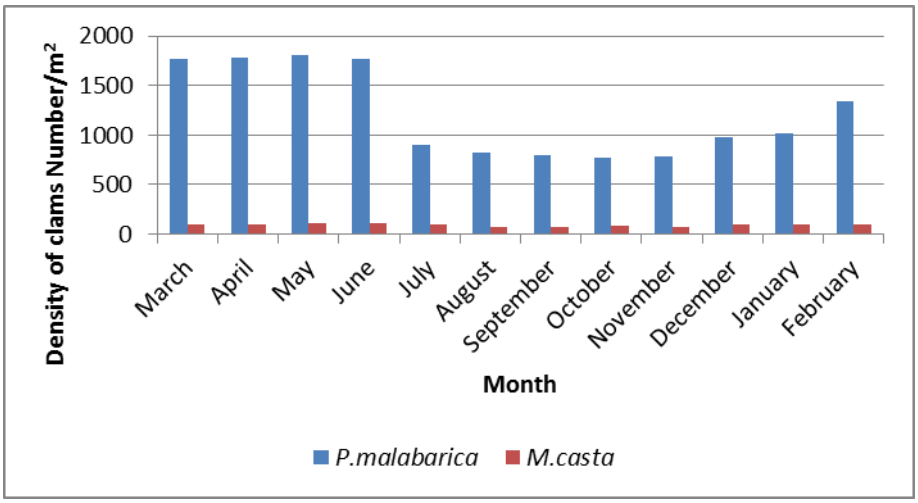


Figure 5: Density of clams in the estuary

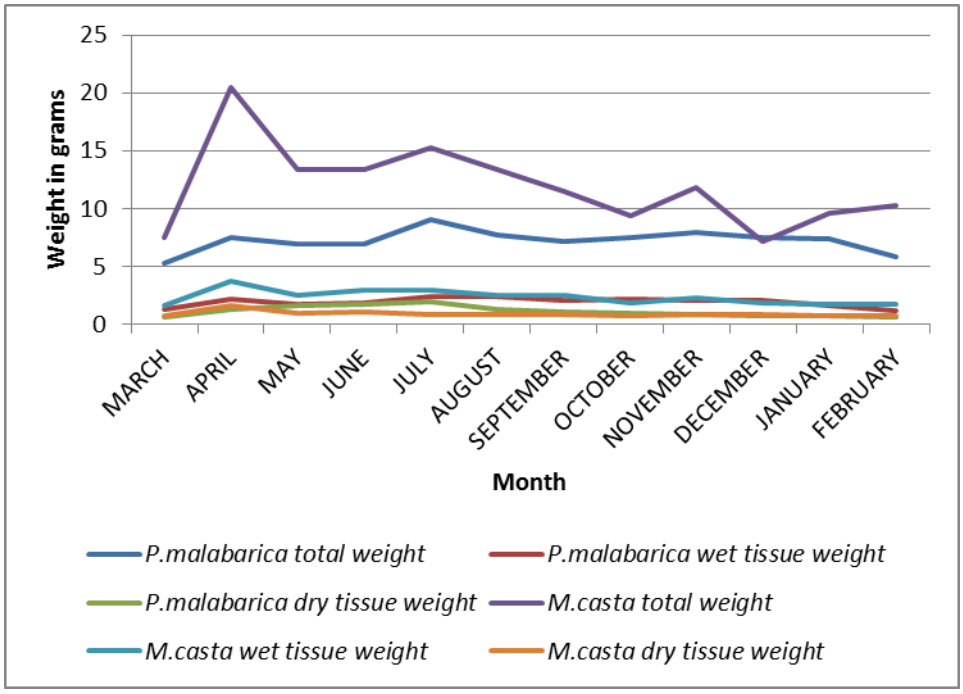


Figure 6: Weights of clams collected

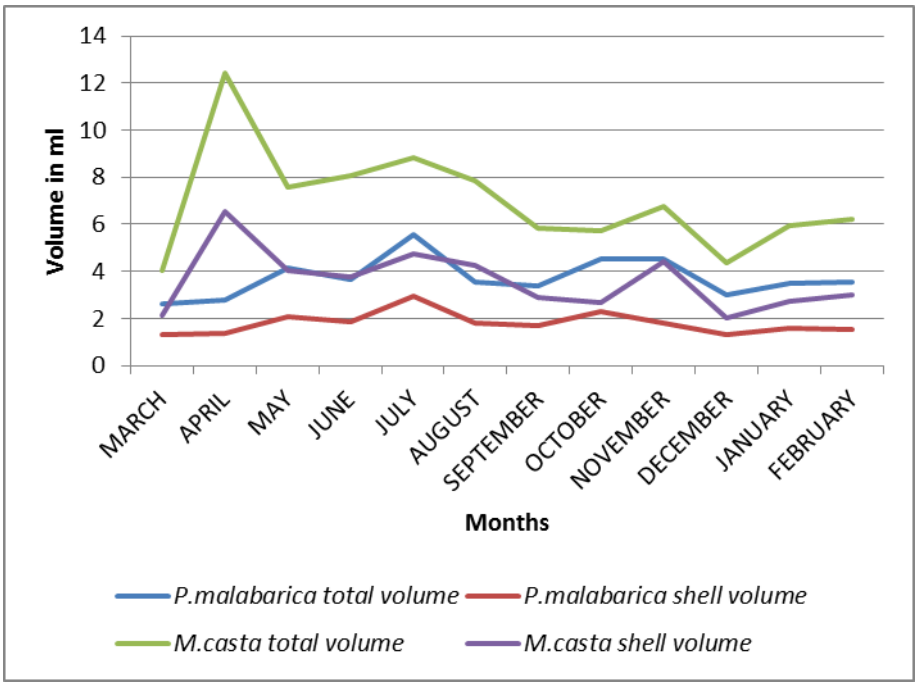


Figure 7: Volumes of clams collected

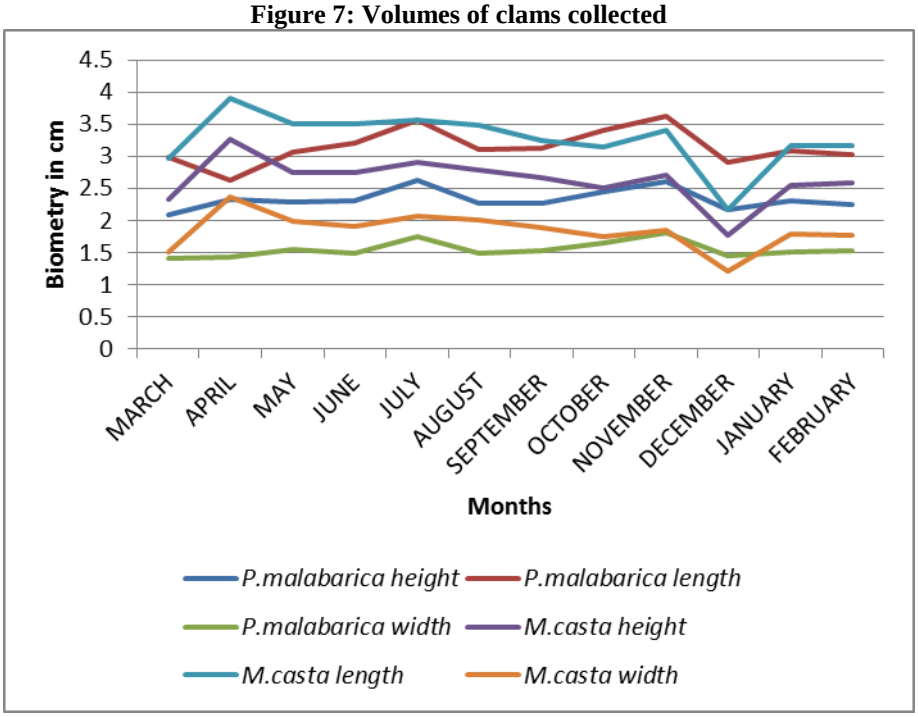


Figure 8: Shell morphometry of the clams collected

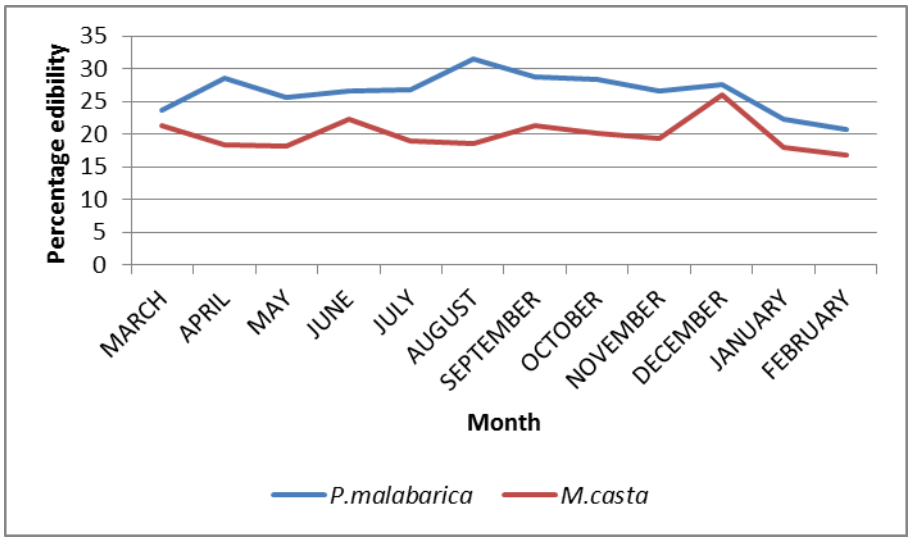


Figure 9 :Temporal variations in percentage edibility

Table I: Sex ratio in *Paphia malabarica*

MONTH	MALE	FEMALE	INDETERMINATE	TOTAL	SEX RATIO M:F
MARCH	30	40	30	100	01:01.3
APRIL	48	45	7	100	01:00.9
MAY	47	50	3	100	01:01.1
JUNE	46	50	4	100	01:01.1
JULY	45	49	6	100	01:01.1
AUGUST	47	51	2	100	01:01.1
SEPTEMBER	48	52	-	100	01:01.1
OCTOBER	46	54	-	100	01:01.2
NOVEMBER	49	51	-	100	01:01.0
DECEMBER	46	54	-	100	01:01.2
JANUARY	48	50	2	100	01:01.0
FEBRUARY	25	27	48	100	01:01.1
TOTAL (N)	525	573	102	1200	
%	43.75	47.75	8.5	100	

Table II: Sex ratio in *Meretrix casta*

MONTH	MALE	FEMALE	INDETERMINATE	TOTAL	SEX RATIO M:F
MARCH	42	58	-	100	01:01.4
APRIL	48	52	-	100	01:01.1
MAY	45	55	-	100	01:01.2

JUNE	40	42	18	100	01:01.0
JULY	45	53	2	100	01:01.2
AUGUST	56	40	4	100	01:00.7
SEPTEMBER	56	44	-	100	01:00.8
OCTOBER	47	53	-	100	01:01.1
NOVEMBER	49	51	-	100	01:01.0
DECEMBER	44	51	5	100	01:01.2
JANUARY	45	49	6	100	01:01.1
FEBRUARY	26	25	49	100	01:01.0
TOTAL (N)	543	573	84	1200	
%	45.25	47.75	7	100	

Evaluation of the Vegetative and Yield Performances of Groundnut (*Arachis hypogaea*) Varieties Samnut 10 and Samnut 20 Treated with Sodium Azide

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Abstract- Dry seeds of groundnut (*Arachis hypogaea*) varieties Samnut 10 and Samnut 20 obtained from the Ministry of Agriculture, Ilorin, Nigeria were treated with sodium azide concentrations (10, 20, 30, 40 and 50 mM) to evaluate the vegetative and yield performances of the varieties in response to treatment. Low concentrations (10-30 mM) promoted fast germination, though germination, percentage germination and seedling survival decreased with increased in concentrations. Highest vegetative growth was induced by 50 mM concentration 2-week after sowing (WAS) and correlations were established performances of the two varieties in relation to different concentrations of sodium azide. The plant vegetative traits evaluated at 4WAS, 6WAS, and 8WAS showed significance responses to different treatment concentrations. Highest performance was obtained at 50 mM, the trend which was sustained till maturity. Early maturity was achieved in all the concentrations applied and quantitative yield parameters evaluated were highest among 50 mM treated plants. In general, the performances of the two varieties were optimal in responses to 50 mM concentration and both varieties (Samnut 10 and Samnut 20) responded similarly to sodium azide treatment of different concentrations. These findings suggest that sodium azide can be utilised to create variability among existing germplasm for improving vegetative and yield parameters of groundnut.

Index Terms- Arachis hypogaea, early maturity, percentage germination, seedling survival, sodium azide

I. Introduction

The peanuts or groundnut (*Arachis hypogaea*) is a species in the legume family (Fabaceae). It is an important oilseed legume grown worldwide and is known by many other local names such as earth nuts, pea nuts, goober peas, monkey nuts, and pig nuts [1]. It is grown both for domestic market and for export. The world groundnut production was estimated to be 35.367 million metric tons in 2011/2012, and the word groundnut exports totals approximately 1.25 million metric tons in 2012. The world leading producers are China, India, and USA followed by Nigeria the fourth position and the largest producer in Africa. Groundnut is the 5th most widely grown crop in the sub-Saharan Africa behind maize, sorghum, millet and cassava, where it is grown exclusively for domestic use, either for consumption or as cash crop for smallholder farmers [2], [3].

Groundnut is a nutritive crop with approximately 25% protein and about 45 – 50% oil. The skin of groundnut is rich in vitamin B and it is used as a base ingredient for cosmetics. It also provides important ingredients in numerous industries for sweet, ice-cream, coating, peanut butter and bakery products. Groundnut protein contents is of high biological value as it contains more protein than meat, about two and a half times more than eggs and far more than any other vegetable foods except soya bean and yeast. The residue of the extraction process is used as commercial groundnut cake which is a concentrate feed for livestock and poultry. The nuts are eaten raw or after roasting as snacks. The green leaves or shoot makes excellent fodder and hay for animals [4], [5].

Though, groundnut is an economic crop with lots of industrial potentials and capacity to fit into the array of crops for food security and poverty eradication among the teeming population of the poor rural farmers, the crop is faced with a number of challenges that has contributed to its decline and low production in sub-Saharan African. Low yield, abiotic stress, pest and diseases are major problem facing the crop [6], [7], [8]. Crop improvement through conventional method of breeding may not be able to create desire variability on which a robust breeding programme could be built. Also, groundnut as a self pollinating crop naturally would have less variability in its gene pool and thus limiting the number of natural varieties for which breeders could screen and exploit for improvement purposes.

Crop improvement by mutagenesis has been applied in a number of crops for yield improvement, creation of new cultivars, stress and drought tolerance, disease resistance and for horticultural or floriculture purposes [9], [10], [11], [12]. Induced mutations have been used to improve major crops that are mainly propagated by seeds [13], [14] and to introduce novel genetic variability in ornamental crops. Effects of Sodium azide on crop plants has earlier been reported some decades back [15].

The present study attempts to evaluate the effects of different concentrations of sodium azide on growth and biological yield of two varieties of groundnut commonly grown in Nigeria. It will also assess and compare the responses of the varieties to sodium azide concentrations based on the seedling and growth parameters of the groundnut. This is with a view to determine the possibility of sodium azide becoming a suitable candidate for generation of additional variability in the varieties studied.

II. MATERIALS AND METHOD

Dried Seeds of groundnuts Samnut 10 and Samnut 20 varieties obtained from Kwara State Ministry of Agriculture, Ilorin, Nigeria were used for this investigation. The seeds (nuts) were exposed to different concentrations of freshly prepared sodium azide solution (10, 20, 30, 40 and 50 mM) for 6 hrs. The control seed for each of the varieties were soaked in distilled water for 6 hrs. After, the seeds treated with sodium azide were thoroughly washed in running tap water for ten minutes to remove excess exudates and chemicals from the seeds. Also, the control seeds were removed from distilled water and air dry for about 20 minutes. The treated seeds along with the control were plated in lunch boxes padded with filter papers soaked in distilled water (10 seeds per box) with labels corresponding to the treatment for germination studies. Daily germination observation was made until maximum germination was achieved on the 10th days after sowing. Number of days to germination and percentage germination were determined.

The pot experiment was conducted at Botanical garden, University of Ilorin, Ilorin, Nigeria. Pot studies were undertaken with two seeds sown in a pot (42 cm x 36 cm planting bags) filled with sandy loam soil. Five replicates were made for each of the treatment concentration and control which were arranged along in a Randomized Complete Block Design (RCBD) layout with 0.5 x 0.5 m spacing. Effects of the mutagenic chemical were evaluated on seedling survival, number of leafs, number of branches, leaf length, leaf breadth, plant height and petiole length. These data were collected every fortnight but number of days to flowering, number of days to maturity and number of pod/plant were determined at maturity.

Data obtained from parameter above were subjected to Analysis of variance and the means were separated using Duncan Multiple Range Test (DMRT) at 0.05 probability level. Correlations among the treatment concentrations were also analyzed.

III. RESULTS

The results showed different responses of the two varieties studied to different concentrations of sodium azide in germination studies, growth and yield parameters evaluated. Seed colour, shape and texture were the same before and after the treatments were applied. More than 80% of the seeds germinated within 7 days after planting in lower concentrations of 10 and 20 mM treatment showed good germination effect on both varieties, germination days however became longer with increased concentration. Percentage germination declined as the concentration of sodium azide increases (Fig.1a and 1b).

The quantitative characters studied 2 weeks after sowing (2WAS) showed increase in plant height with increase in treatment concentrations and with respect to the control plants; plant height was positively affected with different concentrations of sodium azide. In Samnut 10, plant height was highest with 50mM treatment with average height of 7.33 cm, while other concentrations and control produced averagely 5.67 cm plant height. Also, highest height of (6.82 cm) was recorded with 50 mM while other treatment concentrations and control ranges between 4.81 – 6.00 cm with control plant producing the least plant height of 4.67 cm among the Samnut 20. The trend was similar for number of leaves, leaf length, leaf breadth and petiole length performance of the two varieties. Different pattern of responses to treatment concentration were recorded by the varieties in terms of number of branches (Table 1). Table 2 revealed the Correlation coefficient showing the relationship between Samnut 10 and Samnut 20 based on plant height at two weeks after planting by concentrations of sodium azide.

At 4, 6 and 8 weeks after sowing (4WAS, 6WAS, and 8WAS), effect of sodium azide treatments on plant height and number of leaves were highest among the 50 mM plants while 10 and 20 mM concentrations recorded the least performance with respect to control in terms of plant height and number of leaves among the two varieties (Fig. 2, 3). The results of mean comparisons for the vegetative characters considered at 10 and 12 weeks after sowing (10WAS and 12WAS) showed significant responses of the varieties to different concentrations of sodium azide as summarized in Tables 3 and 4.

Evaluation of both fruit and nut parameters (Table 5) showed different patterns in performance and responses of Samnut 10 and Samnut 20 to different concentrations of sodium azide. Early maturity was obtained among the chemically treated plants; the number of days to maturity reduces as the concentration increases. Highest average number of pods (76.00 in Samnut 10 and 54.66 in Samnut 20) was obtained from 50 mM plant. Control plants produced 60.33 and 37.66 number of pods per plant in Samnut 10 and Samnut 20 respectively. In addition, weight of 100seeds was highest among 50 mM plants for both varieties.

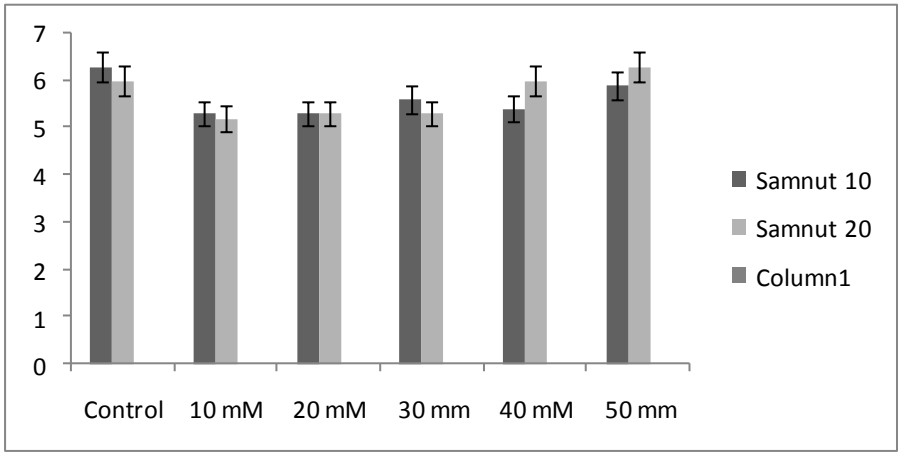

Fig 1a: Effect of sodium azide concentrations on mean number of days to germination of Samnut 10 and Samnut 20 groundnut varieties

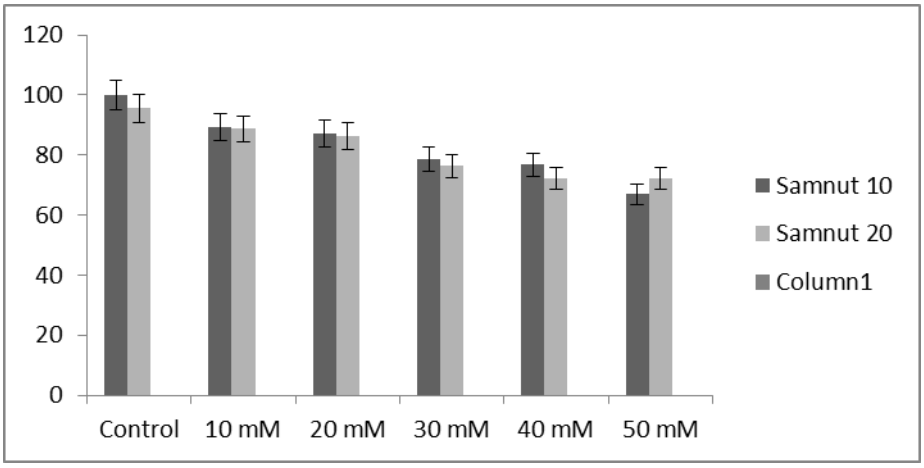

Fig. 1b: Effect of different concentrations of sodium azide on Percentage germination of Samnut 10 and Samnut 20 varieties of groundnut.

Table 1: Effects of Sodium azide on quantitative characteristics of *A. hypogaea* (Samnut 10 and Samnut 20) two weeks after sowing

Variety	Plant Height (cm)	Number of leaf	Number of Branch	Number of leaflet	Leaf length (cm)	Leaf width (cm)	Petiole length (cm)
Samnut 10 Control	5.67±0.33	4.00±0.33	2.67±0.33	16.47±1.33	1.97±0.33	1.23±0.33	1.99±0.05
10 mM	5.67±0.33	3.67±0.33	2.33±0.33	14.67±1.33	1.80±0.00	1.00±0.00	1.77±0.03
20 mM	5.67±0.33	4.00±0.58	2.33±0.33	16.00±2.31	1.90±0.05	1.67±2.67	1.80±0.00
30 mM	5.67±0.33	5.43±0.33	2.12±0.00	22.67±1.33	1.87±0.33	1.17±0.88	1.83±0.06
40 mM	5.67±0.58	5.00±0.58	2.10±0.58	20.00±2.30	1.90±0.05	1.07±0.67	1.87±0.03
50 mM	7.33±0.33	5.58±0.33	2.33±0.33	22.60±1.33	1.97±0.03	1.13±0.67	1.98±0.05
Samnut 20 Control	6.00±0.33	5.67±0.33	2.33±0.33	20.67±1.33	1.93±0.03	1.03±0.33	1.90±0.05
10 mM	4.67±0.33	4.67±0.33	2.25±0.00	18.67±1.33	1.93±0.06	1.00±0.00	1.77±0.03
20 mM	4.81±0.57	5.00±0.58	2.67±0.33	20.00±2.31	1.90±0.05	0.93±0.33	1.80±0.00
30 mM	6.00±0.57	6.00±0.58	2.67±0.33	24.00±2.31	2.06±0.03	1.07±0.33	1.87±0.06
40 mM	6.00±0.57	6.00±0.58	2.33±0.33	24.00±2.31	2.00±1.00	1.07±0.67	1.89±0.03
50 mM	6.82±1.00	6.00±1.00	2.33±0.33	24.00±4.00	2.06±0.08	1.13±0.67	1.90±0.05

Table 2: Correlation coefficient showing the relationship between Samnut 10 and Samnut 20 on Plant height at two weeks after planting

Samnut 20	Control	10 mM	20 mM	30 mM	40 mM	50 mM
Control	1					
10 mM	0.997**	1				
20 mM	0.990**	0.995**	1			
30 mM	0.995**	0.997**	0.993**	1		
40 mM	0.998**	0.994**	0.987**	0.994**	1	
50 mM	0996**	0.994**	0.986**	0.994**	0.998**	1
Samnut 10						
Control	1					
10 mM	0.997**	1				
20 mM	0.990**	0.995**	1			
30 mM	0.995**	0.997**	0.993**	1		
40 mM	0.998**	0.994**	0.987**	0.994**	1	
50 mM	0996**	0.994**	0.986**	0.994**	0.998**	1

**Correlation is significant at the 0.05 level (2-tailed)

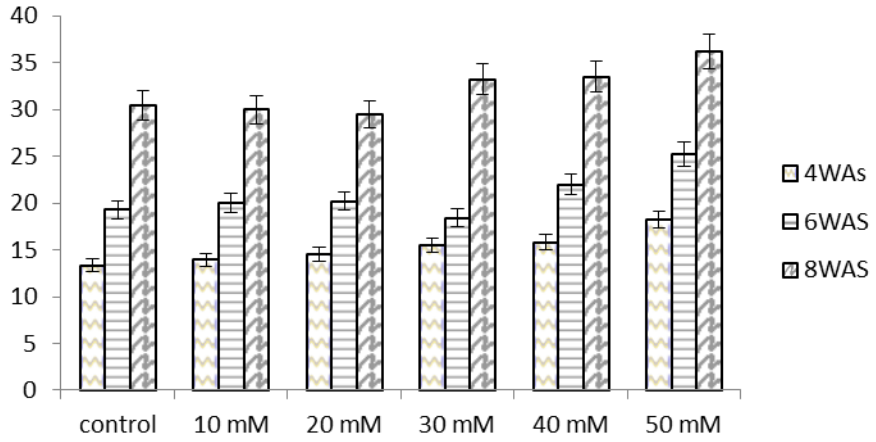

Figure 2a: Effects of Sodium azide on plant height of Samnut 10 four, six and eight weeks after sowing

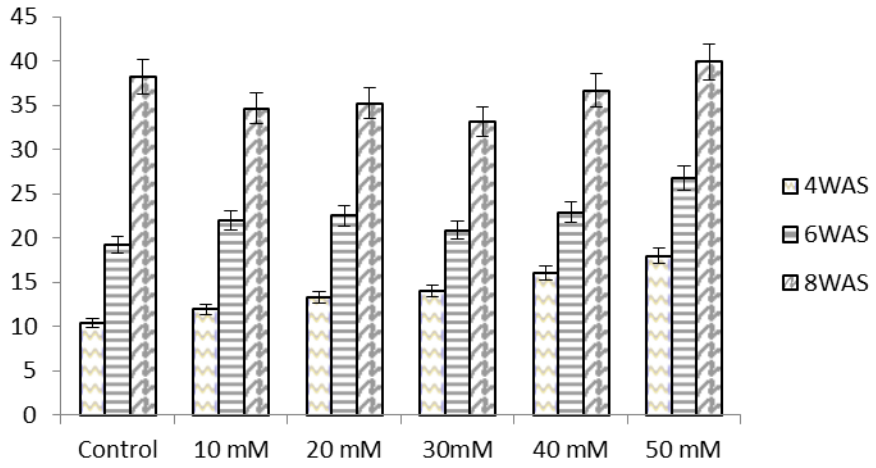

Figure 2b: Effects of Sodium azide on plant height of Samnut 20 four, six and eight weeks after sowing

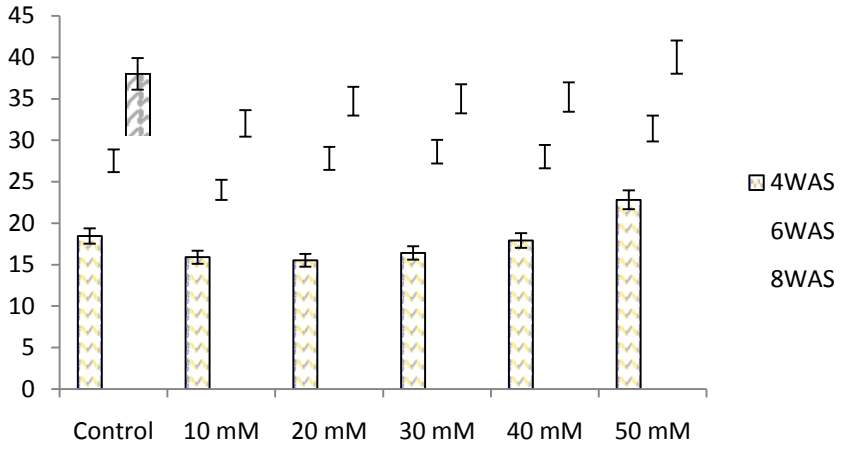

Fig 3a: Effects of sodium azide on number of leaves of Samnut 10 Four, Six and Eight weeks after sowing

Figure 3b: Effects of Sodium azide on the number of leafs of Samnut 20 four, six and eight weeks after sowing

Table 3: Mean comparison result on the different characters on vegetative growth on the two varieties at ten weeks after sowing

Character	Plant height (cm)	Number of Leaf	Number of branch	Number of leaflet	Leaf length (cm)	Leaf width (cm)	Petiole length (cm)
Samnut 10							

Control	36.93^{d}	47.33^{bc}	7.67^{a}	189.33^{bc}	6.47^{b}	3.13^{cd}	6.37^{d}
10 mM	34.10^{e}	43.00^{d}	8.00^{a}	172.00^{d}	6.40^{b}	3.03^{d}	6.43^{cd}
20 mM	34.63^{d}	45.00^{cd}	8.00^{a}	180.00^{cd}	6.47^{b}	3.16^{bcd}	6.57^{abc}
30 mM	37.57^{c}	48.33^{ab}	8.33^{a}	193.33^{ab}	6.57^{a}	3.23^{abc}	6.47^{bcd}
40 mM	38.60^{b}	48.33^{ab}	7.67^{a}	193.33^{ab}	6.57^{a}	3.30^{ab}	6.60^{ab}
50 mM	39.00^{a}	50.67^{a}	8.30^{a}	206.70^{a}	6.60^{a}	3.36^{a}	6.70^{a}
Samnut 20							
Control	43.66^{d}	52.33^{a}	7.33^{a}	171.00^{b}	6.07^{c}	3.03^{d}	6.70^{b}
10 mM	42.66^{e}	43.00^{bc}	7.33^{a}	170.67^{b}	6.03^{c}	3.00^{d}	6.67^{b}
20 mM	43.67^{d}	45.00^{b}	8.00^{a}	174.67^{b}	6.07^{c}	3.00^{d}	6.67^{b}
30 mM	45.33^{c}	48.33^{b}	7.67^{a}	181.33^{a}	6.23^{b}	3.13^{c}	6.67^{b}
40 mM	45.66^{b}	53.33^{a}	8.00^{a}	182.67^{a}	6.36^{a}	3.20^{b}	7.00^{a}
50 mM	46.33^{a}	54.67^{a}	7.67^{a}	185.33^{a}	6.46^{a}	3.11^{a}	7.00^{a}

Values bearing the same letter(s) along the same column are not significantly different at $p \leq 0.05$

Table 4: Mean comparison result on the different characters on vegetative growth on the two varieties at twelve weeks after sowing

	Plant height (cm)	Number of Leaf	Number of branch	Number of leaflet	Leaf length (cm)	Leaf width (cm)	Petiole length (cm)
Samnut 10							
Control	34.93^{d}	50.67^{ab}	7.67^{a}	202.67^{ab}	6.47^{b}	3.13^{cd}	7.04^{d}
10 mM	34.10^{e}	47.33^{c}	8.00^{a}	189.33^{c}	6.40^{b}	3.03^{d}	6.90^{cd}
20 mM	34.63^{d}	49.00^{bc}	8.00^{a}	194.00^{bc}	6.47^{b}	3.16^{bcd}	7.11^{abc}
30 mM	37.57^{c}	52.00^{ab}	8.33^{a}	208.00^{a}	6.57^{a}	3.23^{abc}	7.23^{bcd}
40 mM	38.60^{b}	52.00^{ab}	7.67^{a}	208.00^{a}	6.57^{a}	3.30^{ab}	7.44^{ab}
50 mM	39.00^{a}	53.67^{a}	8.30^{a}	214.67^{a}	6.60^{a}	3.36^{a}	7.60^{a}
Samnut 20							
Control	34.93^{d}	47.00^{b}	7.33^{a}	188.00^{b}	6.50^{a}	3.33^{cd}	7.14^{b}
10 mM	34.10^{e}	47.33^{b}	7.33^{a}	189.33^{b}	6.15^{c}	3.23^{d}	7.10^{b}
20 mM	34.63^{d}	48.67^{b}	8.00^{a}	194.67^{ab}	6.33^{b}	3.23^{d}	7.140^{b}
30 mM	37.57^{c}	49.67^{a}	7.67^{a}	198.67^{a}	6.19^{c}	3.36^{c}	7.11^{b}

40 mM	38.60[b]	49.33[a]	8.00[a]	197.33[a]	6.50[a]	3.43[b]	7.78[a]
50 mM	39.00[a]	50.00[a]	7.67[a]	200.07[a]	6.50[a]	3.50[a]	7.80[a]

Values bearing the same letter(s) along the same column are not significantly different at p≤0.05

Table 5: Effect of Sodium azide on the fruit character of two varieties of *A. hypogaea*

	Number of days to maturity	Number of pods/plant	Number of nuts/pod	100 seed/ weight (g)
Samnut 10				
Control	65.67[a]	60.33[c]	2.58[c]	49.87[c]
10 mM	65.33[a]	59.00[c]	1.98[d]	50.67[b]
20 mM	57.00[bc]	48.33[cd]	2.81[b]	51.36[b]
30 mM	62.00[b]	52.33[d]	1.96[d]	53.15[ab]
40 mM	59.00[bc]	72.00[b]	2.85[a]	55.39[a]
50 mM	53.067[c]	76.00[a]	2.85[a]	55.44[a]
Samnut				
Control	65.67[a]	47.66[b]	2.67[b]	73.24[d]
10 mM	66.33[a]	47.00[b]	2.00[c]	75.06[c]
20 mM	65.18[a]	47.33[b]	1.67[d]	73.17[d]
30 mM	59.00[b]	45.33b[c]	2.33[bc]	86.12[b]
40 mM	55.08[ab]	44.33[c]	2.67[b]	88.10[ab]
50 mM	50.17[c]	54.66[a]	2.99[a]	89.61[a]

Values bearing the same letter(s) along the same column are not significantly different at p≤0.05

IV. DISCUSSION

The vegetative and yield parameters considered showed distinctive responses of the two varieties to sodium azide treatment of different concentrations. The ability of the seeds with treatment ranges from 10 -30 mM to germinate within 5-6 days for the two varieties showed that sodium azide of such less concentrations could induced increase enzymatic and metabolic activities which could be responsible for the early germination. However, there were reductions in germination with increase in concentrations of sodium azide above the range. Reduction in percentage germination and seedling survival due to effect of mutagens has being reported in crop plants [15], [17], [18].

Higher concentrations of 40 and 50 mM improved seedling vegetative growth parameters studied 2WAS. Plant height and number of leaves were positively affected by these higher concentrations of mutagen. This finding is in contrast to report of [18] who reported that plant height decreases as mutagenic concentration increases while working on sesame seed. The positively induced height by 40 and 50 mM concentrations of sodium azide could have arisen as a result of the treatment ability to stimulate production of growth hormones. Correlation analysis revealed that significant correlation exits in the performance and responses of Samnut 10 and Samnut 20, in plant height with respect to different concentrations applied. This implies that in term of plant height at 2WAS; both varieties responded similarly to different sodium azide concentrations.

In most of the growth parameters studied, 50 mM consistently produced significant effects on the two varieties from 2WAS to maturity (12WAS). Tallest plants with higher number of leave were obtained with this high concentration of mutagen. This indicates that the induced plant growth hormone by this treatment concentration is sustained throughout vegetative growth phase of the crop. However, various concentration used in this studied did not significantly affect the number of branches with respect to the control. Early maturity and heavier seed (nuts) were achieved in all the tested concentrations of sodium azide, which is similar to findings of [19]. Average number of pods per plant, mean number of nuts in a pod and mean weight of 100 nuts were highest in 50 mM for both varieties suggesting that these traits were dose dependent as previously opined [20]. This report is further corroborated by [18] who opined that application of higher concentration of sodium azide and Colchicine produced early maturing mutants with increased in number and fruits size.

V. CONCLUSION

Sodium azide was effective in inducing early germination at low concentrations, higher concentrations would produce adverse effect on percentage germination and seedling survival in groundnut. High concentration of 50 mM had optimal effects on vegetative and yield parameters considered in this study. Lower doses of 10-30 mM were probably too low to induce desirable agronomy characters in the crop. Sodium azide therefore could be utilized to increase variability in groundnut that ultimately increased the possibility of isolating beneficial mutants for groundnut improvement. Various concentrations could further be screened towards targeted traits which could be selected for breeding improved varieties and subsequently expand the existing germplasm.

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Mortality Pattern of Preterm Infants and Etiological Factors of Preterm Births in Rural Tertiary Care Center: A Retrospective Study

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Abstract- A substantial number of premature deliveries occur in hospitals lacking neonatal intensive care facilities. Advances in perinatal and neonatal care over the last 30 years have contributed to improved survival among extremely low birth weight (ELBW) infants. Little is known about how birth outcomes vary in rural referral hospitals, by degree of rural isolation.

We conducted a retrospective cohort study, from Feb 2012-Jan 2013, about etiologies and the mortality of preterm birth in MVJ medical college, Hoskote, which is a rural hospital, Much higher neonatal death rates were observed for preterm or low-birth weight babies in rural areas with no metropolitan influence, suggesting inadequate access to optimal neonatal care.

We conclude that birth outcomes in rural areas differ according to the degree of rural isolation. Fetuses and infants of mothers from rural areas with weak or no metropolitan influence are particularly vulnerable to the risks of death during the perinatal and postnatal periods.

Index Terms- Premature, Extremely low birth weight, Rural areas

I. Introduction

Progress in neonatology is generally portrayed as inexorable: doing better and better with smaller and smaller. This also has lead to us pushing down the boundaries of viability and also increasing the morbidity and also the mortality. A number of babies born after a greatly curtailed pregnancy develop into normal adults. Unfortunately, this is not always the case and therefore issues on survival and disability of preterm babies are important in perinatal medicine [1, 2].In industrialized countries, preterm delivery is responsible for 70% of mortality and 75% of morbidity in the neonatal period. It also contributes to significant long-term neurodevelopment problems, pulmonary dysfunction, and visual impairment [3,4].

Among the neonates, very low birth weight (VLBW) preterm babies are at increased risk of perinatal, neonatal and postnatal mortality and morbidity, mainly due to infections and complications of prematurity. Mortality of VLBW neonates is 30 times more than that of newborns of normal weight[5]. This study is conducted to figure out areas where we can intervene to prevent or decrease preterm mortality.

II. Materials and Methods

This study was done at Neonatal unit of MVJ Teaching Hospital. It is a level III neonatal intensive care unit. The study population comprised of neonates admitted to NICU with gestational age less than 37 completed weeks over a period of one year from Feb 2012- Jan 2013. In this retrospective study, data was collected from hospital records of labour room, NICU and medical records of the admitted preterm babies were reviewed. Data regarding gestational age, birthweight, causes of preterm birth, duration of hospital stay, various morbidity and mortality patterns and treatment provided in the NICU were reviewed. Maternal risk factors contributing to preterm delivery were also analyzed.

III. Results

During the study period, total of 58 preterm babies were included. Among 58preterm 53% were late preterm (gestation age 34-37weeks), 24% were 28- 34 weeks, remaining 3% were <28 weeks. Among them 66% were weighing 1500-2500gms and 5% were < 1000gms. Preterm babies with less than 28 weeks gestation accounted to 8% of all preterm deaths where as neonates with 28-34 weeks and 34-37 weeks accounted to 41% and 50% of all mortality. . Mortality patterns were more in lesser gestational age. Of the 3 neonates with Gestation < 28 weeks 2 expired. Causes of preterm birth were anemia & poor antenatal visits in 57% mothers and PIH in 22% of the cases.

Table 1: Etiology of preterm birth according to gestational age

Etiology	Gestation age in weeks			Total cases (% of cohart)
	<28	28-34	34- 37	
PIH	0	12	3	15(25.86%)
Fetal distress	0	0	3	3(5.17%)
Infection	0	3	0	3(5.17%)
Twins	3	0	0	3(5.17%)
Oligohydromnios	0	1	3	4(6.89%)
Anemia and	0	8	22	30

Irregular ANC				
Total	**3(5.17%)**	**24 (41.37%)**	**31 (53.44%)**	**29 (48.3%)**

Table 2: Mortality according to gestational age

Mortality	**Gestation age in weeks**			**Total cases**
	<28	**28-34**	**34- 37**	
Live	3(5.17%)%)	21(36.20%)	29(50%)	53(91.37%)
Dead	2(3.44%)	3(5.17%)	0	5(8.62%)
Total	**5(8.62%)**	**24 (41.37%)**	**29 (50%)**	18(31.03%)

IV. Discussion

Progress in the frontiers of neonatology has continually pushed back the limit of viability and significantly improved the survival of extremely preterm infants [6, 7, 8]. Regardless of the cause, the burden of prematurity is enormous for the infant, health care system, family and the society [9, 10]. In this study, all cases had obstetrical reasons for premature delivery, which were PIH, multiple pregnancy, oligohydramnios, fetal distress, infection and anemia and irregular ANC.

This was different in comparison to data described from a study done in USA by Ananth CV et al from 1989-2000 that showed cause of premature deliveries is idiopathic in 45-50%, PROM in 30% and preterm deliveries in 15-20% were medically indicated[11]. This difference can be explained by the fact that, our hospital being a tertiary level referral centre, complicated cases are referred from the different parts.

In this study, 53.44%of preterm babies were late preterm which is consistent with proportion described by Goldenberg RL et al [12]. Mortality was 8.62% in this study, which was lesser than seen in a study done by Khan MR et al[13]. In a similar study population and found mortality to be 14%. According to Baki MA et al, Mortality was 36% and was related to gestational age, birth weight, respiratory distress syndrome and requirement of mechanical ventilation [14].

V. Conclusion

The main risk factors for preterm delivery were anemia, inadequate antenatal check-up and pregnancy induced hypertension. Mortality is inversely proportional to the gestational age. Type of interventions & outcome of the neonate depends on financial Prowess and resourceavailability.Major causes of preterm birth mortality are easily preventable causes like anaemia, regular ANC and sepsis.

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Recurrent Cholestatic Jaundice – Think beyond Viral Hepatitis

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Abstract- We report a case of recurrent intrahepatic cholestasis in an 4-year-old boy who developed four episodes of purities and jaundice at the ages of 6months, 1yr 2yr and 4 years. Each episodes had lasted 6-8 weeks and the 2nd and 3rd episodes were associated with fever which had lasted for 4-6 days. The liver functions were minimally deranged and serum bilirubin, returned to normal between attacks. Investigation in previous episodes proved cholestatic hepatitis and excluded other causes of liver disease. First three episodes had been diagnosed as viral hepatitis and managed for the same. On 4th recurrence child had been extensively investigated and proved to have features of benign recurrent intrahepatic cholestasis (BRIC). Rarity of the disease and its unpredictable clinical morbidity and resemblance to viral hepatitis prompted us to report this case.

Index Terms- cholestasis, jaundice, benign recurrent intrahepatic cholestasis

I. Introduction

Benign recurrent intrahepatic cholestasis (BRIC) is a rare hereditary disorder characterized by recurrent and intermittent episodes of cholestasis, episodes of pruritus and jaundice with normal extra hepatic biliary tree. It can be Familial or sporadic, and can be both autosomal recessive or autosomal dominant in inheritance. The disease may start in early infancy or childhood but does not proceed to cirrhosis or chronic liver disease and is associated with normal life expectancy. (1) Attacks last from several weeks to months and resolve spontaneously. Between attacks patients remain well for months to years. (2)

Case Report

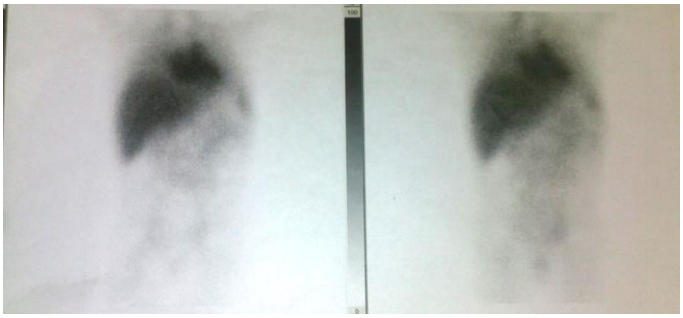
4 yr boy presenting with with complaints of yellow discoloration of sclera, urine and associated with loss appetite, generalized itching all over body more in night since 06 weeks. Past history of recurrent cholestatic jaundice episode, with similar complaints, at the ages of 6 months, 1 year and 2 years of life was present. Each episode had lasted 4-8 weeks. The 2nd and 3rd episodes were associated with 4-6 days of fever at the onset of symptoms. On examination child was stunted and wasted with features suggestive of vitamin A deficiency and multiple scratch markings.

The liver functions in last two episodes ranged as depicted in Table 1.

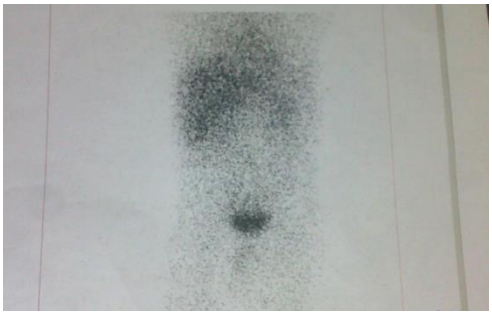
	3rd episode at presentation	3rd episode at last follow up (6weeks later)	**4rd episode at presentation**	4rd episode at last follow up (8weeks later)
Total Serum Bil (Conjugate)	**16.3(11,5)**	1.4(1.1)	**10.3 (8.3)**	3.9
SGOT	**124**	84	**56**	60
SGPT	**76**	54	**21**	40
ALP	**386**	384	**338**	269
Albumin	**3.65**		**3.9**	

Table 1- The liver functions

Other Investigation suggested - Hb 12.3, TLC 16400, P 44%, pletlet 3.5 lakhs, Bun/creatnine 12/0.5. PT/PTTK normal , GGT 190 U/L, . HbsAG/ anti HCV /anti HAV/anti HEV-Negative, HbeAg- negative serum ceruloplasmin -0.471 ug/l, ICT MP negative, ANA –negative, TORCH titers & HSV were negative, VDRL and HIV--negetiveChest x ray normal, USG abdomen-hepatomegaly 10.5 cm, MRCP-contracted Gall Bladder with normal intrahepatic and extra hepatic billiary radicals.
HIDA scan suggested of severe cholastasis with parenchyma normal. (Fig 1) & (Fig 2)



Post phenobarbitone HIDA (Fig 1) Normal up take



(Fig 2)24 hrs - no transit of tracer into gut

Liver biopsy showed- increased lymphocytic infiltrate with piecemeal necrosisin the portal tracts with evidence of portal fibrosis. Intrahepato cellular Cholestasis was seen with paucity of bile ducts in portal triad. (fig 3 & 4)

Fig 3-Liver biopsy –gross specimen

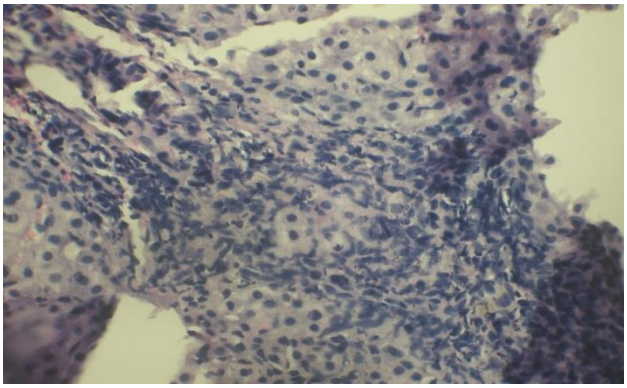


Fig 4- Liver biopsy -Histopathology

The 2nd and 3rd episodes were associated with fever which had lasted for 4-6 days and had been diagnosed as viral hepatitis and managed for the same. But a prolonged hyperbilirubinemia was noted on followup of 3rd episode. The child was given symptomatic treatment in the 4th episode and he improved by 8 weeks with near normalization of serum bilirubin. As the child had no evidence of chronic or progressive liver disease and other possible causes of jaundice were excluded, a diagnosis of benign recurrent intrahepatic cholestasis was made.

II. DISCUSSION

Summerskill and Walshe first described benign recurrent intrahepatic cholestasis in 1959[3,4] as recurrent episodes of jaundice and pruritus. Hence its also called Summerskill-Tygstrup-De Groote disease. Its Heterogeneous, benign disease which typically the manifests early in life but later presentations have been reported. BRIC is now recognized, as a syndrome due to a mutation in ATP8B1, an aminophospholipid transporter, while BRIC2 is caused by a mutation in ABCB11. There are at least three forms of BRIC all with a similar phenotype. BRIC types 1 and 2 are inherited as autosomal recessive and are related to mutations on chromosomes 18 and 2 respectively. BRIC type 3 is transmitted as an autosomal dominant disease and is not linked to mutations on chromosomes 18 or 2.[5]. Its is characterized by self limiting cholestasis episodes and seen to exacerbate with intercurrent infections. Many a times this presentation is misdiagnosed as viral hepatitis. Luketic & Shiffman (1999) gave diagnostic criteria for BRIC, [2] Which includes the following five criterias

1. episodes of jaundice separated by a symptom free interval lasting several months to years
2. Laboratory values ~ intrahepatic cholestasis
3. Severe pruritus secondary to cholestasis
4. Normal intra and extrahepatic bile ducts confirmed by cholangiography
5. Absence of factors known to be associated with cholestasis

Biochemical findings consist of elevated total and direct bilirubin, raised alkaline phosphatase levels and elevated bile salts but normal gamma glutamyl transferase levels. Often the diagnosis in BRIC patients is made very late and patients are subjected to invasive investigations. Elevation in gamma glutamyl transferase levels or rising levels of ALT and AST should suggest an alternative diagnosis of progressive familial intrahepatic cholestasis (PFIC). Treatment of the condition is purely symptomatic and aimed mainly at the relief of pruritus.

III. CONCLUSION

Our patient was initially managed as viral fever due to exacerbation with some intercurrent illness. All 5 diagnostic criteria for BRIC given by Luketic & Shiffman (1999) were met by our patient. He was treated symptomatically and needs long term follow up for early identification of Possible Progressive

Familial Intrahepatic Cholestasis. Its important to think beyond viral hepatitis in a case of Recurrent painless cholestatic

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Hydrodynamics Studies of Gas-Solid Fluidization in Non Cylindrical Conduits for Spherical and Non-Spherical Particles -A review

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Abstract- Importance of noncylindrical fluidized bed for process operation has been emphasized.. The correlations and the models developed for gas-solid fluidized bed in noncylindrical conduits (square, Hexagonal, semi cylindrical and conical) as compared with cylindrical, with a special focus on the development during the last two decades.Limited investigation have been carried out in noncylindrical bed hence emphasis is given to recent investigation on hydrodynamics study in noncylindricalconduits,while dynamics for cylindrical bes have been exhaustively studied by different authors. Available studies relating to hydrodynamic properties viz. minimum fluidization velocity, bed pressure drop, bed expansion and fluctuation, bubbling and slugging velocity, bubbling and fluidizing index in non-cylindrical conduits have been detailed. The gray areas in non-cylindrical column hydrodynamics for future studies have been identified and potential application of such column have been suggested.

Index Terms- Gas–solid fluidization, non-cylindrical conduits, bed dynamics

I. INTRODUCTION

Fluidization is a phenomenon by which fine solids are transformed into a fluid-like state through contact with gas or liquid or by both gas and liquid. It is a fluid-solid contacting technique, which has found extensive industrial applications. Investigations relating to various aspects of fluidization as a novel fluid-solid contacting technique is being carried out since the world war –II and numerous process applications have been made based on these techniques like drying, adsorption and chemical processes such as combustion, carbonization, gasification and solid-catalyzed reaction.

A large number of review paper, reports and other articles show the advancement and improvement in fluidization technology. In order to keep this review to reasonable proportion, it has been confined to gas-solid systems . In the past, a number of excellent reviews have been published on measurement techniques for fluidized beds by Cheremisinoff [1], Grace and Baeyens [2], and Yates and Simons (3). More recently, Louge (4) reviewed experimental techniques for circulating fluidized beds. Werther (5) gave an overview of measurement techniques in fluidized beds, with emphasis on applicability in industrial practice. Chaouki et al. (6) extensively reviewed non-invasive measurement techniques for multiphase flows in general.

Cylindrical gas-solid fluidized beds have been employed extensively in process industries. Apart from the advantages of gas-solid fluidization in cylindrical beds, the efficiency and the quality in large diameter and deep beds suffer seriously due to certain inherent drawbacks such as channeling, bubbling and slugging behavior at gas velocity higher than the minimum fluidization velocity resulting in poor gas-solid contact, homogeneity of the fluid and ultimately quality of fluidization. Hence efforts have been made by the investigators to improve the quality of gas-solid fluidization. To overcome the above-mentioned drawbacks and to improve the fluidization quality techniques such as vibration and rotation of the bed, use of improved distributor and promoter , operation in multistage and Use of non-cylindrical conduits have been recommended by the investigators

Consideration of non-cylindrical conduits, instead of a conventional cylindrical one is considered to be an attractive alternative technique for smooth gas-solid fluidization by Kunni [7], Levey [8]. The introduction of vibration and rotation of the bed , turbulence promoters in a gas-solid fluidized bed enhance the fluidization quality by minimizing bubbling, channeling and slugging but the relative demerits of the above technique is the increase of pressure drop. Vibration and rotation may require additional accessories to the bed with some operational difficulties .Hence to improve the quality of fluidization, the use of noncylindrical conduits has been found to be more effective in controlling fluidization quality as compared to the other methods. Recently the use of non-cylindrical beds has begun to receive much attention for several applications because of a few advantages, like (i) the operation of the fluidizer over a wide range of superficial velocity, (ii) the possibility of fluidizing a wide range of particles of different sizes or densities, and (iii) intensive particle mixing.

Although qualitative explanations relating to fluidization quality have been presented in terms of the bed parameters for cylindrical beds by different authors, their effects in case of a non-cylindrical column remain unexplored. Keeping in view, studies relating to the quantification of fluidization quality in terms of minimum bubbling velocity, fluidization index and range of particulate fluidization in a non-cylindrical beds, viz. the semi-cylindrical, square, hexagonal and conical ones have been taken up and predominantly in this review preference is given for the correlations and models developed for gas-solid fluidized bed in non-cylindrical conduits as compared with cylindrical developed during last ten years.

II. Bed Dynamics of Gas-Solid fluidized system in a Conical Bed

Conical fluidized bed is very much useful for the fluidization of wide spectrum of particles, since the cross sectional area is enlarged along the bed height from the bottom to the top. Therefore the velocity of the fluidizing medium is relatively high at the bottom, ensuring fluidization of the large particles and relatively low at the top, preventing entrainment of the small particles. Since the velocity of the fluidizing medium at the bottom is fairly high, this gives rise to low particle concentration, thus resulting in low reaction rate and reduced rate of heat release. Therefore the generation of high temperature zone near the distributor can be prevented. Due to the existence of a gas velocity gradient along the height of a conical bed, it has some favorable characteristics. The conical bed has been widely applied in many industrial processes such as biological treatment of waste water, immobilized bio-film reaction, incineration of waste-materials, coating of nuclear fuel particles, crystallization, roasting of sulfide ores, coal gasification and liquefaction, catalytic polymerization, fluidized contactor for sawdust and mixtures of wood residues and fluidization of cohesive powder.
The study of the hydrodynamic characteristics of fluidization in conical beds is focused on two areas viz. the liquid–solid and the gas–solid systems. Gas –solid systems generally behave in a quite different manner. With an increase in flow rate beyond minimum fluidization, large instability with bubbling and channeling of gas is observed. At higher flow rates agitation becomes more violent and the movement of solids becomes vigorous. In addition, the bed does not expand much beyond its volume at minimum fluidization called an aggregative fluidized bed.. Therefore proper characterization of the bed dynamics for the binary and the multi-component mixtures in gas solid systems is an important prerequisite for their effective utilization, where the combination of particle size ,density and shape factor influence fluidization behavior by Sau. et al [9].

Investigations in the field of dynamic studies relating to various aspects of gas-solid fluidization have been carried out by many investigators. Dynamic studies relating to various aspects of gas-solid fluidization in cylindrical conduits have been carried out by a numbers of investigator but limited study have been carried out in conical conduits. In view of the limited information available for conical gas-solid fluidization system in general the present study has been taken up to investigate a few important work on bed dynamics which are responsible for the quality of fluidization have been discussed thoroughly.

2.1 Minimum fluidization velocity and pressure drop

In view of its potential application in the field of gas solid systems, it is a pre-requisite that the dynamics of the bed be explicitly understood. Two bed characteristics of relevance in this context are the minimum fluidization velocity (V_{mf}) and the pressure drop $(-\Delta P_{mf})$ for a fluidized bed. In the course of experiments it has been observed that, at a particular velocity, the pressure drop reaches a maximum and the particles in the bed are lifted slightly upward by the fluid. This is followed by the particles at the bottom of the bed beginning to fluidize. Once the particles are unlocked there is a sharp decline in the pressure drop. Evidently, fluidization is initiated when the force exerted by the fluidizing medium flowing through the bed is equal to the total effective weight of the particles in the bed. It is assumed that the lateral velocity of the fluid is relatively small and can be neglected. The pressure drop through a packed bed over a differential height of dh is given by Ergun equation [10] as follows:

$$\frac{\Delta P}{H} = \frac{150 U_{mf} \mu_g (1-\varepsilon_{mf})^2}{\phi_s^2 d_{psm}^2 \varepsilon_{mf}^2} + \frac{1.75 U_{mf}^2 \rho_g (1-\varepsilon_{mf})}{\phi_s d_{psm} \varepsilon_{mf}^2} \qquad (1)$$

i.e. $dP = (AU + BU^2)dh$

Where, $A = \frac{150 U_{mf} \mu_g (1-\varepsilon_{mf})^2}{\phi_s^2 d_{psm}^2 \varepsilon_{mf}^2}$ and $B = \frac{1.75 U_{mf}^2 \rho_g (1-\varepsilon_{mf})}{\phi_s d_{psm} \varepsilon_{mf}^2}$

For conical Bed the overall pressure drop across the bed height, H, is obtained by integrating Ergun equation [1]

$$-\Delta P = \int_{h_0}^{H+h_0} -(dP) = \int_{h_0}^{H+h_0} -(AU + BU^2)dh \qquad (2)$$

For a conical bed with apex angle of α

$$\frac{v}{v_0} = \frac{D_0^2}{D^2}, \frac{D}{D_0} = \frac{h}{h_0} \; and \; U = U_0 \frac{h_0^2}{h^2} \qquad (3)$$

On integration Ergun equation becomes

$$-\Delta P = AU_0 \frac{H.h_0}{(H+h_0)} + \frac{BU_0^2 h_0}{2}\left[1 - \frac{h_0^2}{(H+h_0)^2}\right] \qquad (4)$$

$$h_0 = \frac{D_0}{2\tan(\alpha/2)}$$

The area of cross-section-of a conical bed increases continuously from the bottom to the top. So the force in a differential bed height of dh is equal to the product of the pressure drop through it, - (dp), and the cross sectional area.

On integration for a conical bed, we get the overall effective weight of the particle in the bed is

$$G = \frac{K[(H+h_0)^2 - h_0^2]}{2} = C_1 \qquad (5)$$

Where, $K = \frac{g(1-\varepsilon)(\rho_s - \rho_f)\pi D_0^2}{4 h_0^2}$

The overall force exerted by fluidizing medium on the particle is

$$F = A_n(-\Delta P) = A_n(AU + BU^2)H \qquad (6)$$

According to the proposed model as given by Agarwal et al [11] , the particles at the bottom start fluidizing when F=G. Therefore the minimum fluidization velocity, Umf can be found out by equating F =G, that give

$$A_1 U_{mf}^2 + B_1 U_{mf} = C_1$$

$$U_{mf} = \frac{-B_1 \pm \sqrt{B_1^2 + 4A_1 C_1}}{2A_1} \qquad (7)$$

$$Where A_1 = A_n BH \;, B_1 = A_n AH \;,\; C_1 = g(1-\varepsilon)(\rho_s - \rho_f)A_n H$$

For conical fluidized Bed

$$A_1 = \frac{\pi BHD_0^2}{4\left(D_0 + 2H\tan\frac{\alpha}{2}\right)} \;, B_1 = \frac{\pi AHD_0^2}{4} \text{ and } C_1 = \frac{K[(H+h_0)^2 - h_0^2]}{2}$$

Putting $U_0 = U_{mf}$ and after integration of Ergun equation the pressure drop is given as

$$-(\Delta P_{mf}) = AHh_0U_{mf} + \frac{Bh_0[(H+h_0)^2 - h_0^2]U_{mf}}{2(H+H_0)^2} \quad (8)$$

The porosity of the bed was calculated from the measurement of height and area of the bed, mass and density of the particles. The sphericityhas been calculated from the correlation of Narsimhan [12] for binary and ternary mixtures ,

$$\frac{1-\varepsilon}{\varphi_s} = 0.231 \log dp_{sm} + 1.417 \quad (9)$$

On the basis of Ergun's equation and Baskakov and Gelperm's modification for cone geometry,a packed bed pressure drop equation for conical beds has been developed by Biswal.et.al.[13], for gas solid systems as under,

$$-\Delta P_{mf} = \cos\frac{\alpha}{2}\left[37.17[\tan(\alpha)]^{-0.47} \frac{H g(1-\varepsilon)^2 R_0(R-R_0)}{dp_{sm}^2 \varepsilon R} + \frac{0.75\rho_f(1-\varepsilon)R_0\left[1-\left(R_0/R\right)^2\right]U_0^2}{2dp_{sm}\varepsilon^3}\right] \quad (10)$$

In order to develop correlations for ternary systems, it is necessary to define the particle diameter and the density of the ternary systems. In this study, they are defined byGoossens et al. [14] as,

$$Dp_{sm} = \frac{1}{\Sigma \frac{X_i}{dp_i}}$$

For heterogeneous ternary mixture $\frac{1}{dp_{sm}\rho_{sm}} = \frac{W_1}{dp_1\rho_{s1}} \frac{W_1}{dp_1\rho_{s2}} \frac{W_1}{dp_1\rho_{s3}}$

For homogeneous ternary mixture $\frac{1}{dp_{sm}} = \frac{W_1}{dp_1} + \frac{W_1}{dp_2} + \frac{W_1}{dp_3}$

Sau et.al. [15] have developed a correlation for maximum pressure drop in gas–solid tapered fluidized beds as,

$$Fr = 0.2741(Ar)^{0.2197}(\sin\alpha)^{0.6092}\left(\frac{\varepsilon_0}{\varphi_s}\right)^{-0.6108} \quad (11)$$

$$\Delta P_{max} = 7.457\left(\frac{D_s}{D_0}\right)^{0.028}\left(\frac{dp}{D_0}\right)^{0.222}\left(\frac{H_s}{D_0}\right)^{0.642}\left(\frac{\rho_s}{\rho_f}\right)^{0.723} \quad (12)$$

The dimensionless correlations for the critical fluidization velocity of mixture of irregular particles and the maximum pressure drop are given by Sau et al [16],

$$Re_c = 301.416(Ar)^{0.1272}\left(\frac{\rho_s - \rho_f}{\rho_f}\right)^{0.2507}\left(\frac{dp_{sm}}{D_0}\right)^{1.562}(\sin\alpha)^{0.1917} \quad (13)$$

$$-\frac{(\Delta P_{max})}{\rho_{sm} g H_s} = 0.0204(Ar)^{0.02}\left(\frac{H_s}{D_0}\right)^{-0.2272}(\sin\alpha)^{0.2947} \quad (14)$$

$$Fr = \left(\frac{U_{mf}}{\sqrt{g d \rho_{sm}}}\right) \quad (15)$$

The original correlation for minimum fluidization velocity of Chiba et al. [17] as reported by Clarke et al.[18] for completely mixed bed of homogeneous binary mixture of particles is given by,

$$U_{vf} = U_{pk} - (U_{pk} - U_f)X_f \quad (16)$$

The critical fluidization velocity as given by Sau et al [19] for binary mixture of regular particles in tapered fluidized bed as ,

$$Re_c = 16.364(Ar)^{0.1969}\left(\frac{\rho_s - \rho_f}{\rho_f}\right)^{0.2507}\left(\frac{dp_{sm}}{D_0}\right)^{1.1854}(\sin\alpha)^{0.0585} \quad (17)$$

$$-\frac{(\Delta P_{max})}{\rho_{sm} g H_s} = 0.081(Ar)^{0.1492}\left(\frac{H_s}{D_0}\right)^{-0.2237}(\sin\alpha)^{0.2826} \quad (18)$$

Based on the above correlations and equation, the computational models were successfully applied for predicting the hydrodynamic characteristics of fluidization viz. the minimum fluidization velocity as well as the dependence of the pressure drop across the bed for a conical gas-solid bed. The developed correlations for cylindrical conduits could not be used in case of fluidization in conical bed with a varying cross sectional area. In most of the investigations, it is observed that the experimental values of U_{mf} and ΔP_{mf} are generally more than that in case binary mixture of irregular particles. Moreover it has also been observed that the bed pressure drop and the minimum fluidization velocity are less in case of irregular particles than that for regular particles because of less bed voidage and reduced channeling and slugging in a conical bed.

2.2.Bed fluctuation ratio(r)

The fluctuation may be defined as the ratio of the highest and the lowest level of the top of the bed for any fluidizing gas mass velocity. Bed fluctuation and fluidization quality being inter-related, efforts have been made to correlate fluctuation ratio in terms of static and dynamic parameters of the system. Experimentally it is given by,

$$r = \frac{\text{highest level the top of bed occupies}(h_2)}{\text{lowest level the top of bed occupies}(h_1)}$$

A correlation for fluctuation ratio in conical vessels for regular particles has been developed by Biswal et al[20] using dimensional analysis approach based on four dimensionless groups neglecting the effect of density of gas and solid particles. The correlations reported by Biswal et al [20] for the fluctuation ratio of regular and irregular particles (21) are given by equations (19) and (20).

$$r = 3.168\left[\left(\frac{d_p}{D_0}\right)^{0.14}\left(\frac{d_c}{h_s}\right)^{-0.16}\left(\frac{h_s}{D_0}\right)^{-0.24}\left(\frac{G_f G_{mf}}{G_{mf}}\right)^{0.17}\right] \quad (19)$$

$$r = 9.48\left[\left(\frac{d_p}{D_0}\right)^{0.27}\left(\frac{d_c}{h_s}\right)^{-0.83}\left(\frac{h_s}{D_0}\right)^{-0.15}\left(\frac{G_f G_{mf}}{G_{mf}}\right)^{0.32}\right] \quad (20)$$

Singh and Roy et al [22] proposed the correlation for bed fluctuation ratio in case of binary homogeneous and heterogeneous binary mixtures of regular and irregular particles in conical beds are,

For homogeneous binary mixture of spherical particles

$$r = 9.8 \times 10^{-2}\left(\frac{G_f}{G_{mf}}\right)^{1.088}\left(\frac{D_0}{dp_{sm}}\right)^{-1.97}\left(\frac{h_s}{D_0}\right)^{-0.25}(\tan\alpha)^{-0.25} \quad (21)$$

For heterogeneous binary mixture of spherical particles

$$r = 0.44\left(\frac{G_f}{G_{mf}}\right)^{0.58}\left(\frac{\rho_{sm}}{\rho_f}\right)^{-0.10}\left(\frac{D_p}{D_0}\right)^{-0.08}(\tan\alpha)^{-0.17} \qquad (22)$$

For both homogeneous and heterogeneous binaries mixture of non-spherical particles

$$r = 3.42\left(\frac{G_f-G_{mf}}{G_{mf}}\right)^{-0.02}\left(\frac{D_0}{d_{p_{sm}}}\right)^{-0.180}\left(\frac{h_s}{D_0}\right)^{0.033}\left(\frac{\rho_{sm}}{\rho_f}\right)^{-0.023} \qquad (23)$$

Current review of literature deals on the development of mathematical model for fluctuation ratio for conical bed.By critically reviewing , It has been observed that very little work has been reported for binary mixtures in conical beds and practically no work has been carried out for ternary mixtures in conical bed. Thus there has been ample of opportunity for the study of the hydrodynamic characteristics of binary and ternary mixtures in a conical fluidized bed.

2.3 Bed expansion ratio (R)

Bed expansion ratio (*R*) is defined as the ratio of the average height of a fluidized bed to initial static bed height at a particular flow rate of the fluidizing medium above the minimum fluidizing velocity. It is an important parameter for fixing the height of a gas-solid fluidized bed when recommended for process applications

Expansion of gas-solid fluidized beds may in general result from the volume occupied by bubbles and from increase in voidage of the dense phase. It is given by the expression,

$$R = \frac{h_s+h_b}{h_s} = \frac{h_{avg}}{h_s} \qquad (24)$$

The bed expansion ratio of a gas-solid fluidized bed depends on excess gas velocity (Gf −Gmf), particle size (dp) and initial static bed height (hs). Bed expansion is substantially greater in a two-dimensional bed than in a three-dimensional one. The use of a square fluidized bed has been advocated for some specific applications in view of its certain advantages as mentioned by Singh et.al. [22].The bed expansion reported by different investigators have different meanings because of the varied methods of measurement adopted. A number of investigations have been made with respect to the prediction of bed expansion in case of cylindrical conduits but limited information is available on the improvement of fludization quality interms of bedexpansion ratio for conical conduit. With respect to the bed expansion, the effects of column geometry have to deal extensively.

III. Bed Dynamics of Gas-Solid Fluidized System in Non-Cylindrical Conduits Other Than the Conical

Application of non-cylindrical conduits, instead of a conventional cylindrical one, is also considered to be an attractive alternative technique for smooth gas-solid fluidization as discussed earlier in this paper. Therefore some dynamic studies have, therefore, been made in hexagonal, square and semi-cylindrical beds for their potential application in gas-solid fluidization.

3.1 Minimum fluidization velocity and pressure drop

The overall pressure drop across a bed height, H is obtained by integrating the Ergun's equation

$$(-\Delta P) = \int_0^H [(AU + BU^2)]\,dh \qquad (25)$$

For the bed whose cross sectional area does not vary with the height equation (25) on integration gives,

$$-\Delta P = (AU + BU^2)H \qquad (26)$$

According to the proposed model as discussed in the above by Agarwal et al [11] the particles start fluidizing when F=G..Therefore, the minimum fluidization velocity, Umf can be found out by equating F =G

$$A_1U_{mf}^2 + B_1U_{mf} = C_1$$

$$U_{mf} = \frac{-B_1 \pm \sqrt{B_1^2+4A_1C_1}}{2A_1} \qquad (27)$$

The pressure drop for minimum fluidization is calculated as,

$$-\Delta P_{mf} = (AU_{mf} + BU_{mf}^2)H \qquad (28)$$

Values for minimum fluidization velocity and pressure drop are calculated using the above equations. The equations for the prediction of minimum fluidization velocity and bed pressure drop, developed for the circular beds on the basis of Ergun's packed bed equation, can also be used to calculate the above mentioned quantities for non-circular beds of constant cross-section For hexagonal, semi-cylindrical, square and cylindrical bed, cross-sectional area remains constant with the height of bed.

3.2 Correlations for bed fluctuation ratio

For any bed the general form for the bed fluctuation ratio is given by Singh et al [22][23], The correlations has been developed with the help of relevant dimensionless groups involving interacting parameters like bed height, equivalent diameter of the column, particle diameter, density of the particle, density of the fluidizing medium and fluid mass velocity

$$r = k\left[\left(\frac{d_p}{D_c}\right)^a\left\{\left(\frac{d_c}{h_s}\right)\left(\frac{\rho_f}{\rho_s}\right)\right\}^b\left(\frac{G_f-G_{mf}}{G_{mf}}\right)^c\right]^n \qquad (29)$$

Where, *k* is the coefficient and *a*, *b*, *c* and *n* are the exponents. The effects of the individual groups on fluctuation ratio, *r* have been separately evaluated for the different conduits and values of *a*, *b*, and *c* have been obtained from the slope of the plots .

Singh[23] studied the effect of various system parameters on fluctuation ratio in case of unpromoted non-colummar beds, viz square, hexagonal and semi cylindrical ones and proposed the following correlations

For Cylindrical Bed

$$r = 1.95\left[\left(\frac{d_p}{D_c}\right)^{0.04}\left\{\left(\frac{d_c}{h_s}\right)\times\left(\frac{\rho_f}{\rho_s}\right)\right\}^{0.04}\left(\frac{G_f-G_{mf}}{G_{mf}}\right)^{0.05}\right] \qquad (30)$$

For semicylindrical bed

$$r = 2.323\left[\left(\frac{d_p}{D_c}\right)^{0.08}\left\{\left(\frac{d_c}{h_s}\right)\times\left(\frac{\rho_f}{\rho_s}\right)\right\}^{0.04}\left(\frac{G_f-G_{mf}}{G_{mf}}\right)^{0.07}\right] \qquad (31)$$

For hexagonal bed

$$r = 2.3\left[\left(\frac{d_p}{D_c}\right)^{0.08}\left\{\left(\frac{d_c}{h_s}\right)\left(\frac{\rho_f}{\rho_s}\right)\right\}^{0.05}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{0.08}\right] \quad (32)$$

For square bed

$$r = 2.55\left[\left(\frac{d_p}{D_c}\right)^{0.09}\left\{\left(\frac{d_c}{h_s}\right)\times\left(\frac{\rho_f}{\rho_s}\right)\right\}^{0.04}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{0.05}\right] \quad (33)$$

3.3 Correlations for bed expansion ratio

Singh et al. [22,23] studied the effect of various system parameters on bed expansion ratio in case of cylindrical and non-cylindrical beds and proposed the following correlations.

$$R = K\left(\frac{d_p}{d_c}\right)^{a}\left(\frac{d_c}{h_s}\right)^{b}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{c} \quad (34)$$

The values of k, a, b, c for various types of bed for bed expansion ratio is given by Singh et al [23]

For Cylindrical Bed

$$R = 2.55\left(\frac{d_p}{d_c}\right)^{0.11}\left(\frac{d_c}{h_s}\right)^{0.21}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{0.18} \quad (35)$$

For semi-cylindrical

$$R = 5.46\left(\frac{d_p}{d_c}\right)^{0.28}\left(\frac{d_c}{h_s}\right)^{0.02}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{0.21} \quad (36)$$

For hexagonal bed

$$R = 2.422\left(\frac{d_p}{d_c}\right)^{0.12}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{0.25} \quad (37)$$

For square bed

$$R = 6.09\left(\frac{d_p}{d_c}\right)^{0.24}\left(\frac{G_f - G_{mf}}{G_{mf}}\right)^{0.27} \quad (38)$$

3.4 Prediction of bubbling velocity and fluidization index in non-cylindrical bed for gas–solid fluidization.

Particulate fluidization exists between minimum fluidization velocity and minimum bubbling velocity. Generally particulate fluidization occurs with liquid–solid systems, sometimes it also occurs with gas–solid systems when the particles are very fine but over a limited range of velocity. The superficial gas velocity at which bubbles first appear is known as the minimum bubbling velocity. The ratio of minimum bubbling velocity to minimum fluidization velocity, Umb / Umf, is known as the fluidization index, which gives a measure of the degree to which the bed can be expanded uniformly .

Wilhelm et al. [24] proposed the use of Froude number (Fr_{mf}) as a criterion for bubbling or aggregative fluidization. A value of $Fr_{mf} > 1.0$ induces a bubbling behavior in the bed, where

$$Fr_{mf} = \frac{U_{mf}^{2}}{d_p g} \quad (39)$$

A correlation for minimum bubbling velocity was suggested by Geldart [25] as

$$U_{mb} = K_{mb} d_s \quad (40)$$

Where $d_s = \frac{1}{\Sigma_i\left(\frac{x_i}{d_{si}}\right)}$

and K_{mb} is Constant whose value is 100 in C. G. S. unit.

Abrahamsen and Geldart [26] correlated the values of minimum bubbling velocity with gas and particle properties as follows:

$$U_{mb} = 2.07\left[\exp(0.716F)\frac{x_p \rho_g^{0.06}}{\mu_g^{0.347}}\right] \quad (41)$$

where F is the fraction of powder less than 45 µm.

Minimum fluidization velocity for particles less than 100 µm is given by Baeyens equation

$$U_{mf} = \frac{(\rho_p - \rho_f)^{0.934} g^{0.934} x_p^{1.8}}{(1100\mu^{0.87}\rho_g^{0.066})} \quad (42)$$

As Fluidization Index is the ratio of minimum bubbling velocity to minimum fluidization velocity, dividing the Abrahamsen equation by the Baeyensequation[27], the correlation obtained is

$$\frac{U_{mb}}{U_{mf}} = \frac{2200\rho_g^{0.126}\mu_g^{0.343}\exp(0.716F)}{d_p^{0.8} g^{0.934}(\rho_p - \rho_g)^{0.934}} \quad (43)$$

This means that higher the ratio, the bed can hold more gas between the minimum fluidization and bubbling point. The correlations for minimum bubbling velocity developed by Singh[28]with the help of relevant dimensionless groups involving interacting parameters like particle diameter, equivalent diameter of the column, packed bed height, density of the particles and density of the fluidizing media. The correlations obtained for different conduits are as follows

Cylindrical bed;

$$U_{mb} = 0.5231\left(\frac{d_p}{D_c}\right)^{1.12}\left(\frac{D_c}{h_s}\right)^{-0.0284}\left(\frac{\rho_p}{\rho_f}\right)^{0.74} \quad (44)$$

Semi-cylindrical bed;

$$U_{mb} = 0.168\left(\frac{d_p}{D_c}\right)^{0.994}\left(\frac{D_c}{h_s}\right)^{-0.1847}\left(\frac{\rho_p}{\rho_f}\right)^{0.80} \quad (45)$$

Hexagonal bed;

$$U_{mb} = 0.15\left(\frac{d_p}{D_c}\right)^{0.5733}\left(\frac{D_c}{h_s}\right)^{-0.0887}\left(\frac{\rho_p}{\rho_f}\right)^{0.5284} \quad (46)$$

Square bed; $$U_{mb} = 0.168\left(\frac{d_p}{D_c}\right)^{0.27}\left(\frac{D_c}{h_s}\right)^{-0.0132}\left(\frac{\rho_p}{\rho_f}\right)^{0.2825} \quad (47)$$

Minimum bubbling velocity and fluidization index are maximum in case of either semi cylindrical bed or hexagonal bed for most of the operating conditions and least in case of square bed by Singh [28] under identical operating conditions. The range of particulate fluidization is maximum again in case of semi cylindrical bed and less in case of other beds used. Hence where particulate fluidization is the requirement of the operation, semi-cylindrical column is a better substitute.

3.5 Prediction of slugging velocity and bubbling bed index in non-cylindrical bed for gas–solid fluidization

The gas-solid fluidization is characterized by the formation of bubble. The size of the bubble increases and sometimes even its diameter may become equal to that of the column. When the bubble diameter approaches the column diameter, it is termed as slugging. The superficial gas velocity at which slug formation starts is known as minimum slugging velocity. An aggregative fluidized bed in a column of small diameter operated at sufficiently high gas velocity will show continuous slug flow. Slugging affects adversely the fluidization quality. Slugging increases the problem of entrainment and lowers the performance

potential of the bed. Slugging is especially serious in long narrow fluidized beds.

Identical to fluidization index,it is proposed to define Bubbling bed index which is the ratio of the minimum slugging velocity and the minimum bubbling velocity and can predict the range of bubbling fluidization for gas-solid system.

Stewart et al. [29] have given a correlation for minimum slugging velocity as

$$U_{ms} = U_{mf} + 0.07\sqrt{gD_c} \qquad (48)$$

The bed must be sufficiently deep for coalescing bubbles to attain the size of a slug. Baeyens et al. [30] concluded that the above condition is applicable only if $h_{mf} > 1.3D_c^{0.175}$ in SI units, otherwise the minimum slugging condition is given by

$$U_{ms} = U_{mf} + 0.07\sqrt{gD_c} + 0.16\left(1.3D_c^{0.175} - h_{mf}\right)^2 \qquad (49)$$

The correlation for minimum slugging velocity have been developed by Singh et al.[31] with the help relevant dimensionless group involving interacting parameter like particle diameter, Equivalent diameter of the column, the packed bed height, the density of the particle and of the fluidizing medium. As by the author the correlations obtained for different conduits are as follows:

Cylindrical bed,

$$U_{ms} = \left[0.136\left(\frac{d_p}{D_c}\right)^{0.8324}\left(\frac{D_c}{h_s}\right)^{0.044}\left(\frac{\rho_p}{\rho_f}\right)^{0.6559}\right] \qquad (50)$$

For semi-cylindrical bed,

$$U_{ms} = \left[0.269\left(\frac{d_p}{D_c}\right)^{1.0245}\left(\frac{D_c}{h_s}\right)^{0.2013}\left(\frac{\rho_p}{\rho_f}\right)^{0.8224}\right] \qquad (51)$$

For hexagonal bed,

$$U_{ms} = \left[0.290\left(\frac{d_p}{D_c}\right)^{0.8478}\left(\frac{D_c}{h_s}\right)^{0.215}\left(\frac{\rho_p}{\rho_f}\right)^{0.5292}\right] \qquad (52)$$

For square bed,

$$U_{ms} = \left[0.863\left(\frac{d_p}{D_c}\right)^{1.23}\left(\frac{D_c}{h_s}\right)^{0.057}\left(\frac{\rho_p}{\rho_f}\right)^{0.78}\right] \qquad (53)$$

Minimum slugging velocity and minimum bubbling velocity are maximum in case of semi cylindrical bed and minimum in case of other noncylindrical conduits like square by Singh [31] and Hexagonal by Padhi et al.[32] under identical operating conditions based on the experimental data. It is further observed that the bubbling bed index is maximum in case of a square bed but the range of bubbling fluidization is maximum in case of a semi cylindrical bed for identical operating conditions. Since the range of bubbling fluidization is maximum again in case of semi cylindrical bed therefore a better substitute for conventional one when bubbling fluidization is desired to meet the process requirements.

IV. Conclusion

By reviewing the investigation of different authors it is concluded that the developed correlations for cylindrical conduits could not be used in case of fluidization in noncylindrical conduits.. Moreover it is also observed that that bed pressure drop and minimum fluidization velocity in case of noncylindrical conduits is less in case of irregular particles than that in regular particles because of less bed voidage and decreased channeling and slugging. However there is some deviation seen when compared with the equations with the fluidization of single particle and found that some of the parameters are less for noncylindrical conduits than that for conventional cylindrical conduits.

Gas-solid fluidization as contacting techniques in noncylindrical conduits has tremendous potential for industrial use. In spite of a lot of research activities carried out for the understanding of fluidization technology in the past few decades, several aspects relating to the effect of distributor, irregular and regular shape particles as bed material, liquid viscosity and surface tension, scaling up of a developed system for industrial application are not fully investigated. Further the various alternative proposition for smooth bed hydrodynamic with improvement in fluidization quality for cylindrical vice versa noncylindrical conduits have not been extensively explored. While some investigation to understand the various bed hydrodynamics of cylindrical and tapered bed have been conducted , the studies relating to alternative column configuration viz. square,hexagonal and semicylindrical extremely limited. In addition, CFD analysis of such bed is absolutely necessary to have an explicit understanding of bed dynamics in view of their potential process application in the year ahead.

Gas-solid system continues to raise the fundamental question, difficult practical dilemmas and opportunities for innovation. Much work has been carried out to understand the hydrodynamics characteristics in cylindrical conduits but limited work has been done in noncylindrical conduits and hence it need more attention However, it is premature to draw more conclusions with respect to dynamic behavior of non-circular beds at this stage and investigations are on for auxiliary enhancement.

WHERE

A =Erguns constant

A_n =Cross-sectional area of non-column bed m^2

Ar =Archimedes number $= \frac{g d_{p_{sm}}^3 \rho_{sm}^2}{\mu_f^2}$

B =Erguns constant

dp_{sm} =Average particle diameter of ternery mixture

dh =Differential bed height , m

dP =Pressure drop through bed height dh , N/m^2

D_o= Bottom diameter of tapered bed , m

D_c =Equivalant column diameter , m

d_p =Particle diameter , m

D_t =Diameter of column , m

Fr =Frouds number

F=Force exerted by the fluidizing medium on particle in the bed , N

G=Effective weight of the material in the medium , N

G_{mf} =Superficial fluid mass velocity at minimum fluidiation , Kg/hrm^2

G_f =Flow rate of fluid at fluidization condition , $\frac{m^3}{hr}$

G_{mf} =Flow rate of fluid at minimum fluidization condition , $\frac{m^3}{hr}$

g =Gravitational acceleration , 9.81 m/s^2

g_c =Gravitational constant

H=height of the bed , m

h_{max} =Maximum height of fluidized bed , L
h_{min} =minimum height fluidization bed , L
h_s =initial static bed height , L
H_f =Height of expanded bed , m
H_s =Height of initial static bed , m
K = Constant
m = Correlation factor , dimensionless
r = Bed Fluctation ratio (dimensionless)
R = Bed expantion ratio (dimensionless)
Re_c =Critical Reynolds number
U = Superficial fluid velocity ,$\frac{m}{sec}$
U_0 =Incipient fluidizing velocity ,$\frac{m}{sec}$
U_{sf} =Superficial velocity of gas where both components in a binary mixture are fluidized, m/sec
U_{pc} = Minimum fluidization velocity of packed components in single component fluidized beds, m/sec
U_f =Minimum fluidization velocity of fluid in single component fluidized beds ,$\frac{m}{sec}$
U_{mf} =Superfecial minimum fluidization velocity ,$\frac{m}{s}$
U_{mb} = Minimum bubbling velocity ,ms^{-1}
U_{ms} = Minimum slugging velocity , , ms^{-1}
V_{mf} = Minimum fluidization velocity
V_0 =fixed bed the superficial velocity
V_t = Particle terminal velocity
X_f: Volume fraction of fines in the mixture

Greek word
ΔP_{mf} = Pressure drop at minimum fluidization velocity ,$\frac{N}{m^2}$
ΔP = Pressure drop through particle bed , , $\frac{N}{m^2}$
$\emptyset_s$ = Sphericity of particle
ρ_p = Density of particle ,$\frac{kg}{m^3}$
ρ_f = Density of air ,$\frac{kg}{m^3}$
ε = Porosity of the fluidizing bed
ϵ_0 = Voidage at packed condition
μ = Viscosity of gas phase
ρ_f = Density of fluid phase ,$\frac{kg}{m^3}$
ρ_s = Density of a particle ,$\frac{kg}{m^3}$
$\emptyset_s$ =Sphericity of a particle

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Pure Testicular Teratoma Presenting as a Metastatic Germ Cell Tumor

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Abstract- Mature teratoma comprises 5-10 % of all testicular neoplasms. Pure testicular teratoma is rare in adulthood with an incidence of 5 %. Regardless of differentiation postpubertal testicular teratoma have aggressive behavior and microscopic appearance of metastasis may differ from that of the primary. We present a case of pure teratoma of testis in an adult presenting as a metastatic germ cell tumor.

Index Terms- Pure teratoma, Testis

I. Introduction

Teratoma is a tumor containing tissues representative of more than one germ cell layer. Teratoma may be classified according to the degree of maturation or differentiation of these tissues into mature and immature. Mature teratoma consists exclusively of well differentiated tissues . Immature teratoma consists of less differentiated or primitive appearing tissues occasionally with malignant transformation. Pure teratoma of the testis is a relatively rare tumor that can occur in children and adults. Teratoma occurring in the postpubertal age group is considered to be a malignant tumor with the capacity for metastasis.[1]

II. CASE REPORT

A 24 year old boy presented with retroperitoneal mass of 2 months duration. On exploratory laprotomy 6 x 4 cm right iliac lymph node mass was found . Excision biopsy of the mass was done. Histopathologic examination of the lymph nodes showed malignant cells with large vesicular nuclei, prominent nucleoli arranged in nests, trabeculae and tubular pattern. Also seen were foci of microcystic pattern and Schiller -Duval bodies.

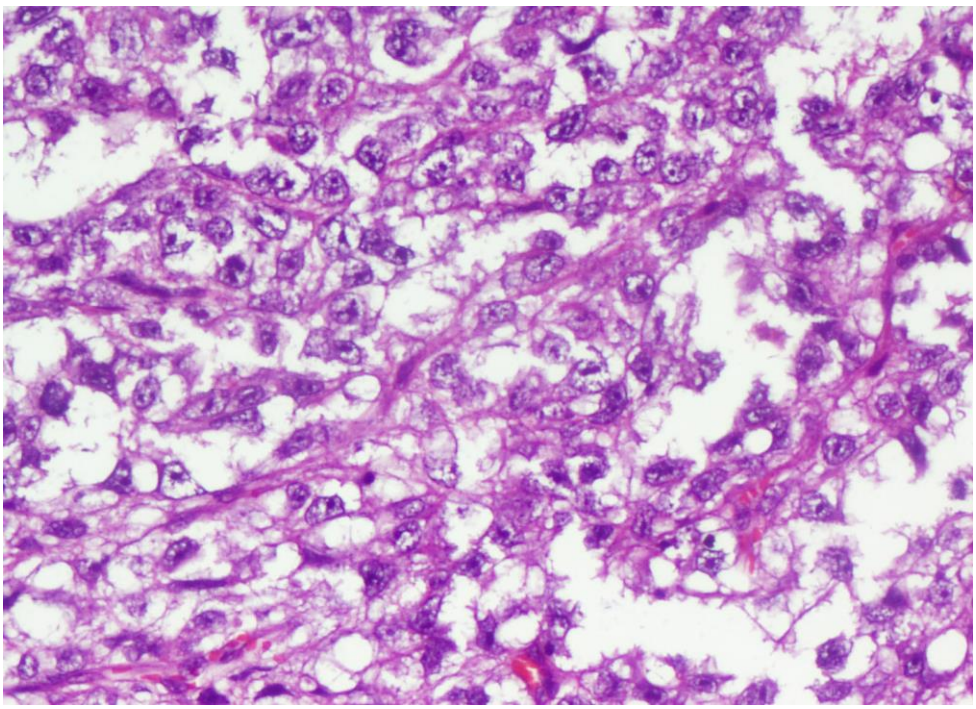

Fig 1.Retroperitoneal node showing malignant germ cell in nests and trabeculae H&E x 200

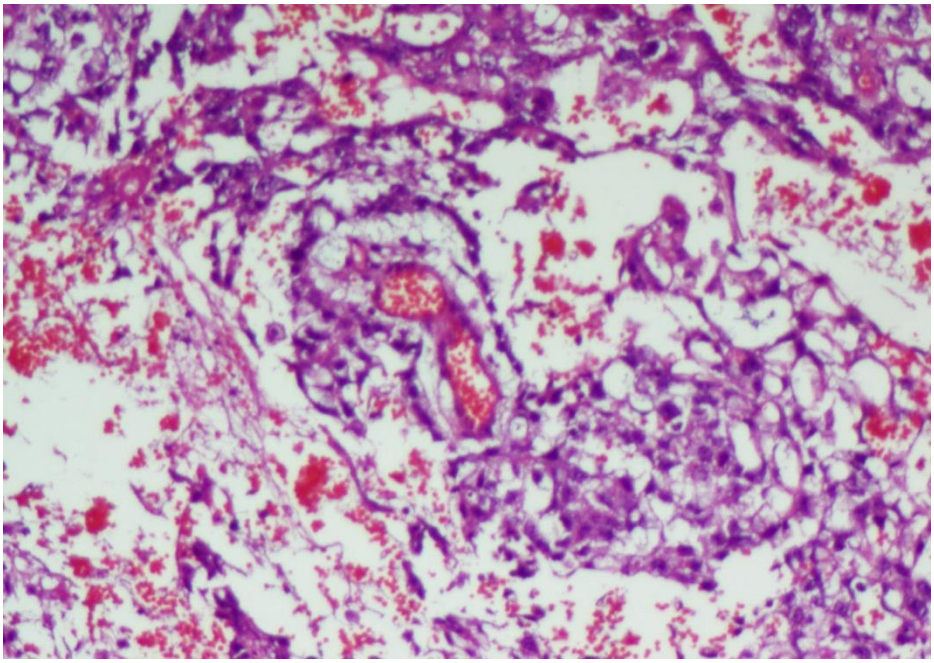

Fig 2. Schiller-Duval bodies H&E x200

A diagnosis of metastatic mixed germ cell tumor with embryonal carcinoma and yolk sac tumor components was given . The patient on further investigation for a possible primary revealed a small nodule in the testis and elevated serum β HCG & alpha-fetoprotein levels. Patient underwent a high inguinal orchidectomy. The specimen of testis was normal in size. Cut section of the testis showed a small white nodular lesion 2 x 1.5 cm in size.

Fig 3 .Testis normal in size with a grey white nodular lesion.

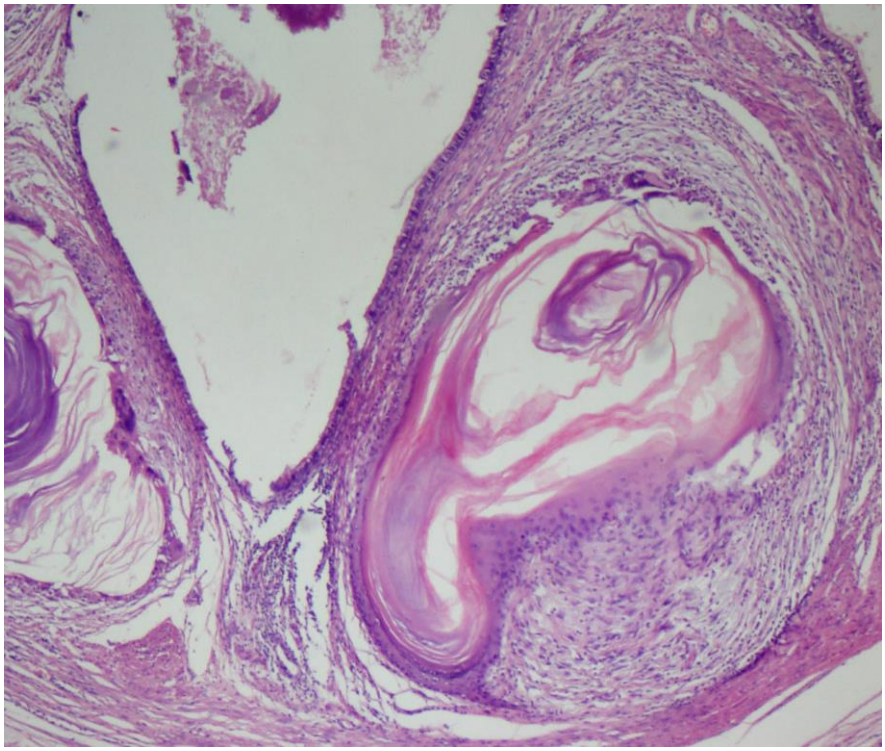

Fig 4. Testis showing a mature teratoma H&E x 100

Histopathologic examination showed mature teratoma .Multiple sections studied from the tumor in the testis showed no immature elements or evidence of other germ cell tumor components .

III. DISCUSSION

Testicular tumors can be classified into germ cell tumors and non germ cell tumors. Approximately 95 % of testicular tumors arise from germ cells .Germ cell tumors are divided into seminomas which occur in approximately 40% of the population and non-seminomatous tumors (NSGCT) which may be seen in pure or mixed form. [2,3] NSGCTs are histopathologically heterogenous and commonly consists of embryonal carcinoma, yolk sac tumor, teratoma and choriocarcinoma .

Teratoma is a tumor containing tissue elements derived from different germ cell layers (endoderm, mesoderm, and ectoderm). While teratomatous elements are found in 55-85 % of all NSGCTs in adults, only 2-6 % of testicular teratomas are pure teratomas.[3,4 ,5] Pure teratomas can be further subdivided by the sexual development of the patient into pre pubertal and post pubertal testicular teratomas. Their biology appear to be significantly different. Prepubertal teratomas usually follow a benign course, successfully managed with orchidectomy, do not recur and do not metastasize. Postpubertal teratomas are regarded as malignant, capable of metastatic behaviour, irrespective of whether the elements are mature or immature. Metastasis may be teratomatous and/or consist of other nonseminomatous germ cell elements, such as embryonal carcinoma and choriocarcinoma.[1,3]

Teratomas are the second most common germ cell tumors after yolk sac tumors in the prepubertal age group . They occur most commonly as pure teratomas in this age group The mean age of patients at diagnosis is 20 months, and rarely occur after the age of 4 years. Postpubertal teratomas are usually found in association with other germ cell elements (mixed germ cell tumors) and occur mainly in the second to fourth decades of life or sporadically in those older than 50 years.

Mixed germ cell tumors contain more than one germ cell component and are much more common in the testis than any of the pure histologic forms, representing 32%-60% of all germ cell tumors. Most common admixtures being embryonal carcinoma and teratoma . Minor foci of yolk sac tumor are common, although it is usually overshadowed by other components, such as embryonal carcinoma.

The biologic behavior of teratomas is quite variable, depending on the pubertal status of the testis. In prepubertal testis, pure teratomas are considered benign even when they are histologically immature. This benign behavior has led some investigators to recommend a testis-sparing tumor enucleation rather than orchidectomy. However, such conservative treatment is not an option for teratomas in postpubertal testis. Of important distinction, every element in a postpubertal testicular teratoma (mature or immature) can metastasize, irrespective of its histologic characteristics.The metastatic disease in a pure teratoma may contain other subtypes of non seminomatous germ cell tumors in addition to teratoma.[6,7]

The exact mechanism of metastasis in a pure teratoma remains controversial .The finding of IGCNU and associated scars support the theory that undifferentiated stem cells within the primary testicular tumor metastasize and differentiate into adult teratoma or undifferentiated germ cell tumor at the new

site. The primary germ cell tumor undergoes regression and /or differentiation to mature teratoma . It, therefore, represents a differentiated, malignant neoplasm that forms through a process of "maturation" from more primitive types of germ cell tumors .[7] Malignant transformation of mature teratoma into other germ cell elements in the metastatic site may represent another possibility of development of metastasis.[7,8]

Pure teratomas with metastasis are thought to be mixed germ cell tumors in which the nonteratomatous component have undergone spontaneous regression. In many of these cases, patients present with distant metastases of germ cell tumor and are subsequently found to have evidence of a regressed germ cell tumor in the testis. For patients who present with a scarred nodule in the testis in the absence of metastases, one must distinguish a completely regressed teratoma, which has metastatic potential, from nonspecific scars that result from injuries or vascular lesions.

Epidermoid cyst and dermoid cyst need to be distinguished from the usual teratoma of the adult testis because they are uniformly benign, whereas postpubertal teratoma may have associated metastasis of either teratomatous or nonteratomatous germ cell tumors. Postpubertal teratoma are associated with changes in the adjoining seminiferous tubules – Intra tubular germ cell neoplasia (IGCNU), microlithiasis, tubular atrophy, sclerosis and scarred areas. IGCNU is absent in dermoid cysts and the surrounding testis also lacks the changes seen in postpubertal teratomas.[6]

IV. CONCLUSION

Primary pure teratoma of testis in post pubertal age are considered malignant with capacity for metastasis and there is a high incidence of malignant germ cell tumor being present in the metastasis.

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The Concept of Time Lost - New Equation of State

Padiga Chandrasekhar Reddy

Abstract- The new concept of time lost during molecular collisions and other physical events has been introduced. Utilizing the concept, the loss of time during molecular collisions in gaseous state was calculated. The amount of pressure decreased due to the loss of time was calculated. Based on the concept the new equation of state has been developed. A new physical state of the matter 'gasolid' was introduced and some of the properties of gasolid were discussed.

Index Terms- Time lost, physical events, gasolid, molecular attractions.

I. Introduction

In the nature every physical event takes place by spending some amount of time. For example the process of ejection of photoelectrons requires certain amount of time ($\approx 10^{-7}$sec). When the radiation with sufficiently high frequency is incident on surface of the electropositive metals the photo electrons are ejected. During the process electrons require certain time to absorb photon and escape from the metal surface. Similarly collisions between micro particles takes place by spending some amount of time (Δt).Therefore it is natural phenomenon that every event in the nature takes place by expense of certain amount of time (Δt).

According to kinetic molecular theory of gases the gas molecules are moving randomly in all directions with very high velocities and they are colloid themselves and also on the walls of the container. During the molecular collision the momentum as well as the direction will be altered. To complete collision process the molecule should have to spend certain amount of time (Δt), that is the molecule should be spent a moment of time to complete the collision process. It implies that the molecules will lost certain amount of time (Δt) without motion during each collision. Owing to this loss of time the molecule can exert the less number of collisions than expected that results the decrease in the pressure of the gas than theoretically expected. Therefore a correction is needed to calculate the decrease in pressure due to the loss of time by the molecules during collisions. This is the vital factor for the deviation of gases from ideal behavior.

So for many equations of state were developed to explain the behaviour of gases but most of the equations developed based on the property of intermolecular attraction and repulsion forces. They felt that intermolecular attraction and repulsion forces are responsible for the decrease in pressure but none of the equation was successful in explaining the behavior of gases. Inter molecular attraction and repulsion forces are operative only in the vicinity of the critical temperature or below its critical temperature where the molecular velocities are less. Above the critical temperature molecules are moving with considerably high velocities, such high velocities can't influenced by the attraction or repulsion forces exert either by neutral molecules or small charges developed on molecules or induced dipoles developed on the molecules during molecular collisions. Even at critical temperature only a small fraction of molecules having lower molecular velocities are exerting considerable amount of intermolecular attractions due to this only small fraction of gas only liquefied at critical temperature but molecules with sufficiently high velocities are not condensed into liquid. If the intermolecular forces are really operative above critical temperature nothing is prevent the gas to liquefy at high temperatures by the application very high pressure. So far no proper explanation is available for not liquefying the gas above its critical temperature. It is clear evidence that intermolecular forces are not operative above the critical temperature, If not so the highly compressed gas can liquefy at any high temperature. Therefore it is concluded that the considerably high molecular velocities and insignificant intermolecular forces of attractions and repulsions are the main reason for not liquefying any gas above its critical temperature. If the intermolecular forces are operative above the critical temperature as expected by Vander Waal and others any gas can be liquefied above its critical temperature by applying considerably high pressure. For instance most of the gases occupy the volume equal to its volume in liquid phase as the pressure reaches to 1000 to 1500Atm. As the pressure increases the gas molecules approaches each other very closely that is the intermolecular distances are reduced as a result the intermolecular forces are increased and the gas will be liquefied but it is not practically possible and it indicates that the intermolecular forces are not operative on the high molecular velocities above the critical temperature.

Therefore a new equation of state has been developed based on the concept of time lost during the molecular collisions. As the number of collisions exert by the gas molecules are increases the amount of time lost by the gas molecules is also increases. It implies that if the collision frequency increases the pressure of the gas also increases accordingly the loss of time due to molecular collisions also increases, hence the deviation from the ideal behavior is going on increasing as the pressure increases.

Further more for the most of the gases the deviation is linearly increases with pressure. If the molecular attraction forces are responsible for the deviation the attraction forces are also increases linearly with pressure that results the liquefaction of gases even at considerably high temperature and pressure but that is not possible.

The above discussion is clearly indicates that the concept of intermolecular attractions of gases is not appropriate factor for the deviation of gases from ideal behaviour. The search for another appropriate factor the concept of time lost during molecular collisions was found to be more responsible factor for the deviation of gases from ideal behaviour.

Therefore the new equation of state is derived based on the concept of time lost during molecular collisions. The total amount of time lost by all the gas molecules in volume (V) is calculated. The total number of collisions that all the molecules

can't exert due to the loss of time and the reduced pressure due to this loss of time was calculated.

II. Derivation of an Equation for the Pressure of Gas

Consider a cube of length '**l**' enclosed with 'n' molecules of gas of molecular weight 'm' moving with RMS velocity 'C'. The velocity component is resolved into three components along three coordinate axis 'x' , 'y' and 'z' as C_x, C_y and C_z

$$C^2 = C_x^2 + C_y^2 + C_z^2 \text{----------} (1)$$

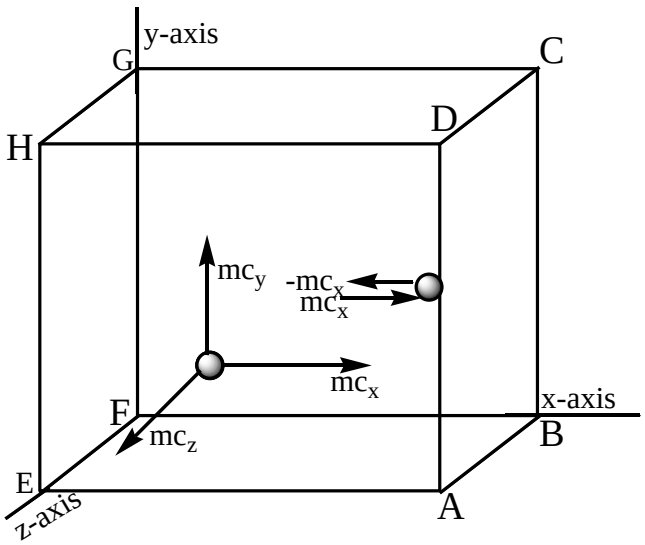


Fig-1

Consider the molecule is moving along with 'x' axis strikes on the face ABCD of the cube communicate a momentum 'mc_x'. Further, since the collision is perfectly elastic the molecule will rebounds from the face ABCD with the same velocity, so that the change in its momentum during the collision on ABCD.

$$mc_x - [- mc_x] = 2mc_x$$

After recoil, the molecule travels to the opposite face EFGH and collides with it rebounds and travels back to the face ABCD after covering the distance '2**ℓ**'.

The number of collisions per unit time which the molecule can makes with ABCD $= C_x / 2\ell$

Therefore the time taken by the molecule for the two successive collisions on ABCD $= 2\ell/C_x$

The loss of time during each of the collision is 'Δt'

The loss of time during the $C_x/2l$ collisions is $= \frac{C_x}{2l}\Delta t$

This time is wasted by the molecule during $\frac{C_x}{2l}$ collisions, by taking into consideration it is possible to calculate the loss of collisions during this time.

The number of collisions per unit time $= \frac{C_x}{2l}$

In '$\frac{C_x}{2l}\Delta t$'time the molecule will make $\frac{C_x}{2l} \times \frac{C_x}{2l}\Delta t$ collisions. But these collisions are not exerted by the molecule due to the loss of time during the collisions. By taking these collisions into account the total number of collisions exerted by the molecules $= \frac{C_x}{2l} \times \frac{C_x^2}{4l^2}.\Delta t$

The rate of change of momentum =

$$2mC_x\left[\frac{C_x}{2l} \times \frac{C_x^2}{4l^2}.\Delta t\right] \text{----------} (2)$$

$$= \frac{mC_x^2}{l} \times \frac{mC_x^3}{2l^2}.\Delta t$$

According to the Newton's second law the impressed force = Rate of change of momentum

$$f_x = \frac{mC_x^2}{l} \times \frac{mC_x^3}{2l^2}.\Delta t$$

Since pressure is force per unit area, the pressure P_x on the face ABCD.

$$P_x = \frac{f_x}{l^2} = \frac{mC_x^2}{l^3} \times \frac{mC_x^3}{2l^4}.\Delta t$$

Similarly, if P_y and P_z are representing pressure on the faces EFBA and FBCH which are perpendicular to the 'Y' and 'Z' axis respectively. Then

$$P_y = \frac{mC_y^2}{l^3} \times \frac{mC_y^3}{2l^4}.\Delta t$$

and

$$P_z = \frac{mC_z^2}{l^3} \times \frac{mC_z^3}{2l^4}.\Delta t$$

$$P = \frac{P_x + P_y + P_z}{3} = \frac{1}{3}\left[\frac{mc^2}{l^3} + \frac{mc^3}{2l^4}.\Delta t\right] \text{---------}(3)$$

It is the pressure exerted by one molecule. Therefore the total pressure exerted by 'n' number of molecules present in the container of volume 'V'

$$P = \frac{1}{3}\left[\frac{mnc^2}{V} + \frac{mnc^2}{V}.\frac{C}{l}.\Delta t\right] \quad \Theta\, l^3 = v \ volume$$

$$P = \frac{1}{3V} mnC^2\left[1 + .\frac{C}{l}.\Delta t\right] \text{---------}(4)$$

$$P = P^1 + P^1 \frac{C}{l}\Delta t \text{---------}(5)$$

$$\Theta\, P^1 = \frac{1}{3V} mnC^2$$

P^1 is the observed pressure

$\frac{C}{l}$ is the number of collisions made by the molecule in unit time.

Actually the number of collisions made by the molecule in unit time is called collision frequency (η) and is equal to $\eta = \frac{C}{\lambda}$

C = RMS velocity of molecule; λ = mean free path; P = Actual pressure; P^l = Observed pressure; d = density of the gas; R = Universal gas constant; T = Absolute Temperature; γ = Viscosity of the gas; The value of 'η' is the collision frequency and calculated with the equation $\eta = \frac{4dRT}{3\pi m\gamma}$

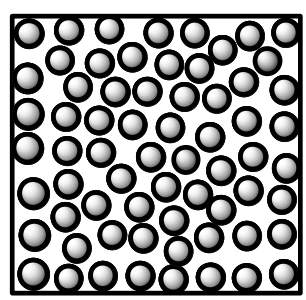
The value of 'Δt', from collision theory is approximately 10^{-18}sec

Therefore the equation of state for the gases above the critical temperature is

$P^1 (1+\eta\Delta t) V = RT$---------- (6)

In the above equation the loss of time 'Δt during the collisions depends on the velocity of the molecules, hence it is temperature dependent and the number of collisions 'η' is both pressure and temperature dependent.

The maximum number of collisions made by the molecule η does not exceed 1/Δt. It implies that η Δt' is never equals to '1'. As the product of the number of collisions executed by the molecule and the loss of time during each collision approaches near to unity the gases behaves like a solid. The translatory motion is almost seized. Since each molecule is closely surrounded by number of highly populated gas molecules. Such closely surrounded molecules do not allow the molecule to move away from its position so easily. At such instance gas molecules are only vibrating among the surrounded molecules and making collisions with them like the particles in the solid. Most of the kinetic energy of the molecules is converted into vibrational energy. When 'η Δt' value tends to reach unity gases differs widely from behavior of gases and gas laws. As the pressure of the gases increased to 1000 to 1500Atm they occupy the volume almost equal to its volume in liquid phase. The difference between gases and liquid is that the intermolecular forces of attractions and repulsions are present in liquid state but intermolecular forces of repulsions are only present among the electron clouds of the surrounded molecules in gaseous state. At that instance gas can be compressed to the insignificant extent. Further compression of gas requires very high extent of force. Therefore at such conditions the compressibility of gases is nearly equal to the liquids and solids. Such state of the gas is named as ***'Gasolid'.*** In the state of gasolid gas do not obey gas laws and having insignificant compressibility like solids. In the state of gasolid as the value of 'η Δt' tends to unity most of the kinetic energy of the gas molecules is converted into the vibrational energy of molecules. Hence the molecules are vibrating among the surrounding molecules. Since molecules are closely packed in gasolid state they experienced very strong repulsive forces due to electron clouds of the molecules. The difference between supercritical liquid and gasolid is that the former one is an equilibrium state between liquid and gaseous states of gas in the vicinity of critical temperature where as the gasolid is the purely gaseous state in which the translatory motion is almost seized and the gas can't be compressed further.



Highly Compressed state Of Gases Called Gasolid

III. Explanation for the Behaviour of Gases at Different Temperatures and Pressure

a) At high temperature and low pressure:

At high temperature the molecular velocities are high therefore the loss of time during each collision Δt is very low hence the loss of pressure is also very low. But at low pressure

the number of collisions made by the gas molecules (η) is relatively low. Hence loss of time (η Δt) is also low. Therefore the decrease in the pressure is also very low and can be negligible at high temperature and low pressure. Then the gas equation at these conditions is ***PV = nRT***

b) At high pressure and low temperature:

At high pressure the number of collisions made by each of the gas molecules is (η) very high, Therefore the loss of time during the molecular collisions is very high. At low temperature the molecular velocities are very low, therefore the loss of time (Δt) during each collision is relatively high. Hence considerable amount of time (η Δt) was lost by the gas molecules as a result the pressure is decreased significantly than expected. Therefore the deviation is more from ideal behaviour of the gases.

c) At high pressure and high temperature:

At high pressure the number of collisions made by the gas molecules(η) is very high, Therefore the loss of time during the molecular collisions is very high moreover at high temperature the molecular velocities are very high as a result the loss of time during each collision (Δt) is very low. Therefore due to very large number of collisions the overall time lost (η Δt) is high and cannot be neglected. Due to this the deviation from gas laws is high. Therefore at the conditions of (b) and (c) the equation of state is $P^1 (1+\eta \Delta t) V = RT$

IV. Explanation for the Behaviour of Gases Like Hydrogen and Helium

Hydrogen and Helium are the gases are known to be the permanent gases. These gases always show a positive deviation from ideal behaviour, this is due to reason that they execute large number of collisions even at low pressure because of their very low molecular weight and relatively high molecular velocities. As a result the time lost by the molecule during collision is high even at low pressure. Therefore at the conditions these gases obey the equation

$$P^1 (1+\eta \Delta t) V = RT$$

V. Conclusions

The concept of time lost was introduced. It is utilized to explain the behaviour of gases and deviation of the gases from the gas laws and ideal gas equation. It is providing the proper explanation for the linear increase of compressibility factor with pressure of all gases especially for permanent gases like Hydrogen and Helium. This concept leads to explain the basic behaviour gas at extremely high pressures and above the critical temperature.

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Decentralization from Below: A Case Study of Nagaland, India

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Abstract- Decentralization and local governance are increasingly recognized as basic components of democratic governance, since they provide an enabling environment in which decision making and service delivery can be brought closer to the people, especially to the rural people. It involves the shifting of fiscal, political and administrative responsibilities from higher to lower levels of government. Throughout the world, countries have been enthusiastically embracing different aspects of decentralization, particularly during the past decades. Decentralized form of governance aims at an economic and political system that responds more closely to people's preferences and requirements at the grassroots level by bridging the gap between suppliers and users of goods and services. Over the past decades the developing world has seen increasing devolution of political and economic power to local governments. And decentralization is considered an important element of participatory democracy and, along with privatization and deregulation, represents a substantial reduction in the authority of national governments over economic policy. Therefore, the present paper examines the institutional and the organizational structures, and execution of various developmental programmes and activities under the decentralized form of local government of the Naga people residing in the Northeastern part of India, where the execution of various administrative and developmental projects are carried out through three institutional and organizational delivery mechanisms which are 'Village Council', 'Village Development Board (VDB)' and through the 'Communitisation' scheme.

Index Terms- Decentralization, Village Council, Village Development Board (VDB), Naga, Communitisation.

I. Introduction

Mahatma Gandhi on Panchayati Raj (corresponding to the 'Village Council' of Nagaland) said,

"Every village has to become a self-sufficient republic. This does not require brave resolutions. It requires brave, corporate, intelligent work…. I have not pictured a poverty-stricken India containing ignorant millions. I have pictured to myself an India continually progressing along the lines best suited to her genius. I do not, however, picture it as a third-class or even a first-class copy of the dying is fulfilled, and every one of the seven lakhs of villages becomes a well-living republic in which there are no illiterates, in which no one is idle for want of work, in which everyone is usefully occupied and has nourishing food, well-ventilated dwellings, and sufficient Khadi[1] for covering the body, and in which all the villagers know and observe the laws of hygiene and sanitation. There is nothing inherently impossible in the picture drawn here. To model such a village may be the work of a lifetime. Any lover of true democracy and village life can take up a village, treat it as his world and sole work, and he will find good results (Prabhu & Rao, 1960, pp. 246-247)."

The State of Nagaland is situated in the extreme North-Eastern part of India, sharing an international boundary with the adjacent country of Myanmar. It is pre-dominantly a tribal state, inhabited by 16 major tribes under the umbrella term of the 'Naga', and along with a number of sub-tribes. The Ao, Angami, Chang, Konyak, Lotha, Sumi, Chakhesang, Khiamniungam, Kachari, Phom, Rengma, Sangtam, Yimchungrü, Kuki, Zeliang and Pochury are the major tribes. Each tribe is distinct and unique in character from the others in terms of village administrations, customs, languages and attires. Traditionally, every Naga village had their own form of administrative system which differs from tribe to tribe and from village to village. And there is no uniformity in the pattern of their administrative systems. However, in the past four decades there has been remarkable extension of the administrative reach to the far-flung corners of Nagaland. In many ways, the organization of the districts along with general tribe geographical boundaries has provided continuity to traditional tribal practices and linguistic affiliations.

Each village in Nagaland today has a Village Council and a Village Development Board – corresponding to a regulating and executive body. The traditional institution of the village council was given a legal status in 1968. Subsequently, in 1978, the traditional Village Councils were given powers to deal with development matters. As a result, a Village Development Board (VDB) was created by the Village Council and Area Councils Act of 1978 (Sahay, 1992). Village Councils are an important component of the modern governance system in Nagaland. While the District Planning and Development Boards provide the needed flexibility to ensure a responsive and holistic approach towards development for the district, linkages to the grassroots through the Village Development Boards (VDB) have been established for delivering the rural developmental inputs. These linkages have become vital for decentralizing governance and decision-making in the post-independence and Statehood eras. Quoting UNDP (1997) "Decentralizing government … enables people to participate more directly in governance processes and can help empower people previously excluded from decision-making. In this way a country can create and sustain equitable opportunities for its entire people. Closer contact between government officials and local communities and organizations

[1] Khadi - An Indian homespun cotton cloth.

also encourages the exchange of information that can be used to formulate development programmes that are tailored to local needs and priorities, and thus are more effective and sustainable." This paper outlines the institutional structure and the execution of various rural developmental projects in the light of mass participation in a decentralized form of local governance.

II. Methodology

This paper is primarily based on field data collected from the sample areas/households through survey and interview method. Secondary data available are also used for the study. These are collected from the official records, journals and publications of the development departments etc. One case study was developed by field visits followed by data collection by the author and selected field collaborators. Data and reports from the village/VDB were selected purposively for the study which covers in total 210 households. Besides the selected village the author had also surveyed several other surrounding villages to observe the developmental projects being implemented under Village Developmental Board and Communitisation project. Observation, interview and questionnaire were employed as key methods for collecting data. Interviews were conducted with the help of systematically prepared schedule on the elders and knowledgeable person of the village.

III. Decentralized Local Governance in Nagaland

The institutionalization of the traditional modes of local governance in Nagaland had been well before the commencement of the Panchayati Raj Act through the Nagaland Village and Area Council Act 1978. In the present context the Village Councils and their subsidiary Village Development Boards (VDBs) are established modes of decentralized governance all over Nagaland. These institutions have evolved from indigenous practices of the Naga tribes and later regularized through legislation, facilitating their easy assimilation with existing village system. Every recognized village in Nagaland has a Village Council and its development wing the Village Development Board (Chakraborty, J). Nagaland has 1,317 villages in its area of 16.579 sq. km. spread over 11 districts and 52 blocks. There is specific distribution of duties and power between the Village Council and the VDB. The Council has administrative and judicial duties whereas the VDB has financial and development functions.

IV. Village Council – power and duties

The Village Council is the principle organ of the Village. The Village Council under the head of the Chairman assisted by the Gaonburas[2] and the Councilors play the most prominent role in running the administration of the village. The members of the Village Councils are elected democratically for a period of five years. The Village Council is the overall authority for the administration of justice within the village. Under the Nagaland Village and Area Council Act, 1978, every recognized village in the State shall have a Village Council. The Village Council acts as an auxiliary to the administration and has the full power to deal with internal administration of the village. It also acts as the court of appeal and all the council members pronounce judgment on trial over the prevailing case. It is the duty of the Village Council to frame rules and regulations regarding civil, criminal, and tradition related cases, they also ensure that offenders are duly punished. Most of the disputes are settled within the village by the Village Council based on their framed existing laws and regulations. However some cases may also be appealed to the Court of District Magistrate or to the Dhobashi[3] Court. The Village Council also constitutes the Village Development Board (VDB) and ensures that various development projects are implemented efficiently in the Village. The council also has full powers to deal with the internal administration of the village, maintenance of law and order, enforce orders passed by competent authority, etc. This is why Village Councils have been the crux of grassroots administration in Nagaland.

V. Village Development Board (VDB)

The VDB is a statutory body, functioning under the primary village authority known as Village Council. The institution of the VDBs, which are synonymous with the concept of decentralized grass root level planning in Nagaland, was first set up in 1976 in Ketsapomi village in Phek District on an experimental basis. Nevertheless, on seeing the success of the Ketsapomi VDB, a mass campaign was launched since 1980 to expand the coverage of this unique institution throughout the State. VDBs were thereafter gradually constituted in the remaining parts of the State and the concept institutionalized with the enactment of VDB Model Rules, 1980 (Karmakar K.G. *et.al*.).

The Village Development Board is a mechanism for decentralization of planning and development at the grass root level at its best. It includes all the permanent residents of the village as its members functioning under a management committee with a Secretary who is elected democratically for a period of three years. Besides women are to constitute 25% of the total of the management committee. This is a novel scheme of development as the locals understand their needs better and can effectively articulate and implement developmental activities better.

The Department of Rural Development has been involved in the developmental activities of the rural areas of Nagaland through the implementation of various programmes and schemes with the objective of improving the economic and social living standard of the rural poor through employment generation and infrastructural development programmes. All the activities of the Department are implemented through the grass root level organization “The Village Development Boards (VDBs)” which has been active since its inception in 1980.

[2] Gaonburas - They are the Ex-officio members in the Council and can exercise franchise in the council election. They are the agent to the Government.

[3] Dhobashis are Govt. agent who deals with customary laws and legal advisor to the Deputy Commissioner of the District Headquarter.

Activities Implemented through the Village Developmental Board (VDB)

VDBs are the grassroots level Development Institutions in the state and are responsible for implementation of all programmes/schemes of both under State Plan and Centrally Sponsored Schemes under Rural Development Department. The following activities implemented under the VDB in Nagaland:

- Swarnjayanti Gram Swarozgar Yojana (SGSY)
- Indira Awaas Yojana (IAY)
- Grant in Aid to VDBs (Household Allocation)
- VDB Welfare Fund
- Fixed Deposit (FD) & Matching Cash Grants (MCG)
- Mahatma Gandhi National Rural Employment Guarantee
- Schemes (MGNREGS)
- Backward Region Grant Fund (BRGF)
- Micro-Finance (MF).

Duties of the Village Developmental Board (VDB)

VDB being a decentralization concept of achieving "Rural Development through Active Participation of the Village Community" performs a vital role in ensuring the overall economic growth and infrastructural development of a village. The following are the duties of the Village Development Board:

- Identify & Select priority based schemes through General Body Meeting.
- Ensure Ground implementation of Programmes.
- Ensure Community participation.
- Ensure Transparency & Proper Fund Utilization.
- Maintain Account, Muster Rolls & Beneficiary Records.

Through VDB the State Government of Nagaland is implementing several welfare measures for alleviating poverty and to bring about socio-economic change in the lives of the rural poor. And also with a view to ensure grass root level participation of the people in the governance, decentralized institutions have come to play crucial roles. Projects for construction of agri link roads, approach roads, irrigational canals, rain water harvesting etc. has come to be implemented for creating infrastructure facilities of the rural areas to bring about progress and development. The primary responsibility for drawing up developmental projects and to prioritize areas for development based on local knowledge falls on the Village Development Boards therefore that makes them a very important institution of the rural villages. In this aspect the role of Village Development Boards needs special attention.

Communitisation: The Concept

Citizen participation is the essence of democracy. People have the right to participate… a right to be part of decision affecting their lives. They know more about where they live and what they want and what is best for them than do people from outside. Further, equipping people with right information and knowledge that is acceptable and compatible with the community will help them make healthy choices. Therefore, the State Government of Nagaland has adopted openness and encouraged active participation of civil society, harnessing its rich social capital to revitalize and improve public services through the concept of Communitisation.

The concept of Communitisation was introduced in 2002 under the "Nagaland Communitisation of Public Institution and Services Act of 2002", under the stewardship of the then Chief Secretary of the State Shri. R.S Pandey. And after enactment of Nagaland Communitisation Act on public institutions and services the same year, the government in phases handed over ownership and management of education, health care, water supply, electricity, tourism and bio-diversity conservation to the communities.

Communitisation consist of a unique partnership between the government and the community involving transfer of ownership of public resources and assets, control over service delivery empowerment, decentralization, delegation and building capacities, all with the aim of improving the delivery of public utility systems. Communitisation therefore involves transfer of government assets to the community, empowerment of community through the delegation of governmental power of management and supervision of day to day functioning of employees to village committees to be managed by committees/boards under the aegis of the Village Council as prescribed by the Act.

It also demand ensuring accountability to government employees posted at the service delivery level to local committees and control of government assets by village committees including the responsibilities for maintenance and augmentation of assets. As such Communitisation is based on triple 'T' approach viz:

- Trust the user Committee,
- Train them to discharge their new found responsibilities and,
- Transfer governmental powers and resources in respect of management.

The venture paid off with Nagaland being selected for United Nations Public Service Awards in 2008 for Communitisation programme in recognition of its innovative use of rich social capital. Moreover, the Unicef's current International issue on the State of the World's Children, has also devoted a full page on "Imagine Nagaland". Nagaland is the only State, which has featured this way in the publication. The State Government of Nagaland was also conferred the United Nations Public Service Awards for Communitisation programme in recognition of its innovative use of rich social capital on June 23, 2008 at New York. And Nagaland is the only award winner in Asia Pacific region in the category of fostering participation in policy-making decisions through innovative mechanism and one among the 12 awardees selected globally in different areas of public services.

Salient Features of the Nagaland Communitisation Act 2002:

- Boards or committees constituted under the aegis of Village Councils to own and manage the communitised institutions.
- A representative Committee of the community: Members are from the user community … the actual stakeholders.

- Assets, powers and management functions of the Government transferred to Committee through MOU.
- Responsibility of the Committee: Disbursal of salary, grant of casual leave, control of employees including power to exercise 'no work no pay', maintenance of buildings and assets, purchase of essentials e.g. textbooks, medicines.
- Responsibility of the Government: Ensure deployment of health workers, provision of funds for salaries and other grants, provision of technical guidance and support.
- Government to be in assistive, monitoring and regulatory role.

Unlike other forms of decentralization or privatization, Communitisation develops partnership between Government and the people through delegation of powers and responsibilities to the community for the management of public institutions, so that the performances of the public utilities improve. As for instance, the Communitisation of health/education sector means the community takes over ownership and management of health/education institutions and services. It also means active participation of community in preventive and promotive measures, contributing their share to make health a reality in their own community (Govt. of Nagaland, 2009).

VI. Case Study

In 2011, the author visited a village namely Sodzulhou, situated to the North Western side of Medziphema Administrative Block of Dimapur District, Nagaland, and detail discussions with the members of the Village Council, VDB and Communitisation committees were held. Besides this village, several other surrounding villages were also visited and discussions were made with the selected individuals of those villages. Like any other Naga villages of Nagaland, the administration of the Sodzulhou is carried out by the local governing body i.e., the ***Village Council***. It is headed by the Village Council Chairman who is elected unanimously from among the Council members for the period of 5 years. The Chairman is assisted by the Council members and the Gaonburas. Along with the Chairman, the number of councilors consists of 10 members which includes; 6 elected members and 4 Ex-officio members i.e., the Gaonburas. The Village Council is the overall authority for the administration of justice within the village. It is the final Authority on all matters relating to the welfare and security of the village.

The Chairman and his Councilors are the legislators in the Village Assembly. They make various necessary rules and regulations, and the same amendments were done from time to time to suit with the prevailing situation and most importantly to meet the welfare of the people. The legislative function of the Village Council is to execute the various existing laws framed by them, government laws, and ensured that these laws are abided by the people of the village effectively. Any breach of laws and taboos by any individuals were punished duly by the Village Council.

The Village Council from time to time decides disputes – public dispute, private dispute and inter village dispute. Private dispute - involving two or more persons, public dispute are those in which the whole village is involved, and inter village dispute – where two or more villages are involved. It is the responsibilities of the Village Council to settle all the disputes within the village jurisdiction and an effective execution of its laws and decisions. In case a person or a party fails to abide by the rules and decisions of the Council, they take up necessary actions against him or them, and see to it that all its laws and regulations are obeyed effectively. The Council does not tolerate any defiance of its authority. Thus, to punish the wrong doer and to ensure the strict observance of laws in the village is one of the primary functions of the Village Council.

Judicial function is another one of the most important functions of the Village Council. The Council members constitutes what is known as the 'Village Court', it is the highest court of justice organ in the village, it deals with all kinds of crimes, disputes and breach of laws by the people within their jurisdiction. The Village Chairman and his Councilors act as the judges and dispense the judgment on the basis of existing laws.

The ***Village Development Board*** of this village headed by the VDB Secretary, who is assisted by four more members are elected democratically by the people of the village for the period of three years. The VDB works under the aegis of the Village Council and is involved in all phases of developmental activities as a part of their responsibilities. They make sure that developmental projects are carried out efficiently with the good results.

VDB, along with MNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) which was introduced by the GOI in 2008 in all the rural areas of India have been very fruitful and successful in delivering development and employment to the villagers of this Village. The introduction of NREGA scheme has greatly boosted to the growth and development of the Village by constructing infrastructure and guaranteeing employment for hundred days a year to all the eligible individuals. It is basically a grass-root development process. Some of the developmental works that are successfully implemented and accomplished under the agencies of VDB and MNREGA since its induction in the village are footpath, village Gate, drainage, community latrines and bathrooms, approach road to highway and to the village, approach road to primary School, public well/water reservoir), community granary, etc. They have also formulated some few projects to be carried out in the near future, and these are; Irrigational canal for agriculture purpose, Retaining Wall, etc.

Nagaland Communitisation *of Public Institution and Services Act of 2*002, is establish partnership between Government and community with the aim of improving delivery of public utility systems. Under this approach, the village has three Committees viz: Village Education Committee (VEC), Village Health Committee (VHC), Water and Sanitation Committee (WATSON) and Managing Board Committee (MBC). These three committees carried out their respective duties delivering the overall socioeconomic growth and higher living standard to the people of the village.

The **Village Education Committee (VEC)** takes over the management of the government Primary and Middle school of the village; take care of the basic elementary education of

children in the village; they make sure that all the children of the village are admitted to the Village Government Primary School; the Committee also disburses the salary of the teachers; they also ensure the discipline and regularity of teachers, with power to enforce 'no work, no pay' principle; they enforced deduction of one day wages for the absentee's teacher in the working days; the VEC members also regularly visited the school and cross-checked the students and faculties activities; they make sure that no proxy teachers are entertained in the village school; purchase of textbooks, furniture, construction and repair of school buildings etc. are also taken care by the VEC along with the school authority; the Committee members also took part in the social activities and other co-curricular activities of the school; lastly, they are also empowered with the selection, appointment and transfers of any teacher who is found of misconduct in discharging his/her duties.

Secondly, **Village Health Committee (VHC)** ensured the proper management of the Village Primary Health Centre; they acted as a vigilante on the working system of the Health Centre, staffs and their effective delivery of services to the people; the committee along with the staffs gave more emphasis to the health condition of pregnant woman, new born babies and children through their supply of free of cost medicines and care; they make sure that pregnancy are registered before the VHC; the committee also examines the health condition of the villagers; ensure all children are immunized (Polio drops); the Health Committees along with the staff members carried out preventive measures to any outbreak of epidemic and disease in the surrounding areas and it is their task to announce the people about the outbreak of the disease and if necessary report it to the nearest District Health Department; the Committee is also empowered with the power to transfer any staff found guilty of misconduct in discharging their duties, and the same with the recommendation of the new replacement staff; the village with the initiative from the Committee and the staff members observed 'Nutrition Day' once every month and medicines are distributed free of cost to the pregnant women, lactating women and children on this day.

Thirdly, **Water and Sanitation Committee (WATSON)** looks after the proper management and supervisions of water supply from the source to the common main distributing reservoir; assets and equipment of water supply are also under the maintenance and custody of the Committee; they appoint and control over the person connected with the management and maintenance of the common water; they implement schemes/projects connected with development and improvement of water shed for the sources of water supply and protection of water supply sources; they also make sure that every household receives enough drinking water.

VII. Conclusion

Decentralization and local governance are increasingly recognized as basic components of democratic governance, since they provide an enabling environment in which decision making and service delivery can be brought closer to the people, especially to the poor. Decentralization facilitates greater popular participation in governance. It brings government closer to people, making it more accessible and knowledgeable about local conditions and more responsive to peoples' demands. This facilitates the forging of a strong relationship between the governors and the governed and identification of the people with their government, which helps to reduce alienation from the political process. Decentralization of power from center to states, states to districts and areas within districts and villages can be one of best ways of radically restructuring an over centralized system of governance, which may be somewhat removable from people, and have limited direct accountability to them. It also results in empowering people, promoting public participation and increasing efficiency as it is evident in the State of Nagaland.

Successfully implementation of development programmes requires adequate funds, appropriate policy framework and effective delivery machinery. However, without good governance and programmed implementation, much of the vast quantum of resources being spent for development is wasted. Therefore, it should be so designed as to bring about improve transparency, better accountability and streamlining of the structure of government.

Decentralization provides opportunities to marginalized sectors of the community, like women in some countries, minorities etc., to participate at the local level, enabling a more sensitive approach to policy formulation and implementation. It makes development projects more sustainable and cost effective because local people are more likely to be involved in their design, execution, and monitoring. Decentralization also represents the most effective means of curbing excessive concentration of power by the central government, which is a distinctive feature of the existing governance model, and which is inimical to several basic tenets of good governance, e.g. openness, transparency, fairness and probity.

Decentralization, manifested in a participatory style of local governance, fosters greater social cohesion and stability, and encourages reconciliation between local interest groups and a convergence around common interests. This process of participation helps to create the conditions for collaboration and working together. It broadens the potential for societal capacity building. Weak capacity is one of the main constraints to national development and good governance. The existing authoritarian, over-centralized model of governance is a major inhibitor to capacity development, because it narrows the amount of people who are allowed any meaningful role in the process. A decentralized, participatory model of governance dramatically increases the opportunity for involvement, and provides space for persons to contribute at several different levels.

To conclude, because of a greater degree of accountability, responsiveness and participation, effective decentralization can make a big difference by making the provision of local (social and economic) services more efficient, equitable, sustainable and cost-effective. Through community participation in decision making, planning, implementation and monitoring and backed by appropriate institutions and resources, it can go a long way in improving the quality of life, particularly of the poorer and marginalized sectors of the population, thereby alleviating poverty. Thus, decentralization from above must converge with decentralization from below.

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Seasonal Incidence and Relation to Weather Parameters of Aphid and their Natural Enemies on Okra

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Abstract- The periodic incidence of different sucking pests on okra during the crop season was significant at different period of crop growth. The period mean revealed that the aphid population was reached to its peak level (27.17 aphids / 3 leaves) during 14th weeks after sowing (first week of July). The aphids were considered as sucking insect pests. The population of aphids was more abundant on the crop during June and July 2011. Results revealed that maximum activity was recorded during July and the correlation studies were made between the incidence of major sucking insect pests and select weather parameters. Aphids showed positive correlation with rainfall (r = 0.261) and negative correlation with both maximum and minimum temperature. Aphids showed positive correlation with relative humidity.

Index Terms- Aphids, Okra, and Sucking Pests.

I. Introduction

Agriculture is the backbone of the Indian economy because 75% of India's population depends on agriculture or agroindustries for livelihood. However, it is disheartening to know that India's economic growth is not keeping up with the expectations because its agricultural growth is lagging behind .The major crops of India are categorized into Cereals, Oilseeds, Pulses, Vegetables and Fruits (Dhaliwal, *et al.,* 2010).

Bhindi [*Abelmoschus esculentus* (L) *Moench*] is one of the popular vegetable of common man, cultivated in India for its immature fruits. It is noted for its rich iron content and nutritive value. Okra is attacked by number of insect pests and mites, during different growth stages and seasons. The major pests of okra include aphid, Coccinellids and Chrysoperla. Among these, aphids, *Aphis gossypii* is a polyphagous sucking pest and also found damaging okra all over India. It also acts as vector of virus and transmits mosaic, leaf curl etc. (Butani and Verma, 1976).

In this paper we can study the seasonal incidence and relation to weather parameters of aphid and their natural enemies on okra ecosystem.

II. MATERIALS AND METHODS

Field trial was conducted at Rewa Madhya Pradesh during 2011. The experiment was laid out in randomized block design in four replications with a plot size of 3.6 m x 3.6 m. Observations on the pest activity were recorded in weekly interval. To record the observation of sucking pest populations, five plants per plot were randomly selected and from each randomly selected plant three leaves each from the top, middle and lower part were observed. The data was statistically analyzed by correlation analysis between weather parameters and sucking pests.

III. RESULTS AND DISCUSSION

Okra plays a vital role in the daily intake of our food. It has good nutritional value particularly high content of calcium (90 mg/100 g) and vitamin C (30 mg/100 g). There is a need to increase its production to eliminate disorders caused by dietary deficiencies prevalent among poor masses of our country. One of the limiting factors in production of okra is the damage caused by insect pests. (Salim, 1999)

The experimental results of the investigations carried out on seasonal incidence of sucking aphid of okra and their natural enemies.

Seasonal incidence of aphid (*Aphis gossypii*)

The activity of aphids on okra crop sown during fourth week of March 11 (summer crop) started in the first week of April 11 (6.01 aphids / 3 leaves). There was a gradual increase in aphid population and reached a peak during first week of July 11 (27.17 aphids / 3 leaves). Again from sixteenth week of sowing population started declining and reached to a lowest population of 1.21 aphids / 3 leaves at last week of July 11. (Table 1)

Dugger and Richter, 1998 reported that peak incidence of aphids were noticed in 21 st July on cotton crop in California. The results are in line that reported by Dhamdhere *et al.,* 1984, as he reported peak population of A. gossypii in last week of June.

Influence of weather parameters on sucking aphids and natural enemies

Correlation coefficient between different weather parameters and population of sucking aphids and their natural enemies revealed that, maximum temperature recorded. Maximum temperature showed significant negative correlation with population of aphid, correlation coefficient of r = -0.456. Minimum temperature showed a significant negative correlation with population of aphid (r = -0.250). Maximum and minimum temperature showed significant negative correlation with population of *Coccinellids*, correlation coefficient of r = -0.322 and -0.449 respectively, and Maximum and minimum temperature showed significant negative correlation with population of *Chrysoperla*, correlation coefficient of r = 0.147 and -0.530 respectively. (Table 2)

Observation between population of aphids and their natural enemies (*Coccinellids* and *Chrysoperla)* related to humidity in morning +0.295, -0.043 and 0.462 and afternoon +0.401, -0.099, -0.281 respectively.

Sarvendra, *et al.*, 2005 reported that temperature and relative humidity had a role in seasonal fluctuation of aphids and their natural enemies on brinjal.

Table 1- Number of Aphids / 3 leaves

Months/Year	Standard weeks	Crop	Leaf	Aphids
Summer Crop April 2011	14 15 16 17 18	2 3 4 5 6	3.11 3.17 3.13 3.69 3.77	6.01 9.11 10.13 10.01 10.11
May 2011	19 20 21 22	7 8 9 10	3.96 5.49 9.71 9.13	12.37 11.41 17.56 19.43
June 2011	23 24 25 26	11 12 13 14	9.81 14.13 16.69 16.99	19.41 19.91 20.16 27.09
July 2011	27 28 29 30 31	15 16 17 18 19	16.94 16.17 13.13 9.61 4.13	27.17 14.11 6.13 3.12 1.21

Table 2 – Relationship of weather parameters with sucking pest of Okra and their natural Enemies

Sucking pest / natural enemies	Correlation coefficient values (r)					R^2	Regression equation
	Temperature °C		Relative Humidity (%)		Rainfall (mm) (X5)		
	Max. (X1)	Min. (X2)	Morning (X3)	Afternoon (X4)			
Aphids	-0.456**	-0.250	+0.295*	+0.401**	+0.261*	0.263*	Y=40.31-5.49 X1-8.54 X2 - 7.40X3+3.81 X4 + 3.55 X5
Coccinellids	-0.322*	-0.449	-0.043	-0.099*	+0.212	0.318**	Y=9.21-1.39 X1-9.01 X2-1.15 X3-1.18 X4 - 3.22 X5
Chrysoperla	+ 0.147	-0.530**	-0.462**	-0.281*	+0.382**	0.402**	Y=2.83+3.07 X1-5.08 X2-1.79 X3+1.82 X4 - 4.29 X5

N = 52
** - Significant at 1 %
* - Significant at 5 %

IV. CONCLUSION

Investigations were carried out to study the seasonal incidence of sucking aphid complex on okra and their natural enemies. Seasonal incidence of sucking aphid on okra revealed that on summer crop peak aphid populations were recorded during first week of July. Correlation coefficient between different weather parameters and population of sucking aphid revealed that, maximum temperature recorded significant negative correlation with population of aphid. Correlation coefficient of minimum temperature with population of aphid and *Chrysoperla* was negative and significant. Morning relative humidity had significant positive correlation with aphid and where as significant negative correlation with *Chrysoperla*. Aphid and *Chrysoperla* showed positive correlation and negative correlation with afternoon relative humidity respectively.

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In-vitro activity of Cefotaxime in the Era of Antimicrobial Resistance

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Abstract- In the past, Cefotaxime inhibited greater than 90% of enteric bacilli at a minimum inhibitory concentrations of less than or equal to 0.5 microgram/ml. But with the emergence of ESBL (Extended Spectrum Beta Lactamase) producing bacteria the activity of cefotaxime became questionable. So the objective of this study was to see the in-vitro efficacy of cefotaxime against common clinical isolates in this hospital. 207 culture positive samples from different sources (urine, sputum, pus and blood) were processed. Isolation and identification of microorganism was done by standard microbiological procedure and antibiotic susceptibility testing was done by Kirby Bauer disc diffusion method, MIC was calculated by E-test strip (HiComb MIC Test) and interpreted following CLSI guidelines. The sensitivity of different isolates was found to be as follows: *Staphylococcus aureus* 66-70%, Enterobacteriaceae (ESBL non producers) 50-75%, Moraxella 91% whereas *Streptoococcus pneumoniae* and *Haemophilus influenzae* were 100% sensitive against cefotaxime. *Acinetobacter spp* however was 33-75% sensitive against cefotaxime. The MIC_{90} of all the isolates were within the sensitive range.

Index Terms- Antimicrobial sensitivity, Cefotaxime, ESBL, MIC

I. Introduction

Cefotaxime, a third-generation cephalosporin, has broad spectrum activity against Gram positive and Gram negative bacteria. Most anaerobes are highly susceptible to cefotaxime. It inhibits bacterial cell wall synthesis by binding to one or more of the penicillin-binding proteins (PBPs). This inhibits the final transpeptidation step of peptidoglycan synthesis in bacterial cell wall, thus inhibiting cell wall biosynthesis. Bacteria eventually lyse due to ongoing activity of cell wall autolytic enzymes (autolysins and murein hydrolases) while cell wall assembly is arrested.

The potent antimicrobial activity of cefotaxime appears to be the result of a combination of characteristics which include: beta-lactamase stability (types I, III, IV and V), good ability to pass through the cell membrane, strong affinity for lethal penicillin-binding proteins 1a, 1b(s), and 3, minimal limitation by the inoculum effect, and bactericidal action at or close to the inhibitory concentration (1). It can achieve its adequate level in plasma within 30 minutes following a single injection(2).

Cefotaxime cannot act against extended spectrum beta lactamase (ESBL) producers. An ESBL is a β-lactamase that may confer resistance or reduced susceptibility to the oxyimino-cephalosporins (i.e., cefotaxime, ceftriaxone, ceftazidime) and monobactams (i.e., aztreonam) (3). However, ESBLs do not hydrolyze the cephamycins (e.g., cefoxitin and cefotetan), (4) and the carbapenems (imipenem, meropenem) and their hydrolytic activity can be inhibited by several β-lactamase inhibitors such as clavulanic acid and tazobactam (5). However, they can become resistant to cephamycins by loss of outer membrane porin (4) But it can act effectively against ESBL non-producers (6). So our objective was to see the in-vitro activity of cefotaxime against common clinical isolates in this hospital.

II. Material and Methods

The study was conducted in the Department of Microbiology, Medical College, Kolkata from April 2013 to July 2013. 207 culture positive samples from different sources (urine, sputum, pus and blood) were processed. Isolation and identification was done by standard microbiological procedure and antibiotic susceptibility was done by Kirby Bauer disc diffusion method, MIC was calculated by E-test strip (HiComb MIC Test) and interpreted following CLSI (Clinical and Laboratory Standard Institute) guidelines.

ESBL detection was done by disc potentiation test (using cefotaxime/ cefotaxime clavulinic acid) and in-vitro effectiveness of cefotaxime was evaluated among ESBL non-producers.

III. Result

Among 69 urine isolates, 17 were E.coli, 13 Enterobacter spp., 12 Klebsiella spp, 10 Citrobacter spp., 10 S.aureus, 4 Proteus spp. and 3 Acinetobacter spp. Their sensitivity against cefotaxime were studied. 25% were ESBL producers.

Table1: Activity of cefotaxime against urinary isolates

Urinary isolates	ESBL producer	ESBL non producer	ESBL non-producer resistant	Susceptible	%sensitivity (among ESBL non-producer)
S.aureus (10)	-	-	-	7	70%
E.coli (17)	4	13	6	7	53.84%
Klebsiella spp. (12)	4	8	3	5	62.5%
Enterobacter (13)	4	9	3	6	66.67%
Citrobacter spp.(10)	2	8	4	4	50%
Proteus spp.(4)	0	4	2	2	50%
Acinetobacter (3)	-	-	-	1	33.33%

Among 72 sputum isolates, 26 were Klebsiella spp, 13 S.aureus, 12 Moraxella spp., 9 Enterobacter spp., 6 Pneumococcus spp., 4 Acinetobacter spp., and 2 H.influenzae . Their sensitivity against cefotaxime were studied. 20% were ESBL producers.

Table 2: Activity of cefotaxime against sputum isolates

Sputum isolates	ESBL producer	ESBL non producer	ESBL non producer resistant	Susceptible	%sensitivity (among ESBL non-producer)
S.aureus (13)	-	-	-	9	69.24%
Klebsiella spp. (26)	6	20	9	11	55%
Enterobacter (9)	1	8	2	6	75%
Moraxella (12)	-	-	-	11	91.66%
Pneumococcus (6)	-	-	-	6	100%
H.influenzae (2)	-	-	-	2	100%
Acinetobacter (4)	-	-	-	3	75%

Among 36 pus isolates, 11 Klebsiella spp, 9 S.aureus, 8 E.coli, 5 Proteus spp. and 3 Acinetobacter spp. were studied to see their sensitivity against cefotaxime. 29.16% were ESBL producers.

Table 3: Activity of cefotaxime against pus isolates

Pus isolates	ESBL producer	ESBL non producer	ESBL non-producer resistant	Susceptible	%sensitivity (among ESBL non-producer)
S.aureus (9)	-	-	-	6	66.66%
E.coli (8)	5	3	1	2	66.67%
Klebsiella spp. (11)	2	9	4	5	55.56%
Proteus spp. (5)	0	5	2	3	60%
Acinetobacter (3)	-	-	-	1	33.33%

Among 30 blood isolates, 10 E.coli, 10 S.aureus, 8 Klebsiella spp., and 2 Acinetobacter spp. were examined to see their sensitivity against cefotaxime. 38.89% were ESBL producers.

Table 4: Activity of cefotaxime againstus blood isolates

Blood isolates	ESBL producer	ESBL non producer	ESBL non-producer	Susceptible	%sensitivity (among ESBL non-producer)
S.aure (10)	-	-	-	7	70%
E.coli (10)	5	5	3	2	40%
Klebsiella spp. (8)	2	6	3	3	50%
Acinetobacter (2)	-	-	-	1	50%

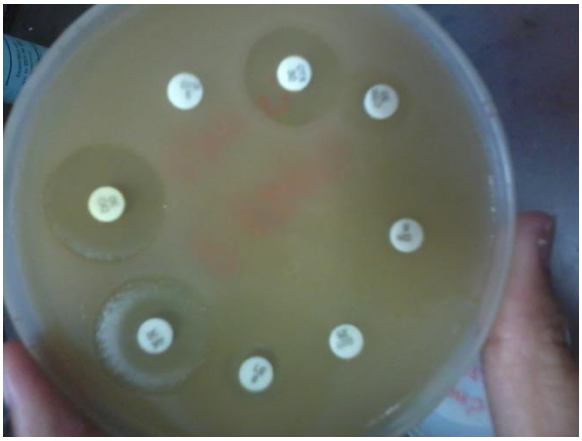

Figure 1: Showing the sensitivity of cefotaxime (arrow head) against clinical isolates

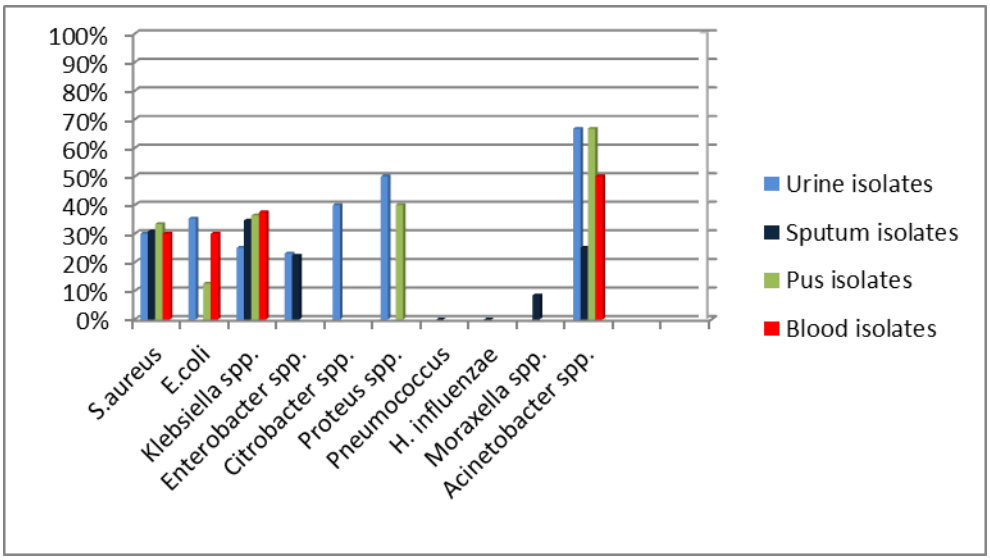

Figure 2: Overall resistance pattern of different isolates (ESBL non-producer) against cefotaxime

Table 5: MIC profile of common clinical isolates (ESBL non-producer) against cefotaxime

Clinical isolates	**MIC_{90}**
S.aureus	.512
E.coli	.512
Klebsiella spp.	1.024
Enterobacter spp.	.256
Citrobacter spp.	1.024
Proteus spp.	2
Pneumococcus	.032
H. influenzae	.064
Moraxella spp.	.128
Acinetobacter spp.	2.048

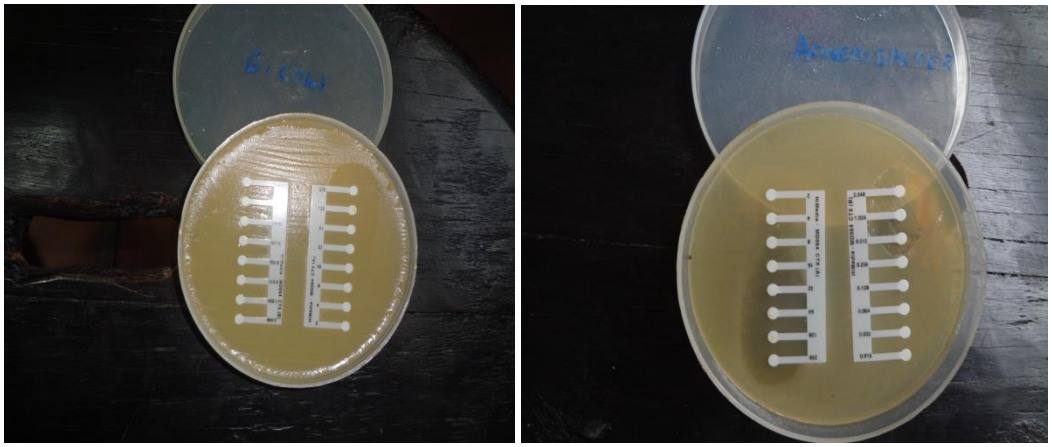

Figure 3: MIC of E.coli and Acinetobacter spp. against Cefotaxime

IV. DISCUSSION

Extensive use of antibiotics has led to increase in antibiotic resistance. (7) In the past, Cefotaxime inhibited greater than 90% of enteric bacilli at a minimum inhibitory concentrations of less than or equal to 0.5 microgram/ml; For staphylococci and nonenterococcal streptococci, the mean values for the minimal inhibitory concentration50 (MIC50) of cefotaxime (i.e., the lowest concentration inhibiting growth of 50% of tested strains) were 1.1-1.9 microgram/ml and 0.01-0.05 microgram/ml, respectively. (8) But in present scenario the emergence of ESBLs has changed the picture. Cefotaxime cannot act against ESBL producers. But it is still showing a very good sensitivity against ESBL non-producers. In this study the sensitivity of *Staphylococcus aureus* was 66-70%, Enterobacteriaceae (ESBL non producers) was 50-88%, *Moraxella spp* was 91% whereas *Streptococcus pneumoniae* and *Haemophilus influenzae* were 100% sensitive against cefotaxime. *Acinetobacter spp* however was 33-75% sensitive against cefotaxime. Similar result was seen in one study (8) where cefotaxime was shown to be moderately active against *Acinetobacter calcoaceticus subspecies anitratus.*

The presence of isolates that are less susceptible to cefotaxime could potentially result from the use of cefotaxime once or twice daily as opposed to adequate dosage of three times a day. (9)(10)(11) A study showed that even in E.coli causing UTI in children the cefotaxime susceptibility was 49% (12) which indicates that cefotaxime is fairly susceptible in non ESBL producers. Another study by Ortega et al showed that only 12% of Klebsiella spp. isolated from blood were resistant to cefotaxime. (13)

According to MIC interpretative criteria, in this study, the MIC_{90} of all the isolates were within the sensitive range. Cefotaxime is active against *Streptococcus pneumoniae*, *H.influenzae*, *Moraxella spp*. and have MIC ≤ 0.5 in 99% culture for all three organisms. (14) The same is shown in our study and hence cefotaxime is a good drug for respiratory pathogens.

Cefotaxime was found to be inactive against *Streptococcus faecalis* and most other serogroup D streptococci. In one study by G. Peters et al the in- vitro activity of cefotaxime (HR 756) was tested in comparison with cefuroxime, cefamandole, cefoxitin, cefazolin, ampicillin, mezlocillin, gentamicin and amikacin and MIC values were investigated on 168 freshly isolated gram-positive and gram-negative bacteria from clinical sources. They found Enterococci and *Pseudomonas aeruginosa* behaved cefotaxime-resistant and all the other species examined showed a very good sensitivity range against cefotaxime. (15) Because the activity of cefotaxime against Enterobacteriaceae and nonfermentative gram-negative bacilli varied, the in vitro susceptibility testing must be used as a guide to therapy.

V. CONCLUSION

According to sensitivity pattern of different clinical isolates by MIC profile as well as by disk diffusion antimicrobial susceptibility testing, the in-vitro activity of Cefotaxime was found to be very good against Streptococcus pneumoniae, H.influenzae, Moraxella spp., Stapylococcus aureus and Enterobacteriaceae (ESBL non-producer). However, it was moderately active against Acinetobacter spp.

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Appraisal of Effect of Training on Biomedical Waste Management in Healthcare Facility: An Analytical Study

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Abstract- The study is interventional in nature because the training has been done as an intervention. The study was done to find out the impact of training on knowledge level of the hospital staff who is dealing with biomedical waste on day to day basis.

The study was conducted on 184 staff members during July – Sept 2012 in multispecialty tertiary care hospital. The survey form was prepared and was applied to all participants in person before and after the training was conducted. The training programme on biomedical waste management was for total 60 hours of which 40 hours were class room lectures and 20 hours practice sessions. the Methods used in the analysis of data were chi-square and t-tests.

Of total study participants 71.7% (132) were female while 28.2%(52) were male. nursing staff constituted 54.3% (100), medical staff 20.1% (37), house keeping 17.3% (32) while general management 8.1% (15). a significant statistical difference (pretraining and post training) was found among these staff members who have received training in biomedical waste management which is evident from the raised level of knowledge and awareness about biomedical waste management.

The safe management of biomedical waste is of paramount importance for the hospital staff, patients as well as community population. Hospital staff is responsible for safe disposal of waste and that can be reinforce with the help of structured training programme.

Index Terms- Biomedical waste, Hospital, Hospital staff, Training

I. Introduction

The biomedical waste which is generated from various types of healthcare facilities and if not managed properly then give rise to considerable environmental pollution. The untreated waste poses significant health risk to patients, visitors, care givers and community as a whole. the waste generated in hospital has been categories in various subtypes like **(1).**

Of the total waste 85 % is non infectious while 10% is infectious and 5% hazardous**.(2)**

Development of infections of various types from these medical waste is common occurrence of which most dangerous are HIV, Hepatitis C, Hepatitis B. These viral borne infections are mostly caused by contaminated waste which contain piercing items like needles, blades, glass etc**.(3)**

If this waste is categorized as infectious waste per se then it will increase the quantum of waste leading to increase in both financial as well as labour cost. hence it is imperative to segregate the waste at the site of generation or at the location of their use **(4).** When such waste is not properly treated and managed then it create various public health issues that is the reason the waste as generated must be segregated as per the class it belongs to **(4).**

It is not the segregation which is important the process of collection, transportation , treatment and final disposal of biomedical waste are mandatory as per the biomedical waste (management and handling) rules 1998 which are amended in 2000 and 2003. **(5).**

The management of the biomedical waste is an ongoing process and cannot be completed by mere instruction rather need training of the stake holder. Training of the staff is the hospital occupier's responsibility. Head of the institution should ensure that there is structured training schedule is laid down and conducted as per the scheduled. Training to the stake holders can be imparted either by internal trainers or external trainers. Hospital can also have a programme of train the trainers as well. **(5)**

Training on biomedical waste management process can be given by designated biomedical waste management officer or infection control officer. **(5)**

In order to prevent waste related injuries to staff, patients, visitors and environment there is need of acquiring knowledge, attitude and behavior by all the concerned staff members **(6).** More over it is mandatory for hospital to have effective biomedical waste management plan to have medical waste controlled and rendered harmless. This goal realization make all the stake holders to have sufficient knowledge on the subject of waste management and if not done then what are hazards to the population and legal implications. Desired success on effective waste management can be achieved through the process of in house training by designated trainer who have grasped the importance of the subject.

Present study was performed in order to investigate whether training has desired impact on knowledge and attitude level of hospital stake holders dealing with biomedical waste management.

II. Materials and Methods

The study was conducted between July to Sept 2012. No sampling was used in our study as almost all the staff members who are concerned with biomedical waste management were included. Study was conducted with 184 participants composed of staff from various department like wards , operation theater, intensive care units , hemodialysis units, endoscopy, emergency unit and procedure room.

The training was planned and structured and was consist of following topics.

1. Defining and classification of Biomedical waste. process of segregation, collection , storage , transportation ,treatment and final disposal.
2. Health hazards of biomedical waste and Biomedical waste (management and handling)Rules 1998.
3. practical applications of biomedical waste management
4. A total 60 hours of training was imparted in batches of 20. Training was divided in to two subsets class room lectures and practical applications. Of 60 hours of training 40 hours were lectures and 20 hours practical aspect of the biomedical waste management. Both training sessions class room as well as practical were interactive in nature based on androgogy pattern of training and all participants were encouraged to put in their verbal , written opinion or questions on the subject under discussion.

Measurement of effectiveness of the training :

The main stay of the sturdy was questionnaire which was prepared and tested with small group of staff (eighteen staff members) to determine whether questions were understood in the correct manner by the study participants. questions were revised according to results obtained and then applied to entire group considered for study. survey was done before initiation of training and then after training and consisted of 25 questions of which some were on socio demographic characteristics and their level of information on various steps of biomedical waste management process in the hospital.

Table – 1 Socio- Demographic Features of the Hospital Staff

All participants took interest in training sessions and answering questions of survey. The data collected in the study were evaluated through SPSS 11.5 programme. chi – square method was used in statistical analysis and $p<0.05$was taken as statistically significant. other statistical variables like means and percentages were also used in the analysis process of the collected data.

III. Results

Of 184 study participants 71.7% (132) were female and 28.2 (52) were male of whom 44.5% (82) werre in the age group of 25 to 30 years. 42.9% (79) has previous experience of working in hospital and dealing with biomedical waste. 54.3% (100)were nurses, 20.1% (37) were medial staff mainly medical officer and clinical assistants, 17.3% (32) housekeeping staff and 8.1% (15) belonging to general management staff.

Of the participants 39.2% has work experience for less than five years.

Statistical significant difference were found between points received by all hospital staff in the preliminary test and final test ($p<0.05$). The study disclosed that the points received by participants were higher in post training test in comparison to pre training test. The number of correct answers were increased in post training session and it is concluded that knowledge level of all participants of study has increased as a result of training.

Table – 2 **Comparision of PreTraining and Post Training Test Response on BioMedical Waste Management Subject**

A ratio of 55.7% (29)of male and 48.4% (64) of the female participants have informed that they had no previous training on biomedical waste management process. while 28.8% (15) of male and 40.1% (53) of female of the study participants claimed to have undergone at least one training annually on the subject of biomedical waste management. As per gender the ratio of the staff who underwent training programme conducted in house on biomedical waste management was also statistically higher in female staff 54.5% (72) then male 44.2%(23) ($p<0.005$)

Table – 3 analysis of the hospital staff's demographic features regarding training status on the subject of BioMedical Waste Management

It was also revealed that 3.7% of nursing staff, 8.2% of medical staff and 7.9%of housekeeping staff and 4.8% general staff had not received training whatsoever on the subject of waste management in hospital. The staff who have receive at least one training constitute majority of the participants.

Except general management staff participants maximum of the participants have receive the training on the biomedical waste management in their previous organization.

In the study it was also observed that those participants who have not received any previous training on the subject in pre training and post training test scored lower than those who have received previous training on the subject of biomedical waste management.

Table – 4 comparison of pre training and post training test responses according to training schedule hospital staff have undergone

According to the collected data on problems regarding biomedical waste management 17.7% responded that sufficient attention towards its scientific management process was not paid while 16.6% said auditing was lacking ,24.6% referred to lack of intensity towards work and 25.5%claimed the insufficiency of work knowledge on waste management.

Table – 5 Analysis of the hospital staff's demographic features regarding hindrance in proper BioMedical Waste Management

All participants to varied degree appreciated that solution to the problems of effective biomedical waste management is necessity of the structured training and audit because they felt that the greater problem encountered by hospital staff on the biomedical management esd lack of waste audit in the institution. the results of the study pointed out that hospital staff of all department and demographics cited the primary problem on the subject as insufficiency of emphasis.

IV. Discussion

The waste generated in the hospital as a result of either after diagnostic or curative patient care poses potential health risk to

care givers, patients, population and environment. If this waste is not segregated, collected, stored, transported , treated and disposed off by use of appropriate methods they will emerge as severe public health and environmental problems.

The onus of biomedical waste management lies with the hospital occupier. the information levels and awareness of hospital staff on the subject of biomedical waste management is very important in the process of waste management.

On review of literature it was revealed that majority of the staff (69.9%) had received appropriate training on the subject of biomedical waste management. according to another study the level of information among hospital staff on waste management 62.1% of medical doctors ,54.5% nursing staff while 47.6% laboratory technician staff were well informed about the subject on biomedical waste management**.(6)** similarly another study pointed out that medical staff, nurses, and laboratory technicians are well informed aobut the process of managing biomedical waste appropriately **(8)**

The stdy conducted by Suvarna and Ramesh in 2012 showed that medical officers and nursing staff had higher level of information then other hospital staff about biomedical waste management process. **(9)**

Laxmi and Kumar conducted an analysis among the healthcare workers on the awareness of biomedical waste management. In the study the finding is that an information and awareness deficiency among the hospital employees as tot the legislation associate with biomedical waste management . In this study performed on qualified hospital employees also indicates that a knowledge and awareness deficiency exist among the qualified hospital personnel about the legislation on biomedical waste management **(10).** The result of present study too is consistent with the conclusion drawn in various other research papers dealing in the information level regarding biomedical waste management among hospital employees **(1,9,10).**

The present study also revealed that hospital employees had better scores in knowledge test score which was done after training session on the subject . As evident the awareness level got improved after the training which clearly indicate the effectiveness of structured training to study participants. as the number of hospitals are increasing the quantum of waste will also increase proportionately. In order to eliminate the potential danger posed by growing quantum of waste to human and environmental health, it is mandatory for hospital employees be armored with “hospital or biomedical waste management plan” and be given regular training on every type so waste produced during the diagnostic and curative patient care in the hospital and healthcare facilities.

The importance of periodic repeated training has become evident in the present study that the knowledge and awareness level of hospital staff was found to be more in the pre training and post training test for the staff member with each training session more than others. This finding give the support to thought process of importance of periodic training programme on biomedical waste management so as to fill the deficiency levels in information about subject among the hospital employees. it is therefore propose that in order to have effective biomedical waste management prog4rmme in the hospital it need to draw an effective waste management plan and have that plan continually implemented by periodic training of staff members.

Compliance to the policies and procedures related to biomedical waste management is directly related to the knowledge and awareness about process and this attitude and knowledge is updated with the help of periodic training in the subject. It is therefore evident that training is as essential part of the hospital employee’s daily activity so as to have proper and scientific management of the biomedical waste generated in the hospital.

in the present study it emerged that to organize and implement a standardised and structured training programme for all staff member of the hospital will play a very important role in solution of the waste management issue.

Conflict of Interest : Nil

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Table -1 Demographic Features of the Hospital Staff (N = 184)

Demographic Features	Number of staff (n)	Percentage (%)	Cumulative Percentage (%)
Female	132	71.8	71.8
Male	52	28.2	100%
Medical staff	100	54.4	54.4
Nursing staff	37	20.1	74.5
Housekeeping staff	32	17.4	91.9
General management staff	15	8.1	100%
Age below 25 years	71	38.6	38.6
Age between 25-30years	82	44.5	83.1
Age more than 30 years	31	16.9	100%
Work experience less than 5 years	72	39.2	39.2
Work experience between 5 – 10 years	89	48.3	87.5
Work experience more than 10 years	23	12.5	100%

Table 2 Comparision of PreTraining and Post Training Test Response on BioMedical Waste Management Subject

Variable	Pretraining test X± s.s	Post training Test X±s.s	Statistical Significance t p
Female (n = 80)	32.13 ± 3.25	37.35 ± 6.20	- 6.41 0.000
Male (n = 104)	29.40 ± 7.08	32.45 ± 6.27	- 14.21 0.000
Medical staff (n = 37)	31.50 ± 3.40	38.15 ± 1.86	- 8.54 0.000
Nursing staff(n = 100)	30.31 ± 4.40	38.07 ±2.80	- 14.43 0.000
Housekeeping staff(n = 32)	29.65 ± 5.23	34.21 ± 7.42	-3.55 0.002
General management staff (n = 15)	28.46 ± 3.80	35.90 ± 3.72	- 7.64 0.000
Age below 25 years (n = 71)	30.08 ± 5.23	36.60 ± 4.32	-9.40 0.000
Age between 25 – 30 years (n = 82)	32.29 ± 3.62	37.55 ± 3.81	-12.45 0.000
Age more than 30 years (n = 31)	30.19 ± 4.95	37.30 ± 5.58	-7.82 0.000
Work experience less than 5 years (n = 72)	33.01 ± 4.32	38.00 ± 2.00	-10.42 0.000
Work experience between 5 – 10 years (n = 89)	32.45 ± 5.16	36.70 ±5.64	-5.55 0.000
Work experience more than 10 years (n = 23)	32.40 ± 3.18	38.15 ±4.60	-7.36 0.000

p<0.05

Table 3 -- analysis of the hospital staff's demographic features regarding training status on the subject of BioMedical Waste Management

(N = 184)

Variables	**Never under any training**		**Underwent training once only**		**Underwent training more than once**		**Statistical Significance**
	n	**%**	**n**	**%**	**n**	**%**	
Male (n = 52)	29	55.7	15	28.8	8	15.3	0.01
Female (n = 132)	64	48.4	53	40.1	19	14.3	
Medical staff (n = 37)	18	48.6	15	40.5	4	10.8	0.01
Nursing staff (n = 100)	63	63.0	28	28.0	9	9.0	
Housekeeping staff (n = 32)	18	56.2	8	25.0	6	18.7	
General management staff (n = 15)	11	73.3	2	13.3	2	13.3	
Age less than 25 years (n = 72)	50	69.4	14	19.4	8	11.11	0.02
Age between 25 - 30 years (n = 82)	53	64.6	20	24.3	9	10.9	
Age more than 30 years (n = 31)	11	35.4	12	38.7	8	25.8	
Experience less than 5 years (n = 72)	49	68.0	13	18.0	10	13.8	0.01
Experience 5 - 10 years (n = 89)	51	57.3	26	29.2	12 13.4		
Experience more than 5 years (n = 23)	5	21.7	10	43.4	8 34.7		

p <0.05

Table 4 – comparison of pre training and post training test responses according to training schedule hospital staff have undergone

Training Schedule	**Pertaining Response X ± s.s**	**Post training Response X ± s.s**	**Statistical Significance**	
			t	**p**
Staff never underwent any training schedule	30.84 ± 2.86	36.18 ± 5.32	-6.58	0.000
Staff underwent training schedule once	31.72 ± 4.27	37.12 ± 4.14	-10.96	0.000
Staff underwent training schedule more than once	33.15 ± 3.46	39.05 ± 2.86	-12.86	0.000

p<0.05

Table 5 -- Analysis of the hospital staff's demographic features regarding hindrance in proper BioMedical Waste Management

(N = 184)

Variables	**Insufficiency of knowledge**		**Lack of BMW Audit in Hospital**		**Lack of staff motivation towards proper BMW management**		**Insufficient resources for proper BMW management**		**Lack of scientific attituge towards BMW management**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Male (n = 52)	11	21.5	9	17.3	13	25.0	8	15.3	11	21.1
Female (n = 132)	39	29.5	21	15.9	32	24.2	22	16.6	19	14.3
Medical staff (n = 37)	8	21.6	6	16.2	10	27.0	7	18.9	6	16.2
Nursing staff (n = 100)	29	29.0	12	12.0	32	32.0	16	16.0	11	11.0
Housekeeping staff (n = 32)	6	18.7	4	12.5	10	31.2	5	15.6	7	21.8
General management staff (n = 15)	2	13.3	3	20.0	6	40.0	2	13.3	2	13.3
Age less than 25 years (n = 72)	15	20.8	10	13.8	22	30.5	11	15.2	14	19.4
Age between 25 - 30 years (n = 82)	19	23.1	13	15.8	26	31.7	12	14.6	12	14.6
Age more than 30 years (n = 31)	7	22.5	3	9.6	11	35.4	4	12.9	6	19.3
Experience less than 5 years (n = 72)	13	18.0	12	16.6	25	34.7	12	16.6	10	13.8
Experience 5 - 10 years (n = 89)6	16	17.9	19	21.3	22	24.7	17	19.1	15	16.8
Experience more than 5 years (n = 23)	4	17.3	5	21.7	6	26.0	3	13.0	5	21.7

Measuring and Comparing the Efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange

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Abstract- Dhaka Stock Exchange and Chittagong Stock Exchange have experienced a massive crash in recent time. Regulated authorities of both stock exchanges are trying to reform the market. They are taking various kinds of initiatives to make the market attractive. This study is conducted to measure the efficiency level of Dhaka Stock Exchange and Chittagong Stock Exchange. Market efficiency is used to explain the relationship between information and share price of capital market. In this research it is tried to find out is there relation between the past information and the share price that means are the prices follow random walk or not. Distance of securities is calculated for Dhaka Stock Exchange and Chittagong Stock Exchange to make assumption are stock exchanges belong to strong form of efficiency or not and to conclude which stock exchange is more efficient. The result of the study shows that Dhaka Stock Exchange and Chittagong Stock Exchanges are not in the form of 'weak efficiency' and 'strong efficiency'. So both stock belongs to the 'semi strong' form of efficiency and Chittagong Stock Exchange is more efficient than Dhaka Stock Exchange.

Index Terms- DSE, CSE, Efficiency, Comparison

1. Introduction

1.1 Background of the Study:

Stock markets in the world individually and collectively play a critical role in the most national economies. The markets perform a wide range of economic and political functions while offering trading, investment, speculation, hedging, and arbitrage opportunities. In addition they serve as a mechanism for price discovery and information dissemination while providing vehicles for raising finances for companies. Stock markets are used to implement privatization programs, and they often play an important role in the development of emerging economies (Fabozzi and Modigliani, 1995). The performance of a stock market of an economy is of interest to various parties including investors, capital markets, the stock exchange and government among others. Stock market performance is influenced by a number of factors key among them the activities of governments and the general performance of the economy. Economic activities do affect the performance of stock markets. Other factors that affect the stock market's performance include, availability of other investments assets, change in composition of investors, and markets sentiments among other factors (Fabozzi and Modigliani, 1995). So, Stock exchange is an important part of the economy of a country. It can be treated as the heart of economy. But in Bangladesh the stock exchange failed to perform its duty. As a result there is a massive crash. But if the market was, efficient there was less chance of crash. So it is important that Stock Exchange should be efficient. There are two stock exchanges in Bangladesh and they are Dhaka Stock Exchange and Chittagong Stock Exchange. The investors of these stock exchanges need to know the form of efficiency. This study will help them to know about the efficiency of stock exchanges and they will also able to compare the efficiency of the stock exchange with each other.

1.2 Rationale of the study:

The stock exchanges of Bangladesh play an important role to the economy. Both stock exchanges help to generate money from idle segment to productive segment. By moving the fund stock exchange creates value of money. Not only that many people of Bangladesh take investment as their career. So, stock exchange of Bangladesh also a great source of employment. The process of open B.O account and the process of trading security are too much easy. That is why people of different segment who have an opportunity to invest try to take the opportunity of investment. But this limited knowledge (opening account and trading system) about investment is not enough. Proper knowledge about the market and its movement must be acquired by an investor. Stock market creates an opportunity to invest for long time. But in Bangladesh it is found that most of the people try to make over night. That is when they find profit quickly they invest more amount in security market. For this reason huge amount of money come to market to purchase little amount of share. And for this reason very recent time Dhaka Stock exchange and Chittagong Stock Exchange experienced massive crash. So there is burning question are the stock exchanges efficient. To find out the efficiency of the stock exchanges and which stock is in a better situation study is needed. So it was the main motivation of the study.

1.3 Objective of the Study:

The main objectives of the study are:

I. Find out the form of efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange.
II. Compare the Efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange with each other.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK:

2.1 Definition of Stock Exchange:

Stock exchange is an organized market for buying and selling corporate and other securities. Here, securities are purchased and sold out as per certain well-defined rules and regulations. It provides a convenient and secured mechanism or platform for transactions in different securities. Such securities include shares and debentures issued by public companies which are duly listed at the stock exchange and bonds and debentures issued by government, public corporations and municipal (Butler, 1992). Stock exchanges are indispensable for the smooth and orderly functioning of corporate sector in a free market economy. A stock exchange need not be treated as a place for speculation or a gambling den. It should act as a place for safe and profitable investment, for this, effective control on the working of stock exchange is necessary. This will avoid misuse of this platform for excessive speculation, scams and other undesirable and anti-social activities (Ivankova, 2012).

2.2 Characteristics of Stock Market:

- Market for securities: Stock exchange is a market, where securities of corporate bodies, government and semi-government bodies are bought and sold (Marisetty, 2004).
- Deals in secondary securities: It deals with shares, debentures bonds and such securities already issued by the companies. In short it deals with existing or second hand securities and hence it is called secondary market (Marisetty, 2004).
- Control the trade of securities: Stock exchange does not buy or sell any securities on its own account. It merely provides the necessary infrastructure and facilities for trade in securities to its members and brokers who trade in securities. It regulates the trade activities so as to ensure free and fair trade (Marisetty, 2004).
- Allows only listed securities: In fact, stock exchanges maintain an official list of securities that could be purchased and sold on its floor. Securities which do not figure in the official list of stock exchange are called unlisted securities. Such unlisted securities cannot be traded in the stock exchange (Marisetty, 2004).
- Transactions effected only through members: All the transactions in securities at the stock exchange are effected only through its authorized brokers and members. Outsiders or direct investors are not allowed to enter in the trading circles of the stock exchange. Investors have to buy or sell the securities at the stock exchange through the authorized brokers only (Marisetty, 2004).
- Association of persons: A stock exchange is an association of people or body of individuals which may be registered or unregistered (Marisetty, 2004).
- Recognition from Central Government: Stock exchange is an organized market. It requires recognition from the Central Government (Marisetty, 2004).
- Financial indicators: Stock exchanges are the financial barometers and development indicators of national economy of the country. Industrial growth and stability is reflected in the index of stock exchange (Marisetty, 2004).

2.3 Operation of stock exchange

Stock Exchange performs many operations as an important part of economy.

The operation can divide into four categories:

1. Main operation:
   - To promote the savings and for them to be canalized towards of carrying through investment projects that otherwise wouldn't be possible you need that the issuing institution of the securities to be admitted for quoting. The negotiations will be done on the primary market.

- To provide liquidity to the investors. The investor can recuperate the money invested when needed. For it, he has to go to the stock exchange market to sell the securities previously acquired. This function of the stock market is done on the secondary market (Kithinji, and Ngugi, 2009).

2. Operation as an organization:
- To guarantee the legal and economic security of the agreed contracts.
- To fix the prices of the securities according to the fundamental law of the offer and the demand (Kithinji, and Ngugi, 2009).

3. Operation in favor of investors:
- It permits him the access to the profitable activities of the big companies.
- It offers liquidity to the security investments, through a place in which to sell or buy securities.
- It permits for the investor to have a political power in the companies in which he invests its savings due that the acquisition of ordinary shares gives him the right (among other things) to vote in the general shareholders meetings of the company in question
- It offers the possibility of diversifying your portfolio by enlarging the field of strategy of investments due to alternative options, as could be the derived market, the money market, etc. (Kithinji, and Ngugi, 2009).

4. Operation in favor of listed companies:
- It supplies them with the obtaining of long-term funds that permits the company to make profitable activities or to do determine projects that otherwise wouldn't be possible to develop for lack of financing. Also, this funding signifies a less cost than if obtained at other channels.
- The securities quoted at the stock exchange market usually have more fiscal purpose advantages for the companies.
- It offers to the company's free publicity, which in other way would suppose considerable expenses. The institution is objecting of attention of the media (television, radio, etc.) in case any important change in its owners (the share holders) (Kithinji, and Ngugi, 2009).

2.4 Stock Exchange of Bangladesh:

There are two Stock exchanges in Bangladesh. They are

i. Dhaka Stock Exchange

ii. Chittagong Stock Exchange

2.4.1 Dhaka Stock Exchange:

The Dhaka Stock Exchange is the prime stock exchange of Bangladesh established in 1954 in Motijheel. Stock exchanges started in Bangladesh with the Dhaka Stock Exchange. The need to develop a new stock exchange in Bangladesh was realized by the government of Bangladesh ever since Calcutta Stock Exchanges had stopped the transactions in Pakistani shares and securities. The Dhaka Stock Exchange basically started with the formation of the Provincial Industrial Advisory Council. Initially it was named the East Pakistan Stock Exchange Association Ltd. It was revised in 1964 and since then it has used the present name. Although the Dhaka Stock Exchange was incorporated in 1954 it started trading formally from 1956 (Chaity and Sharmin, 2012).

Trading in the Dhaka Stock Exchange discontinued for a span of five years following the liberation war of 1971. Trading was regained from 1976. In 1976, there were nine listed companies in Dhaka Stock Exchange with a paid up capital of Tk 137.52 million. The Dhaka Stock Exchange actually witnessed high growth in 1983 when the market capitalization reached Tk 812 million. By 1987, there was a spurt in the market size with the number of listed companies shooting up to 92. With the opening up of the economy in the 90s the Dhaka Stock Exchange also rapidly developed (Chaity and Sharmin, 2012).

2.4.2 Structure of the Dhaka Stock Exchange

By 2001 the number of listed securities in the Dhaka Stock Exchange was 244, number of listed companies was 224, number of listed debentures was 10, and the number of shares issued by the listed companies was 666,553. The number of Mutual Funds was 72,250 and the market capitalization was Tk 72,168 million (Chaity and Sharmin, 2012).

2.4.3 Nature of Dhaka Stock Exchange

The Dhaka Stock Exchange was a physical stock exchange in its initial days when trading took place in the open outcry system. But with the advent of new technology, the traditional mode of trading was abolished and was replaced by a fully automated computerized Stock Exchange. The trading session occurs in five parts- the pre-opening session, opening session, continuous or regular trading session, closing session or post-closing session (Chaity and Sharmin, 2012).

2.4.4 Functions of the Dhaka Stock Exchange

The following are the functions of the Dhaka Stock Exchange:

- Listing of Companies
- Providing screen based automated trading of securities.
- Settlement of trading following the Settlement of Transactions Regulation.
- Market Administration and Control
- Market Surveillance
- Publication of monthly review
- Monitoring the activities of the listed companies following the Listing Regulations.
- Formation of the Investors' Grievance Cell
- Formation of the Investors' Protection Fund
- Online Notification of price sensitive and other information about the listed companies (Chaity and Sharmin, 2012).

2.5 Chittagong Stock Exchange

Chittagong Stock Exchange Ltd. (CSE) grants access to public limited companies to list in the Exchange, thus providing its securities a securities trading facility. CSE has an automated trading system with satellite based a network connecting three major cities: Dhaka, Chittagong and Sylhet. CSE also initiated Internet Trading Services for investors to trade its listed securities from anywhere in the world which in turn facilitates the listed companies to liquidate their securities with fair and transparent pricing. While listing CSE ensure the fulfillment of qualitative and quantitative eligibility criteria by the companies. At initial listing companies, CSE make sure of exacting compliance of listing rules and regulation by the listed companies to provide an efficient and transparent market of international standard (Chaity and Sharmin, 2012).

The Securities and Exchange Commission is the final authority to approve an IPO. The Exchanges' role is limited to comments of the information in the prospectus. Chittagong Stock Exchange has to compete with the other stock exchange in Bangladesh (the Dhaka Stock Exchange), who is much older and whose brokers are much experienced, in general. CSE often offer discounted fees to the new company listing (Chaity and Sharmin, 2012).

2.5.1 The main objectives of CSE are:

- To develop a strong platform for the entrepreneurs for raising capital.
- To develop a transparent market ensuring investor protection
- To provide fully automated trading system
- To ensure quick, easy settlement system
- To attract non-resident Bangladeshis to invest in Bangladesh Stock Market
- To develop a high standard of commercial practice
- To develop a research cell for analysis status of the market (Chaity and Sharmin, 2012).

2.6 Earlier Studies:

A stock market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. Formally, the market is said to be efficient with respect to some information set if security prices would be unaffected by revealing that information to all participants. Efficiency with respect to information set also implies that it is impossible to make economic profits by trading on the basis of this information (Burton, 1989)

Factors such as weak regulation, lack of supervision, lack of market transparency which may influence the efficiency level of capital market; even recent market scam report also indicate these factors as vital for stock market crashes (Burton, 1989)

Haque et al., (2001) tested the Efficient Market Hypothesis (EMH) based on the data four months before and four months after the automation which was imposed in DSE market on 10th August, 1998. The test results indicated that the market does not improve and even after automation, manipulation continued.

Stock markets provide investors with an efficient mechanism to liquidate their investments. The very fact that investors are certain of the possibility of selling out what they hold as and when they want, is a major incentive for investment as it guarantees mobility of capital in the purchase of assets .The interactions of buyers and sellers in a stock market determine the price of traded assets ;or equivalently the required return that investors demand and is this feature of stock market that signals how funds in the economy should be allocated among financial assets (Fabozzi,1995).

A stock exchanges' efficiency can be measured by its liquidity and price discovery. An exchange that provides price discovery will have high liquidity. By measuring the speed of stock price adjustment to its intrinsic value with the arrival of new information we can understand price discovery process and productive efficiency of a stock exchange Speed of adjustment is based on the information sharing process among the market participants and the information dissemination of the companies to the market participants. As mentioned above, speed of adjustment should be instantaneous in an efficient market. Such an instantaneous adjustment occurs when the information shared among the market participants, the information disseminated by the companies and the information transmitted by the media is symmetric. The technology involved to process information for instantaneous adjustment is also an important factor (Marisetty, 2004).

The misinterpretation of information can affect on market misleading and valuing. How to analyze information and the amount and optimism or pessimism level about information can affect on the pricing. Optimists are optimistic to deal with incoming information and set higher prices for them, and pessimists set lower prices even for that valuable information. In one hand, optimists risk more on unreliable futures and predict the future events incorrect. Also, market traders that have less information about upcoming events pay to stock price invasive than others. It is caused the market be inefficient in pricing of securities and they trusted more on incomplete information and excess in pricing based on. (Karimkhani et al., 2012)

An efficient stock market sector will have the expertise, the institution and the means to priorities access to capital by competing users so that an economy manages to realize maximum output at least cost. This is what economist refer to as the optimum production level. If an economy does not have efficient financial markets there is always the risk that scarce capital could be channeled to non-productive investments as opposed to productive ones, leading to wastage of resources and economic decline (Lee, 1998). To find out the efficiency of Stock exchange many scholar used Statistical tools like ARIMA, Autocorrelation, If prices conform to a random walk, then the security returns are independent over time (Leland, 1999 and Nyberg and Vaihekoski, 2011). They applied autocorrelation and run test to examine the nature and extent of serial dependence. The Efficient Market Hypothesis no longer holds the impervious position in finance it once did. Consequently the assumption that share prices follow a random walk is now uncertain. (Dupernex, 2007). Many researches have been conducted to find out or measure the efficiency of Dhaka Stock Exchange. (Chaity and Sharmin, 2012) try to evaluate the efficiency of the Dhaka stock exchange by using Statistical tools. They used both non-parametric and parametric test for the period 1993 to 2002.

2.7 Value of the Study:

The study is basically conducted to find out the efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange. The study will also find out the better stock exchange between the two stock exchanges (Dhaka Stock Exchange and Chittagong Stock Exchange). It is very import at present for the investor to know the efficiency of the Stock exchange of Bangladesh. Because in Bangladesh the stock exchange has experienced two massive crashes (1996 and 2011) already. So, investors of the country are very much worried to invest. If this situation continues for a long time, the Stock exchanges as well as the whole economy will be affected roughly. But the study will help the party by providing information of efficiency about the Stock Exchanges.

So it can be said that, authority and stakeholders will be benefited by the study. Because at present there is general idea about DSE and CSE is very poor. The investors who have already invested at the market are very much upset after the recent crash. New investors who have money to invest are worried to invest. But if they can know about the efficiency level of Dhaka Stock Exchange and Chittagong Stock Exchange they will be able to find out their duty and can take decision.

There is no comparison parameter to compare the efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange. The study will find out the more efficient Stock Exchange. So investor will be benefited by the study and will be able to find out the better stock exchange between Dhaka Stock Exchange and Chittagong Stock Exchange. Regulated body will be able to take proper initiative about

the market. That is why further crash can be avoided. Authority of Dhaka Stock Exchange and Chittagong Stock Exchange can take proper decision by joining there plan and activities. Moreover the study will help to increase the efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange.

3. MATERIALS AND METHODS:

3.1 Research Question:

This research is conducted to find out the answer of two question and the questions are

- How efficient the stock exchanges (DSE and CSE) are?
- Which stock exchange is more efficient?

3.2 Research Design:

The research is basically a descriptive research. It will find out the position of DSE and CSE. That means it will find out which form of efficiency DSE and CSE belongs to. To conduct this research descriptive statistics test and ARIMA test is conducted. And to compare the efficiency of DSE and CSE equation of security market line for DSE and CSE is formulated. And after the distance of sample security is calculated.

3.3 Data Collection and Analysis Techniques:

To conduct the research DSE General Indices and daily price for sample stock is used. All data is collected from the website of Dhaka Stock exchange and Chittagong Stock Exchange. The data is also collected from stockbangladeh.com. Sample stocks are the blue chip share of Dhaka Stock Exchange and Chittagong Stock Exchange. They are taken as sample because the position of blue chips should be more attractive.

Data analysis basically divided into two parts

I. Find out the efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange.
II. Compare the efficiency of Dhaka Stock Exchange and Chittagong Stock Exchange.

The daily market returns are calculated from the daily price indices without adjustment of dividend. Because in recent years many analysts have claim that trader paying more attention to information related to recent trends in return instead of information related to future dividend Daily Market returns (R_m) are calculated from the daily price indices as follows:

$$R_m = \mathrm{Ln}\left(\frac{P_t}{P_{t-1}}\right)$$

Where, R_m measures market return in period t; PI_t indicates price indices at day t and PI_{t-1} follows the price index at time period t-1. Ln = natural log, Logarithmic returns are more likely to be normally distributed which is prior condition of standard statistical techniques (Strong 1992; Mubarak 2000; Hossain 2010). If the market follows a hypothesis of weak form efficient then stock prices should be random walk. The Null and Alternative hypothesis of the study would be-

Ho: Market returns series follow the random walk model.

H_1: Market returns series do not follow the random walk model.

One of the basic assumptions of random walk model is that distribution of the return should be normal. Skewness helps to find is the distribution normal or not. Here skewness is measured by using the data of market return. If the skewness is 0 it can be said that the distribution is normal. If it is negative it can be said that the left tail is longer the right tail which indicate that the distribution of the return should not be normal. And if it is negative it can be said that the right tail is longer than the left tail. Which also indicate that the distribution of the return is not normal. To test the hypotheses ARIMA test is also conducted. The acronym ARIMA stands for "Auto-Regressive Integrated Moving Average." Lags of the differenced series appearing in the forecasting equation are called "auto-regressive" terms, lags of the forecast errors are called "moving average" terms. Under the random walk model, ARIMA model is (0, 1, 0) where future values of share returns cannot be determined on the basis of past information.

To compare the efficiency between DSE and CSE a security market line equation is formulated. The formula of liner equation is

$$Y = mx + c$$

Where 'm' is the slope and c is constant that means it is the intercept value of Y axis. To formulate the SML equation risk free rate is considered as 'c' and difference between market return and risk free return that means risk premium is considered as the slope 'm'. After that distance of each sample stock is calculated by using the following formula.

$$d = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$$

Here beta coefficient is considered as x_1 and Actual Return is considered as y_1. The value of risk premium is considered as 'a' and the value 'b' is one (1). Beta coefficient (β) is taken from the website stockbangladesh.com after that average distance for each stock is calculated. The lower average distance is indicate the higher efficiency than the others

4. FINDINGS AND ANALYSIS:

In this part at first descriptive statistics of Dhaka Stock Exchange and Chittagong Stock Exchange are analyzed. To analyze descriptive statistics mean, standard deviation and skewness of the data are calculated. From the result of skewness it is tried to find out are the data following random walk or not. After that ARIMA test is conducted to make sure again that is it following random walk model or not. That means are the data influencing by the past information or not. If the data are influencing by the past information it can be conclude that there is a weak form of efficiency. Finally by formulating SML (security market line) equation and measuring the distance of selected stock it is tried to find out which stock is more efficient. In an efficient market all the stocks are laying on security market line. So if any kind of discrepancy is found it can be concluded that the stock exchange is not in the form of Strong form of efficiency. By making average of the distance of both the stock it is tried to find out which stock is more efficient. The stock exchange which shows the lower distance is said to be in higher form of efficiency. And the stock exchange which shows the higher distance is said to be in lower form of efficiency.

4.1 Descriptive Statistics Dhaka Stock Exchange:

Table:1

Statistic	Market return (DSE)
N	237
Mean	0.001007
SD	0.020710
Skewness	-.155

Table-1 shows that data of 237 days is taken for descriptive analysis. It also shows that the mean of market return is 0.001007 and Standard deviation is 0.020710. Skewness is -.155. One of the basic assumptions for testing the random walk model and therefore, EMH is that return series should be normal. But Table 1 shows that there is a negative Skewness which is -.155 that means the left tail is longer than right tale. To be normal distribution skewness should be 0. So the distributions are not normal and reject the null hypothesis. But earlier studies shows that the skewness was .859 (Chaity. N. S & Sharmin .S, 2011) . That was near about unity. But in recent time the skewness is -.155 which is near about zero. That means in recent times there is enough chance that the data are influenced by the past information. Which indicate that market efficiency is going down. If all the data are followed by historical information then the market is said to be in weak form of efficiency.

4.2 ARIMA Test (Dhaka Stock Exchange):

Table:2

Model	Parameters	Coefficient	Standard Error	T-statistics	Probability
(0,1,0)	Constant	.00002891	.002	.015	.988
(1,0,1)	AR1	-.360	.863	-.417	.677
	MA1	-.296	.883	-.336	.737
	Constant	.001	.001	.782	.435
(1,0,0)	AR1	-.055	.065	-.839	.402
	Constant	.001	.001	.788	.432

Table-2 shows the ARIMA test Result for the Model of (0, 1, 0) (1, 0, 1) 1, 0, 0). Under the random walk model, the ARIMA model needs to be fitted in to (0, 1, 0). The results of ARIMA are presented in the Table 2 evident that the return series for indices are highly insignificant. For ARIMA (0, 1, 0) the coefficient (.00002891) with T-ratio of (.015) reject the null hypothesis with a probability of .988 for indices. For ARIMA (1, 0, 1) the estimated values for AR1 and MA1 are found best fitted model for 1% level of significance. Additionally ARIMA (1, 0, 0) is to calculated for indices to examine the auto- regression coefficient is equal to unity. The coefficient showing for indices AR1 (-.055) indicates the changes in the return series do not depend on past information. In case of earlier study it is found that return of Dhaka Stock Exchange follow random walk model. That means that the information of stock is not influenced by the past information and the past information here means the price of the security. It can be concluded easily that Dhaka Stock Exchange is not in the form of weak efficiency.

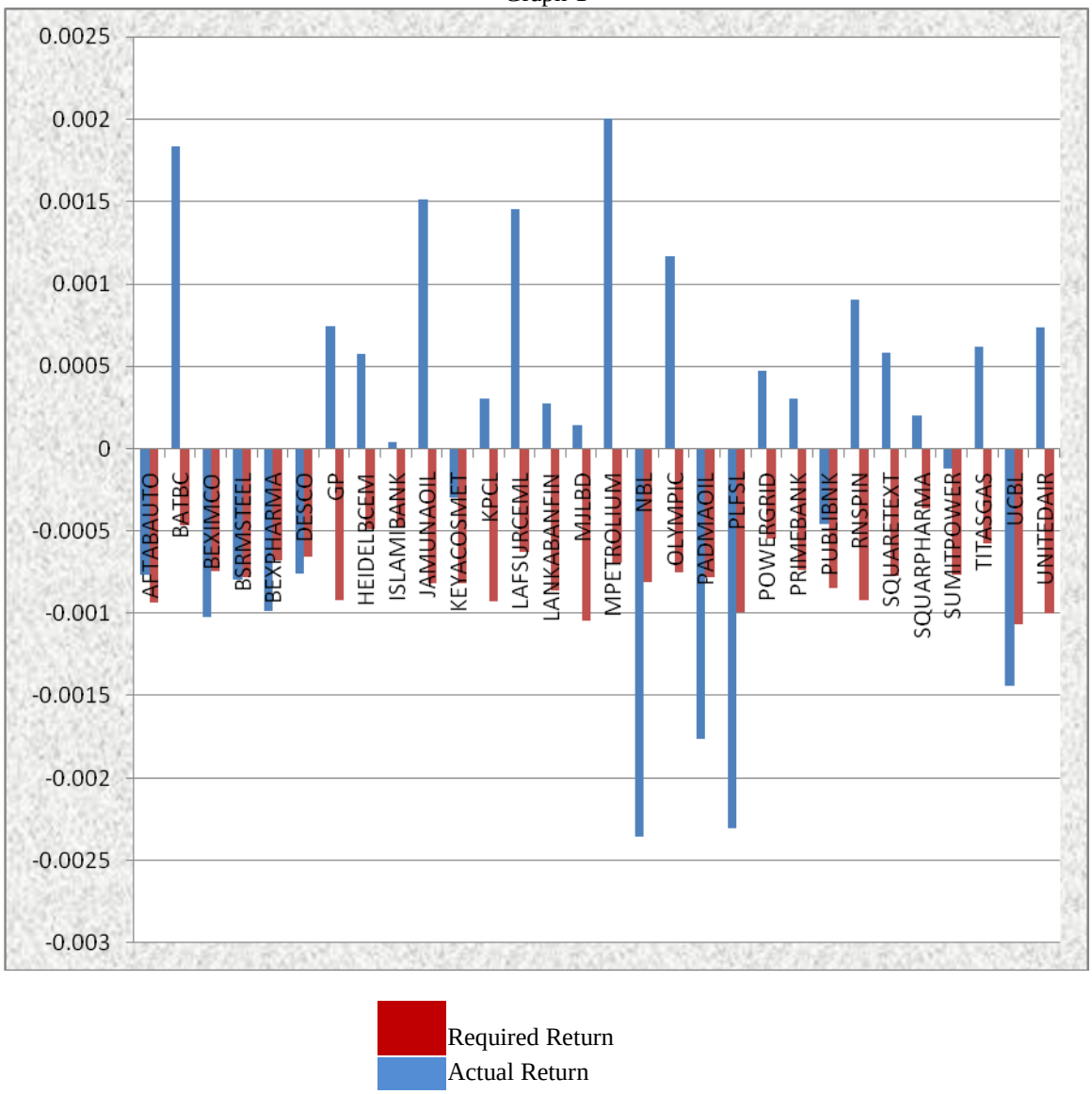
4.3 Calculation the distance of selected stock from SML (DSE):

Table: 3

Name of the Stock	Actual Return	Risk	Required Return	Distance from SML
AFTABAUTO	-0.000764945	1.14413380233	-0.000935021	0.000170073
BATBC	0.001836778	*0.64147118692*	-0.000463211	0.002299987
BEXIMCO	-0.00102618	*0.94467723432*	-0.000747807	0.000278376
BSRMSTEEL	-0.000794628	*0.98207989914*	-0.000782914	.0000117172
BEXPHARMA	-0.000986818	*0.87289155530*	-0.000680427	0.000306394
DESCO	-0.000758099	*0.84682345917*	-0.000655959	0.000102143
GP	0.000745126	*1.12647967975*	-0.000918451	0.001663573
HEIDELBCEM	0.000571297	*0.6676010259*	-0.000487737	0.001059032
ISLAMIBANK	0.0000407	*0.66077506158*	-0.00048133	0.000522028
JAMUNAOIL	0.001509531	*1.01942653367*	-0.000817968	0.002327496
KEYACOSMET	-0.000301207	*1.01942653367*	-0.000817968	0.000516758
KPCL	0.000300465	*1.13767230565*	-0.000928956	0.001229418
LAFSURCEML	0.001449408	*0.81788385867*	-0.000628796	0.002078201
LANKABANFIN	0.000271	*1.06965967994*	-0.000865118	0.001136115
MJLBD	0.000138385	*1.26193827446*	-0.001045595	0.001183977
MPETROLIUM	0.002002677	*0.88267199064*	-0.000689607	0.002692282
NBL	-0.002352547	*1.00779965675*	-0.000807055	0.001545495
OLYMPIC	0.001168716	*0.94711174036*	-0.000750092	0.001918805
PADMAOIL	-0.001762883	*0.9772313210*	-0.000778363	0.000984523
PLFSL	-0.002300692	*1.20585143803*	-0.000992951	0.001307745
POWERGRID	0.000473405	*0.72768428694*	-0.000544132	0.001017535
PRIMEBANK	0.000304792	*0.93138165863*	-0.000735327	0.001040116
PUBLIBNK	-0.000461604	*1.05191402064*	-0.000848462	0.000386855
RNSPIN	0.000902772	*1.12903181242*	-0.000920846	0.001823615
SQUARETEXT	0.000578103	*0.96998563928*	-0.000771562	0.001349662
SQUARPHARMA	0.00019859	*0.53235811836*	-0.000360795	0.000559383
SUMITPOWER	-0.000123483	*0.96160685057*	-0.000763697	0.000640211
TITASGAS	0.00061945	*0.75843849988*	-0.000572999	0.001192447
UCBL	-0.001437263	*1.28578199385*	-0.001067976	0.000369291
UNITEDAIR	0.000733301	*1.21741033756*	-0.0010038	0.001737098

Table-3 shows the actual return, beta co-efficient, required rate of return, and the distance of each stock from SML for the sample stock. DSE is showing very ridicules scenario. Because it is very unusual that the market return is negative. It should be more than the risk free rate which is 5% per year (http://www.stockbangladesh. com/resources/individual_return/11101). Because there is a risk in the market. So investor will demand more than the risk free rate as risk premium. Table 3 shows that actual return more of less satisfactory. But because of negative market return all the required rate of return is negative which is also unusual. The average distance of the stock from security market line is 0.0011150 and this is high. That means Stocks are not lies on SML. It indicates that market is not belongs to 'strong form of efficiency'. Because it is said that in an efficient market all the stocks must lie on SML. But in case of Dhaka Stock Exchange no stock is lies on SML because distance of any stock is not showing 0. If distance is 0 that represent the stock is laying on the Security Market Line.

Graph-1



Graph shows that the Actual return for most of the stock is greater than the required rate of return. It means this stock perform better in case of getting return. But the real case is the market fluctuated in the year so much and the price of most of the share decreased. As a result market return was negative. And for that reason required rate was negative. In case of getting return MPETROLIUM is highest and NBL is lowest. Required is highest for SQUAPHARMA and lowest for TITASGAS. Because the risk for SQUAREPHARMA is the lowest and the risk for TTASGAS is the highest.

4.4 Descriptive statistics for Chittagong Stock Exchange:

Table-4

Statistic	Market return (DSE)
N	236
Mean	-0.001007424
SD	.0265392
Skewness	.147

Table-5 shows that the mean of market return is -0.001007424 and Standard deviation is 0.065392. Skewness is .147. It shows the positive skewness. So the distribution is not normal. Its right tail is longer than the left tail. Because normal distribution shows 0

skewness. And to prove random walk for EMH skewness should be 0. So here we see that the data set is not following the random walk model. And reject the null hypothesis. The skewness is closer to zero. Which indicates that there is enough chance that data are influenced by the past information. Earlier it was that the skewness of Dhaka Stock Exchange was near about unity. It can be assumed from that situation is skewness for Chittagong was also high. But in recent time both the stock exchanges are showing very low skewness. That means investors are taking decision of buying and selling share by the influence of past information.

4.5 ARIMA Test (Chittagong Stock Exchange)

Table-5

Model	Parameters	Coefficient	Standard Error	T-statistics	Probability
(0,1,0)	Constant	-.00002891	.002	-.015	.988
(1,0,1)	AR1	-.001	.001	-.786	.433
	MA1	-.386	.778	-.496	.620
	Constant	-.318	.800	-.398	.691
(1,0,0)	AR1	-.001	.001	-.791	.429
	Constant	-.057	.065	-.867	.387

Table-5 shows the ARIMA test Result for the Model of (0, 1, 0) (1, 0, 1) 1, 0, 0). Under the random walk model, the ARIMA model needs to be fitted in to (0, 1, 0). The results of ARIMA are presented in the Table 5 evident that the return series for indices are highly insignificant. For ARIMA (0, 1, 0) the coefficient (-.00002891) with T-ratio of (-.015) reject the null hypothesis with a probability of .988 for indices. For ARIMA (1, 0, 1) the estimated values for AR1 and MA1 are found best fitted model for 1% level of significance. Additionally ARIMA (1, 0, 0) is to calculated for indices to examine the auto- regression coefficient is equal to unity. The coefficient showing for indices AR1 (-.001) indicates the changes in the return series do not depend on past information.
But it can not be said that both exchanges are in the form of weak efficiency unless the skewness is zero.

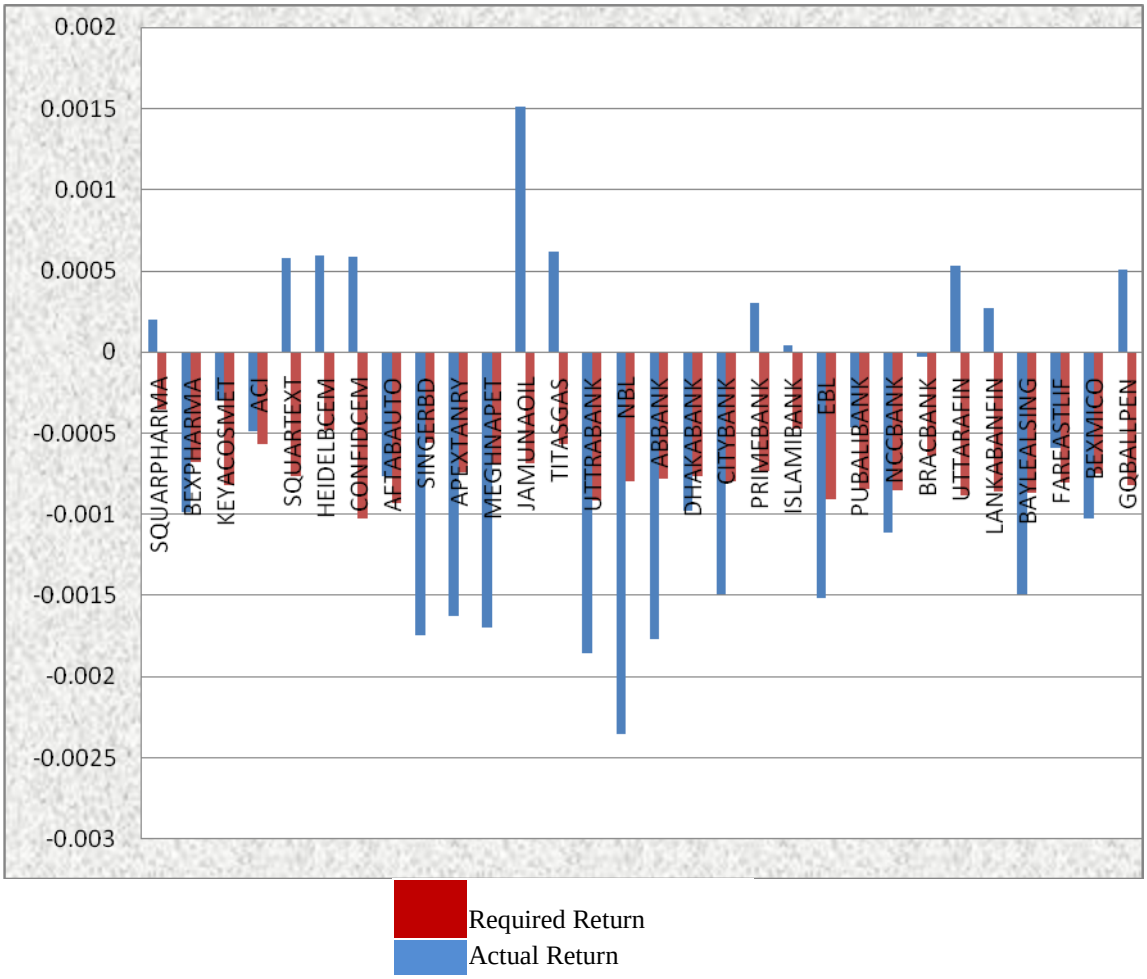
4.6 Calculation the distance of selected stock from SML (CSE):

Table-6

Name of the Stock	Actual Return	Risk	Required Return	Distance from SML
SQUARPHARMA	0.00019859	0.531773984	-0.000357459	0.0005588
BEXPHARMA	-0.000986818	0.875009407	-0.000677829	0.000304406
KEYACOSMET	-0.000301207	1.029200525	-0.000821748	0.000525932
ACI	-0.000488934	0.757740404	-0.000568372	0.00008340766
SQUARTEXT	0.000578103	0.97049993	-0.000766958	0.001350145
HEIDELBCEM	0.000592331	0.666825524	-0.000483514	0.001079338
CONFIDCEM	0.00058568	1.250611406	-0.001028409	0.00162064
AFTABAUTO	-0.000764945	1.143427636	-0.000928366	0.00016941
SINGERBD	-0.001748011	0.751258602	-0.000562322	0.001181754
APEXTANRY	-0.00162526	0.942681803	-0.000740993	0.000879329
MEGHNAPET	-0.001693098	0.880542729	-0.000682994	0.001005492
JAMUNAOIL	0.001509531	0.88478816	-0.000686956	0.002201122
TITASGAS	0.00061945	0.759961175	-0.000570445	0.001193876
UTTRABANK	-0.001851945	1.130955155	-0.000916724	0.000929297
NBL	-0.002352547	1.003110322	-0.000797396	0.001549897
ABBANK	-0.001766769	0.985051234	-0.00078054	0.000981069
DHAKABANK	-0.000981337	0.969187523	-0.000765733	0.000210528
CITYBANK	-0.001494739	1.003391023	-0.000797658	0.000691825
PRIMEBANK	0.000304792	0.931634046	-0.000730681	0.001040353
ISLAMIBANK	0.0000407259	0.654258621	-0.000471784	0.000515937
EBL	-0.001514524	1.118014739	-0.000904646	0.000604022
PUBALIBANK	-0.000463568	1.050379123	-0.000841516	0.00038345
NCCBANK	-0.001111777	1.05854348	-0.000849136	0.000257096
BRACBANK	-0.0000335768	0.836630863	-0.000642007	0.000612813
UTTARAFIN	0.000531168	1.099081083	-0.000886973	0.001423899
LANKABANFIN	0.000270678	1.072356038	-0.000862029	0.001138323
BAYLEALSING	-0.001493644	1.075994097	-0.000865425	0.000622584
FAREASTLIF	-0.000588801	1.01433292	-0.000807871	0.000224383
BEXMICO	-0.00102618	0.950423417	-0.000748219	0.000272982
GQBALLPEN	0.000503164	1.025970559	-0.000818733	0.001327272

Table-6 shows the actual return, beta co-efficient, required rate of return, and the distance of each stock from SML for the sample stock. CSE is also showing very ridicules scenario. The market return is also negative here . It should be more than the risk free rate which is 5% per year. Because there is a risk in the market. So investor will demand more than the risk free rate as risk premium. Table 6 shows that actual return more or less satisfactory. But because of negative market return all the required rate of return is negative which is also unusual. The average distance of the stock from security market line is 0.000831313 and this is high. That means Stocks are not laying on SML. It indicates that market is not efficient. Because it is said that in an efficient market all the stocks must lie on SML. But in case of Chittagong Stock Exchange no stock is lies on SML because distance of any stock is not showing 0. If distance is 0 that represent the stock is laying on the Security Market Line. So The Chittagong is not in the form ‘strong efficiency’.

Graph-2

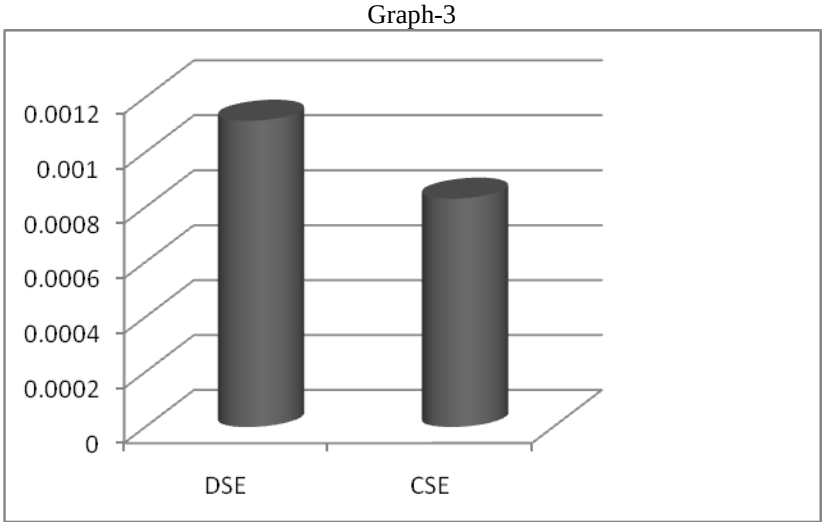


Here we see the same kind of scenario. Actual return for most of the stock is greater than the required rate of return. It means this stock perform better in case of getting return. But the real case is the market fluctuated in the year so much and the price of most of the share decreased. As a result market return was negative. And for that reason required rate was negative.
Here we also see that the in case of giving return JAMUNAOIL is highest and like DSE NBL is the lowest. Required rate of return is highest for SQUAREPHARMA and the lowest is CONFIDCEM.

4.7 Comparison the Efficiency of DSE and CSE:

Analysis shows that the average distance of stock from SML CSE is lower than the SML of DSE.

Graph-3



Graph clearly shows that the average distance of the stock of Chittagong Exchange from SML is lower than the average distance of DSE. That means the stocks are closer to SML for the case of CSE. It indicates that CSE is more efficient than DSE. Because it is known to all that in a strong efficient market all the information about security is traded within a few times. And if any discrepancy is found by capitalizing those discrepancy investors try to earn extra profit. For that reason discrepancy is not found after few times. But in case of Dhaka Stock exchange and Chittagong Stock Exchange we see that all most all the security is not laying on Security Market Line. But the stocks of Chittagong Stock Exchange are closer than the stocks of Dhaka Stock Exchange. So it can be said that the discrepancy between risk and return is lower in case Chittagong Stock Exchange. Which indicate the greater efficiency. Analysis and graph indicate that Chittagong is more efficient than Dhaka Stock Exchange.

5. CONCLUSION:

This study was designed to provide evidence on weak form of efficiency concentrating on following the random walk model for Dhaka Stock Exchange and Chittagong Stock Exchange. The results of the study conclude that the return series of both indices of Dhaka Stock Exchange do not follow the normal distribution. ARIMA (time series) forecasting strengthens the non-random nature of Dhaka stock Exchange and Chittagong Stock Exchange. The resulting situation by rejecting the null hypothesis would be that the investors can not gain a fair return by holding a well diversified portfolio. SML and the position of the stocks on SML graph shows that Chittagong Stock Exchange is more efficient than Dhaka Stock Exchange. In Chittagong Stock Exchange the stock lies closer to SML than Dhaka Stock Exchange. Analysis also shows that Dhaka stock Exchange and Chittagong Stock Exchange are not in the form of 'weak efficiency' and 'strong efficiency'. So both stocks belong to the 'semi strong' form of efficiency. Besides this, there are other factors such as weak regulation, lack of supervision, lack of market transparency which may influence the efficiency level of capital market; even recent market scam report also indicate these factors as vital for stock market crashes.

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A appraisal paper on Breadth-first search, Depth-first search and Red black tree

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Abstract- Breadth-first and depth-first search are indispensable adventure strategies leading which many other rummage around algorithms are built. In this dissertation, we projected an loomed of integrating these two strategies in a solitary algorithm that combines the corresponding strengths of mutual. We account preliminary computational outcome using the tree width predicament as an example. This dissertation explores the configuration of red-black trees by solving an apparently straightforward crisis: grant an uphill progression of rudiments, erect, in linear time, a red-black tree that contains the rudiments in symmetric sort. Numerous tremendous red-black ranking shapes are characterized: trees of least quantity and maximum loftiness, trees with a nominal and with a maximal fraction of red nodes.

Index Terms- BFS (Breadth-First Search), DFS (Depth-First Search), Red Black Tree, Algorithm

I. Introduction

Breadth-first and Depth-first search are indispensable investigated strategies for incisive. specified the very diverse way in which they categorize node expansions, it is not apparent that they can be pooled in the same search algorithm. To demonstrate the reimbursement of this loom, we exploit the tree thickness predicament as an example. The tree breadth of a grid (also known as the induced tree width) is a appraise of how analogous the grid is to a hierarchy, which has a tree width of 1. A entirely attached graph is slightest akin to a hierarchy, in addition has a tree breadth of (n–1), where n is the number of vertices in the grid. Nearly every graphs enclose a tree width that is everywhere in sandwiched between 1 and the numeral of vertices minus 1. Red-black trees are well-designed search-tree proposal, with the intention of guarantees O (logn) worst-case administration era of vital dynamic-set operations. Recently,[1,2] vacant a stunning serviceable accomplishment of red-black trees[5]. In this dissertation we stab deeper into the formation of red-black trees by solving an according to the grapevine effortless quandary: prearranged a mounting progression of rudiments, assemble a red-black tree[6] that contains the ground rules in symmetric array. A red-black hierarchy is a binary search tree (BST) with five linked red-black properties[7]:

1. All node is either red or black.
2. The derivation nodule is black.
3. peripheral nodes are black.
4. A red node's children are mutually black.
5. All paths on or after a knob to its sheet descendants restrain the equivalent amount of black nodes. The erection ought to merely take linear instance. This algorithm has a uncomplicated recursive portrayal ***[3]:***

1. **procedure** DFS(v)
2. **begin**
3. smudge v as visited;
4. **while** there is an intact vertex w contiguous to v **do**
5. add (v, w) to T
6. DFS(w)
7. **end** { while)
8. **end** { DFS)

Algorithm of BFS[3]:

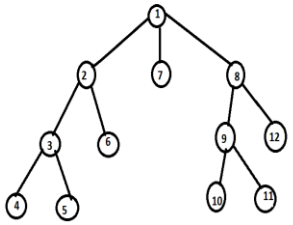

Fig:-Depth First Searc

1. procedure BFS(Graph,source):
2. generate a queue Q
3. enqueue foundation onto Q
4. blotch source
5. while Q is not vacant:
6. dequeue an item from Q into v
7. for each margin e incident on v in Graph:
8. let w be the other conclusion of e
9. if w is not marked:
10. mark w
11. enqueue w onto Q

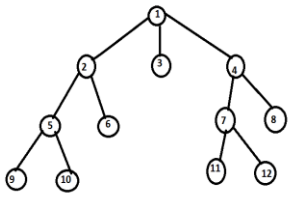

Fig:-Breadth First Search

Algorithm of RED BLACK TREE[5]:

```
void insert_case3(struct node *n)
{
struct node *u = uncle(n), *g;

if ((u != NULL) && (u->color == RED)) {
n->parent->color = BLACK;
u->color = BLACK;
g = grandparent(n);
g->color = RED;
insert_case1(g);
} else {
insert_case4(n);
}
}
```

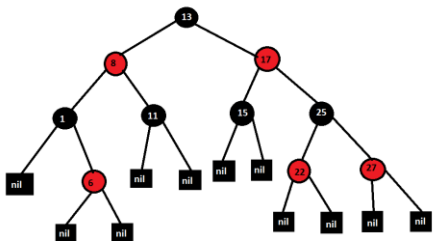

Fig:-Red Black Tree

II. LITERATURE REVIEW

Finding the accurate tree width of a general table is an NP-complete trouble. One come near to result the exact tree width is depth first [1,2]branch-and-bound rummage around in the space of vertex elimination orders. However, recent studies showed that best-first search can dramatically outperform depth-first branch-and-bound search by avoiding repeated generation of spare investigate nodes. In the search space of the tree width problem, each node corresponds to an in-between graph that results from eliminating a set of vertices from the original graph. Each elliptical represents a search node that is identified by the set of vertices eliminated so distant from the original graph. A lane from the start node which has an drain set of eliminated vertices to the ambition join which has all vertices eliminated to an exclusion order, and there is a one-to-one mapping from the set of exclusion orders to the set of paths from the start to the goal node. Even though there are n! different elimination orders for a graph of n vertices, there are only 2n diverse search nodes. This is since dissimilar ways of eliminating the same set of vertices always reach your destination at the same in-between graph, and there is only one distinct in-between graph for each grouping (as opposed to permutation) of the vertices. Depth-first[1,2] branch-and-bound search treats the search space as a tree with n! separate states instead of a graph with only 2n states. The faster presentation of best-first tree width search reflects the difference in size connecting a search tree and a search graph. Unfortunately, the scalability of best-first search is limited by its memory necessities, which tend to grow exponentially with the search depth. To improve scalability, use a memory-efficient version of best-first search called breadth-first heuristic search. Red-black trees[10] are a form of balanced search trees which can be without problems implemented [8,9]. They can also be seen as a variant of (2;4)-trees. Definition 1 (Red-black tree). A red-black tree is a binary tree whose inner nodes are associated with keys. Keys are elements of a entirely ordered set. A node can either be red or black.

III. PROPOSED METHODOLOGY

To reduce the time overhead of intermediate graph age band, we portray a search algorithm that does not generate the in-between graph from the original graph at the root node of the search space. Instead, it generates it from the intermediate graph of a close neighbor of the node that is being expanded. A red-black tree[2] is a binary tree whose inner nodes are coupled with keys. Keys are elements of a totally ordered set. A node can either be red or black.The advantage is that the in-between graph of a close fellow citizen is already very similar, and so there is much less overhead in transforming it into a new intermediate graph. The simplest way to find the node's closest neighbour is by computing shortest paths from a node to all of its neighbors and alternative the contiguous one. But at first, this does not seem to work for the tree width problem, since its state space is a partially ordered graph in which the distance between any pair of nodes at the same depth is infinite. Our idea is to measure the distance between a pair of nodes in a meta search space, in its place of the original search space. A meta search space has accurately the same set of states as the original search space, but is increased with a set of meta proceedings that can transform one node into another in ways not allowed in the original search space. For example, a meta action for the tree width problem can be an action that uneliminates a vertex by reversing the changes made to a graph when the vertex was eliminated. For the tree width problem augmented with the uneliminate meta action, its search graph is an undirected adaptation of the graph. In this new graph, called a meta search graph, actions i.e., edges can go back and forth between a pair of flanking nodes, and this allows us to cause the intermediate graph of a node from another knob at the same depth. This is very of use for breadth-first heuristic search, which expands nodes in order of their depth in the search freedom. Since a node is uniquely known by the set of vertices eliminated, we use the same lower-case letter (e.g., n, u, and v) to denote both a knob and a set of eliminated vertices in the rest of this paper. To implement the uneliminate meta action, each edge of the meta search graph is labeled by a tuple u, v, $\Delta E+$, $\Delta E-$, where u & v is the set of vertices eliminated so far at the source (destination) node of the edge, and $\Delta E+$ ($\Delta E-$) is the set of edges added to (deleted from) the graph when the vertex in the singleton set v \ u is eliminated.

Let, $G_n = V_n$, E_n be the intermediate graph associated with node n. The task of adding a previously-eliminated vertex backside to the graph can be uttered formally as: given $G_v = V_v, E_v$_ and e = _u, v,$\Delta E+$,$\Delta E-$_, how to compute G_u = _V_u,E_u Since all the changes are recorded with theedge e, one can reconstruct G_u = _V_u,E_u_ as follows, $V_u = V_v \cup {}_v \setminus u$ (1)
$E_u = E_v \cup \Delta E- \setminus \Delta E+$ (2)

That is, by adding (deleting) the edges that have been beforehand deleted (added) to the graph, the "uneliminate" metan deed can undo the things of an elimination action in the original search space. In general, adding up meta actions can turn bound for search graphs into undirected graphs. This guarantees that any changes made to the current state (e.g., the intermediate graph) is reversible, creating a graph with the subsequent charming assets: for any two states accessible from the start state, there is always a lane that maps one into the other. This material goods allows a search algorithm to produce the state illustration of a node from any stored node, as if all actions are deterministic, then a state s' is uniquely identified by another state s plus a path from s to s'. If it takes less space to correspond to a path involving s and s', then this approach to state training can save memory, even if at the cost of some computational overhead. For the tree width problem, this means the intermediate graph of a node can be generated from any node instead of only from the node's unswerving relatives, such as the start node. Thus, one only needs to preserve a single transitional graph, which can be personalized to develop into the transitional graph for any node in the search space. An motivating question is how to diminish the overhead of generating the transitional graph from one node to another. The response depends on the search approach, because finally our goal is to minimize the overhead of getting higher not just a single node save for a set of nodes.

Red condition: Each red node has a black parent.

Black condition: Each path from the root to an empty node contains exactly the same number of black nodes (this number is called the tree's black height).

Note that the red circumstance implies that the root of a red-black tree is black. The algorithm for inserting an element into a red-black tree is nearly indistinguishable to the standard algorithm for unbalanced binary trees. The main difference is that the constructor for building nodes, *N*, is replaced by a smart constructor [1] that maintains the invariants.

Algorithm for Red Black Tree

```
insert : (Ord a))a !RBTree a !RBTree a
insert a t =blacken (ins t)
where ins E N R E a E
ins (jN c l b r) a <b =bal c (ins l)b r ja ==b N c l a r a >b =bal c l
b (ins r)blacken (N l a r) N B l a r
```

IV. CONCLUSION

We had offered a novel arrangement of breadth-first and depth-first search that allows a single search algorithm to acquire the matching strengths of both. While our paper focuses on the tree width problem, many of the ideas have the prospective to be applied to other search troubles, especially graph-search harms with large encoding sizes, for which memory-reference neighborhood is the key to achieving good piece. Possibilities include model checking, where a large data structure that represents the current state is typically stored with each search node, and constraint-based forecast and scheduling, where a simple secular group is stored with each search node. As long as the similarities among unusual search nodes can be captured in a form that allows depth-first search to waste the state-representation locality in node expansions, the approach we have described could be ineffectual. Red-Black trees let us apply all dictionary operations in O(log n). Further, in no case are more than 3 rotations done to rebalance. Certain very complex data structures have data stored at nodes which requires a lot of work to adjust after a revolving red-black trees ensure it won't go off habitually.

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Exponential – Log Logistic Additive Failure Rate Model

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Abstract- A combination of exponential and log – logistic failure rate model is considered and named it as exponential log-logistic additive failure rate model. An attempt is made to present the distributional properties, estimation of parameters, testing of hypothesis and the power of likelihood ratio criterion about the proposed model.

I. INTRODUCTION

It is well-known that in the theory of distributions, Normal distribution and exponential distributions are the basic models exemplified in theory of distributions. Specifically, exponential distribution is an invariable example for a number of theoretical concepts in reliability studies. It is characterized as CFR model also. In case of necessity for an IFR model, the choice falls on Weibull model with shape parameter more than 1 (>1), in particular taken as 2. Similar in shape, with common characteristics of Weibull, we have log-logistic distribution as another model. Log-logistic distribution has its own prominence as a life testing model. A log-logistic distribution is an IFR model and it is also a weighted exponential distribution. In this paper, we propose to combine an exponential model (CFR) and a log-logistic model (IFR) through their hazard functions to get two component series system reliability.

Log-logistic distribution is the model of transformed well-known logistic variate (Bain, 1974). Ragab and Green (1984) have studied the properties of log-logistic distribution and constructed its order statistics. Kantam *et al.* (2001&2006) constructed the acceptance sampling plans for log-logistic distribution. Kantam and Srinivasa Rao (2002) studied the modified maximum likelihood estimation in log-logistic distribution. Rosaiah *et al.* (2007) have constructed the confidence intervals for log-logistic distribution. Srinivasa Rao *et al.* (2013a) studied the properties, estimation and testing of linear failure rate model with exponential and half – logistic distribution. Srinivasa Rao *et al.* (2013b) have discussed the distributional properties, estimation of parameters and testing of hypothesis for additive failure rate model combining exponential and gamma distributions.

Because, exponential model and log-logistic model and the related works are not published in the available literature, we made an attempt to consider such a model for our study. In reliability studies, combinations of components forming series, parallel, k out of 'n' systems are quite popular. The survival probabilities of such systems are evaluated either by the systems as a whole or through the survival probabilities of the component that define the system. It is well known that in a series system of a finite number of components with independent life time random variables, the system reliability is equal to the product of the component reliabilities. If f(x), F(x), h(x) respectively indicates the failure density, failure probability, failure rate of a component with life time random variable 'X', then we know that

The reliability R(x) = 1-F(x)

$$R(x) = e^{-\int_0^x h(x)dx}$$

If a series system has two components with independent but non-identical life patterns explained by two distinct random variables say X_1, X_2, with respective failure densities, failure probabilities, failure rates as $f_1(x)$, $f_2(x)$; $F_1(x)$, $F_2(x)$; $h_1(x)$, $h_2(x)$, then the system reliability is given by

$$R(x) = e^{-\int_0^x [h_1(x)+h_2(x)]dx} \tag{1}$$

From the above equation, we can get the failure density and failure rate of the series system whose reliability is given by (1). Specifically, we consider a series system of two components with their respective life times modeled by exponential and log-logistic distribution.

The hazard functions of the exponential distribution with parameter 'λ' and a log- logistic distribution with parameters α, β are given by,

$$h_1(x) = \lambda,\ x > 0$$

and

$$h_2(x) = \frac{\left(\frac{\beta}{\alpha}\right)\left(\frac{x}{\alpha}\right)^{\beta-1}}{1+\left(\frac{x}{\alpha}\right)^{\beta}},\ x > 0,\ \alpha, \beta > 0$$

The corresponding reliability functions are $e^{-\lambda x}$ *and* $\left[1+\left(\frac{x}{\alpha}\right)^{\beta}\right]^{-1}$

The reliability of the series system is

$$R(x) = e^{-\int_0^x \left(\lambda + \frac{\left(\frac{\beta}{\alpha}\right)\left(\frac{x}{\alpha}\right)^{\beta-1}}{1+\left(\frac{x}{\alpha}\right)^{\beta}} \right) dx} \tag{2}$$

We consider the failure density corresponding to (2) as our exponential log-logistic additive failure rate model (ELLAFRM). The distributional properties, graphical natures for different choices of λ, β (assuming α = 1) are discussed in Section II. Estimation of parameters is presented in Section III. Likelihood ratio criterion and power of likelihood ratio criterion are given in Sections IV and V respectively. Summary and conclusions are given in Section VI.

II. Distributional Properties

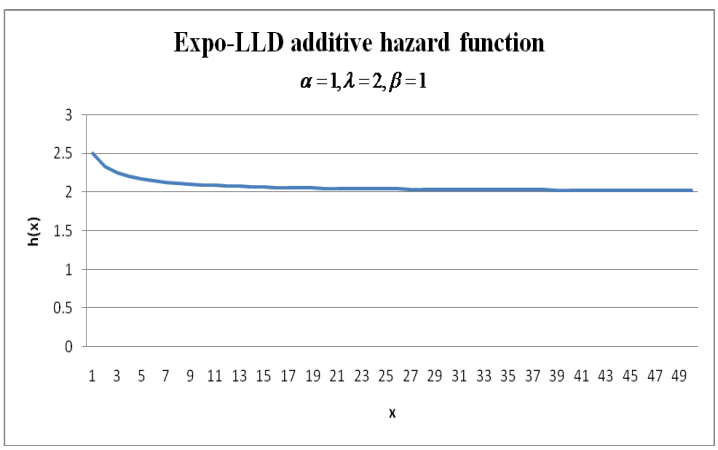
The probability density function (pdf), the cumulative distribution function (cdf), failure rate of ELLAFRM are respectively given by

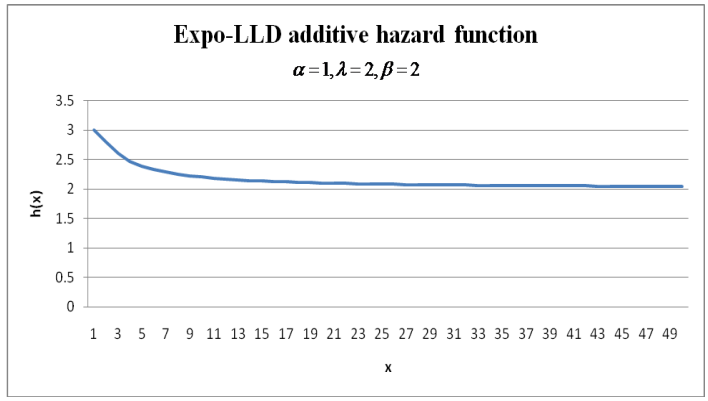
$$f(x) = e^{-\lambda x - \log\left[1+\left(x/\alpha\right)^{\beta}\right]} \left[\lambda + \frac{\beta x^{\beta-1}}{\alpha^{\beta} + x^{\beta}} \right], \qquad x>0, \alpha>0, \beta>0, \lambda>0 \tag{3}$$

$$F(x) = 1 - e^{-\lambda x - \log\left[1+\left(\frac{x}{\alpha}\right)^{\beta}\right]}, \qquad x>0, \lambda>0, \alpha>0, \beta>0 \tag{4}$$

$$h(x) = \lambda + \frac{\beta x^{\beta-1}}{\alpha^{\beta} + x^{\beta}}, \quad x>0\,;\ \lambda, \alpha, \beta > 0 \tag{5}$$

The following graphs show that the hazard function is decreasing for initial values of x and then constant.





III. Maximum Likelihood Estimation

Let $x_1, x_2, \ldots\ldots, x_n$ is a random sample of size 'n' drawn from the ELLAFRM with pdf given in equation (3), then the likelihood function is given by

$$L = \prod_{i=1}^{n} f(x_i; \lambda, \alpha, \beta)$$

$$\Rightarrow L = \pi_{i=1}^{n} \left[e^{-\lambda x_i - \log\left[1+\left(x_i/\alpha\right)^{\beta}\right]} \left[\lambda + \frac{\beta x_i^{\beta-1}}{\alpha^{\beta} + x_i^{\beta}} \right] \right] \tag{6}$$

$$\Rightarrow \log L = \sum_{i=1}^{n} \log \left[e^{-\lambda x_i - \log\left[1+\left(x_i/\alpha\right)^{\beta}\right]} \left[\lambda + \frac{\beta x_i^{\beta-1}}{\alpha^{\beta} + x_i^{\beta}} \right] \right] \tag{7}$$

The MLE's of λ, α can be obtained with known β by solving the following likelihood equations

$$\frac{\partial \log L}{\partial \lambda} = 0 \qquad \Rightarrow \sum_{i=1}^{n} \left[-x_i + \frac{1}{\lambda + \frac{\beta x_i^{\beta-1}}{\alpha^{\beta} + x_i^{\beta}}} \right] = 0 \tag{8}$$

$$\frac{\partial \log L}{\partial \alpha} = 0$$

$$\Rightarrow \beta \sum_{i=1}^{n} \left[\frac{x_i^{\beta}}{\alpha\left(\alpha^{\beta} + x_i^{\beta}\right)} - \frac{\beta x_i^{\beta-1} \alpha^{\beta-1}}{\left[\lambda\left(\alpha^{\beta} + x_i^{\beta}\right) + \beta x_i^{\beta-1}\right]\left[\alpha^{\beta} + x_i^{\beta}\right]} \right] = 0 \tag{9}$$

Assuming that β is known, the equations (8) and (9) have to be solved simultaneously through iterative only with some well known numerical methods to get the MLEs of λ and α say $\hat{\lambda}$ and $\hat{\alpha}$ respectively .

However, by using a simple successive method, the ML equations (8) and (9) can be further simplified and get the following estimator (not ML estimator) for λ .

$$\hat{\lambda} = \frac{n}{\sum_{i=1}^{n} x_i} \tag{10}$$

Accordingly, the exact variances of the MLEs are not mathematically tractable. However, the asymptotic variance, covariance of the estimates of the parameters is obtained using the following elements of the information matrix:

$$\mathrm{I}_{11} = -E\left(\frac{\partial^2 \log L}{\partial \lambda^2}\right) = -E\left[-\sum_{i=1}^{n} \frac{1}{\left[\lambda + \frac{\beta x_i^{\beta-1}}{\alpha^\beta + x_i^\beta}\right]^2}\right] \tag{11}$$

$$\mathrm{I}_{12} = \mathrm{I}_{21} = -E\left(\frac{\partial^2 \log L}{\partial \lambda \partial \alpha}\right) = -E\left[\sum_{i=1}^{n} \frac{\beta^2 x_i^{\beta-1} \alpha^{\beta-1}}{\left[\lambda\left(\alpha^\beta + x_i^\beta\right) + \beta x_i^{\beta-1}\right]^2}\right] \tag{12}$$

$$\mathrm{I}_{22} = -E\left(\frac{\partial^2 \log L}{\partial \alpha^2}\right) = -E\left[\beta \sum_{i=1}^{n}\left[\frac{-x_i^\beta\left(\beta\alpha^{\beta-1}\alpha + \left(\alpha^\beta + x_i^\beta\right)\right)}{\left[\alpha\left(\alpha^\beta + x_i^\beta\right)\right]^2} - \beta x_i^{\beta-1}\left[\frac{(\beta-1)\alpha^{\beta-2}\left(\left[\lambda\left(\alpha^\beta + x_i^\beta\right) + \beta x_i^{\beta-1}\right]\left[\alpha^\beta + x_i^\beta\right]\right) - \left(\beta\alpha^{\beta-1}\left[\lambda\left(\alpha^\beta + x_i^\beta\right) + \beta x_i^{\beta-1}\right] + \lambda\beta\alpha^{\beta-1}\left(\alpha^\beta + x_i^\beta\right)\right)\alpha^{\beta-1}}{\left(\left[\lambda\left(\alpha^\beta + x_i^\beta\right) + \beta x_i^{\beta-1}\right]\left[\alpha^\beta + x_i^\beta\right]\right)^2}\right]\right]\right] \tag{13}$$

The estimated information matrix elements are

$$\hat{\mathrm{I}}_{11} = -E\left(\frac{\partial^2 \log L}{\partial \lambda^2}\right)\Big|_{\lambda=\hat{\lambda}}, \qquad \hat{\mathrm{I}}_{12} = \hat{\mathrm{I}}_{21} = -E\left(\frac{\partial^2 \log L}{\partial \lambda \partial \alpha}\right)\Big|_{\lambda=\hat{\lambda},\, \alpha=\hat{\alpha}}$$

and $\hat{\mathrm{I}}_{22} = -E\left(\frac{\partial^2 \log L}{\partial \alpha^2}\right)\Big|_{\alpha=\hat{\alpha}}$

The estimated asymptotic dispersion matrix of the MLEs is given by the inverse of

$$\begin{bmatrix} \hat{\mathrm{I}}_{11} & \hat{\mathrm{I}}_{12} \\ \hat{\mathrm{I}}_{21} & \hat{\mathrm{I}}_{22} \end{bmatrix}$$

IV. Likelihood Ratio Type Criterion and Critical Values

Let us designate our distribution **ELLAFRM** as null population, say P_0. We call exponential distribution as alternate population, say P_1. We propose a null hypothesis H_0: "A given sample belongs to the population P_0" against an alternative hypothesis H_1: "The sample belongs to population P_1". Let L_1, L_0 respectively stand for the likelihood function of the sample with population P_1 and P_0. Both L_1 and L_0 contain the respective parameters of the population. The given sample is used to get the parameters of P_1, P_0, so that for the given sample, the value of L_1/L_0 is now estimated. If H_0 is true, L_1/L_0 must be small, therefore for accepting H_0 with a given degree of confidence, L_1/L_0 is compared with a critical value with the help of the percentiles in the sampling distribution of L_1/L_0.

We have seen in Section 4, how to get the estimates of parameters. But the sampling distribution of L_1/L_0 is not analytical, we therefore resorted to the empirical sampling distribution through simulation. We have generated random samples of size 2(1)10 from the population P_0 with various parameter combinations and get the value of L_1, L_0 along with the estimates of respective parameters for each sample. The percentiles of L_1/L_0 at various probabilities are computed and are given in Tables 1 to 3.

Table -1: Percentiles of L_1/L_0 for $\alpha = 1,\ \lambda = 1,\ \beta = 2$

n	0.99	0.975	0.95	0.05	0.025	0.01
2	3.1748	1.8985	1.3072	0.4991	0.4938	0.4872
3	2.7711	1.7240	1.2677	0.3660	0.3547	0.3498
4	2.8102	1.6521	1.1175	0.2700	0.2625	0.2547
5	2.4595	1.8190	0.9772	0.2000	0.1924	0.1857
6	2.0317	1.3517	0.8563	0.1479	0.1422	0.1371
7	1.9982	1.1476	0.7408	0.1089	0.1402	0.1009
8	1.8364	1.0352	0.6722	0.0832	0.0772	0.0746
9	1.2912	0.8237	0.5504	0.0611	0.0575	0.0536
10	1.2227	0.7506	0.4759	0.0457	0.0425	0.0396

Table – 2: Percentiles of L_1/L_0 for $\alpha = 1,\ \lambda = 2,\ \beta = 2$

n	0.99	0.975	0.95	0.05	0.025	0.01
2	2.0360	1.5561	1.2253	0.7671	0.7583	0.7495
3	2.0246	1.5835	1.2806	0.6885	0.6795	0.6644
4	2.2464	1.6317	1.2722	0.6160	0.6031	0.5949
5	2.2765	1.7299	1.2907	0.5511	0.5395	0.5295
6	2.2025	1.6206	1.2341	0.4949	0.4853	0.4724
7	2.1648	1.5702	1.1961	0.4440	0.4316	0.4239
8	2.1820	1.6057	1.1646	0.4011	0.3876	0.3748
9	1.8864	1.4697	1.1364	0.3608	0.3485	0.3374
10	1.9067	1.3768	1.1642	0.3252	0.3138	0.2979

Table – 3: Percentiles of L_1/L_0 for $\alpha = 1,\ \lambda = 3,\ \beta = 2$

n	0.99	0.975	0.95	0.05	0.025	0.01
2	1.5899	1.3377	1.1367	0.8704	0.8651	0.8531
3	1.6767	1.3865	1.2034	0.8258	0.8191	0.8063
4	1.8069	1.4294	1.2104	0.7796	0.7700	0.7599
5	1.8615	1.5064	1.2212	0.7394	0.7266	0.7173
6	1.8182	1.4643	1.2159	0.6989	0.6908	0.6737
7	1.8471	1.4986	1.1990	0.6604	0.6515	0.6419
8	1.9015	1.5261	1.2276	0.6284	0.6155	0.5977
9	1.8025	1.4491	1.2234	0.5959	0.5860	0.5716
10	1.7324	1.4192	1.2444	0.5652	0.5522	0.5378

V. Power of Likelihood Ratio Criterion

In testing of hypothesis, we know that the power of a test statistic is the complementary probability of accepting a false hypothesis at a given level of significance. Let us conventionally fix 5% level of significance. So that the percentiles given in Table 1 to 3 under the column 0.05 shall become the critical values. We generate a random sample of sizes 2(1)10 from the population P_1 namely exponential. At this sample, we find the estimates of the parameters of P_1 and P_0 using the respective probability models. Accordingly, we get the estimates of L_1, L_0 for the sample from P_1.

Over repeated simulation runs, we get the proportion of values of L_1/L_0 that fall below the respective critical values of Table 1 to 3. These proportions would give the value of β, the probability of type II error. If the test statistic has a discriminating power, β must be small so that the power l-β must be large. Various power values are given in Table-4. We see that as 'n' increases, β is decreasing and hence l-β increases. We conclude that as long as 'n' increases the power of the likelihood ratio criterion increases. We therefore conclude that exponential can be a reasonable alternative to our model in small samples.

Table – 4

Power of Likelihood Ratio criterion for α = 1						
	$\lambda = 1,\ \beta = 2$		$\lambda = 2,\ \beta = 2$		$\lambda = 3,\ \beta = 2$	
n	***0.975***	***0.950***	***0.975***	***0.950***	***0.975***	***0.950***
2	0.883	0.826	0.783	0.747	0.729	0.691
3	0.860	0.817	0.734	0.687	0.654	0.624
4	0.854	0.797	0.713	0.658	0.607	0.576
5	0.882	0.789	0.716	0.631	0.569	0.519
6	0.837	0.769	0.674	0.604	0.530	0.470
7	0.824	0.755	0.634	0.569	0.495	0.431
8	0.815	0.744	0.626	0.550	0.452	0.390
9	0.795	0.725	0.589	0.529	0.407	0.370
10	0.797	0.718	0.562	0.514	0.369	0.332

VI. Summary and Conclusions

Exponential and log-logistic failure rate models are combined for the reliability studies and is named as Exponential – log logistic additive failure rate model. The distributional properties, estimation of parameters, testing of hypothesis and the power of likelihood ratio criterion about the proposed model are discussed.

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The Quintic Trigonometric Bézier Curve with single Shape Parameter

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Abstract- In this paper, we have constructed a quintic trigonometric Bézier curve with single shape parameter. The shape of the curve can be adjusted as desired, by simply altering the value of shape parameter, without changing the control polygon. The quintic trigonometric Bézier curve can be made close to the cubic Bézier curve or closer to the given control polygon than the cubic Bézier curve. Approximation property has been discussed.

Index Terms- Trigonometric Bézier Basis Function, Trigonometric Bézier Curve, Shape Parameter, Bézier Curve, Approximation properties.

I. Introduction

The construction of curves and surfaces is a key issue in computer aided geometric design (CAGD). The CAGD method arise from the need of the efficient computer representation of practical curves and surfaces, which is very broadly used in engineering design. In CAGD, the parametric curves is the combination of basis functions and control points. The parametric representation of curves and surfaces with shape parameters have received attention in recent years. In recent years, the trigonometric with shape parameters play a very important role in CAGD in the design of curves. Many works have been done with the help of trigonometric polynomial for the representation of the curves and surfaces, see [1], [2], [6], [8], [10]. Therefore, it is clear that Bézier curves, the quadratic and cubic Bézier curves, have very wide applications. In recent years, trigonometric polynomial curves like those of Bézier type are considerably in discussion. Han [3] discussed a class of quartic trigonometric polynomial curves with a shape parameter. Han [4] presented pieceswise quadratic trigonometric polynomial curves with C^1 continuity analogous to the quadratic B-spline curves. Han [5] introduced cubic trigonometric polynomial curves with a shape parameter. The cubic trigonometric Bézier curves with two shape parameter was presented by Han et al [7]. Liu, et al [9] presented a study on class of TC- Bézier curves with shape parameters.

The paper is organized as follows. In section 2, the basis functions of the quintic trigonometric Bézier curve with single shape parameter are established and the properties of the basis function has been described. In section 3, quintic trigonometric Bézier curves and their properties are discussed. In section 4, By using shape parameter, shape control of the curves is studied and explained by using figure. In section 5, the approximability of the quintic trigonometric Bézier curves and cubic Bézier curves corresponding to their control polygon are shown.

II. Quintic Trigonometric Bézier Basis Functions

In this section, definition and some properties of quintic trigonometric Bézier basis functions are given:

Definition 2.1: For selected real values of λ, where $\lambda \in [-2, 1]$ the following four functions of t ($t \in [0, 1]$) are defined as quintic trigonometric Bézier basis functions with single shape parameter λ:

$$\begin{cases} b_0(t) = \frac{1}{4}(1-\sin\frac{\pi}{2}t)^3(1-\lambda\sin\frac{\pi}{2}t)^2 \\ b_1(t) = \frac{1}{2}\left[1-\frac{1}{2}(1-\cos\frac{\pi}{2}t)^3(1-\lambda\cos\frac{\pi}{2}t)^2\right] \\ b_2(t) = \frac{1}{2}\left[1-\frac{1}{2}(1-\sin\frac{\pi}{2}t)^3(1-\lambda\sin\frac{\pi}{2}t)^2\right] \\ b_3(t) = \frac{1}{4}(1-\cos\frac{\pi}{2}t)^3(1-\lambda\cos\frac{\pi}{2}t)^2 \end{cases} \tag{2.1}$$

Proof: (a) For $t \in [0,1]$ and $\lambda \in [-2,1]$, then

$0 \le (1-\sin\frac{\pi}{2}t)^3 \le 1,$

$0 \le (1-\cos\frac{\pi}{2}t)^3 \le 1,$

$0 \le (1-\lambda\sin\frac{\pi}{2}t)^2 \le 9,$

$0 \le (1-\lambda\cos\frac{\pi}{2}t)^2 \le 9,$

It is obvious that $b_i(t) \ge 0, i = 0,1,2,3.$

(b)

$\sum_{i=0}^{3} b_i(t) = \frac{1}{4}(1-\sin\frac{\pi}{2}t)^3(1-\lambda\sin\frac{\pi}{2}t)^2 + \frac{1}{2}\left[1-\frac{1}{2}(1-\cos\frac{\pi}{2}t)^3(1-\lambda\cos\frac{\pi}{2}t)^2\right] + \frac{1}{2}\left[1-\frac{1}{2}(1-\sin\frac{\pi}{2}t)^3(1-\lambda\sin\frac{\pi}{2}t)^2\right] + \frac{1}{4}(1-\cos\frac{\pi}{2}t)^3(1-\lambda\cos\frac{\pi}{2}t)^2 = 1.$

The remaining cases follow obviously.

Fig.1 shows the curve of the quintic trigonometric basis functions for $\lambda = -2, \lambda = -1, \lambda = 0, \lambda = 1$ are shows (a), (b), (c) and (d) respectively.

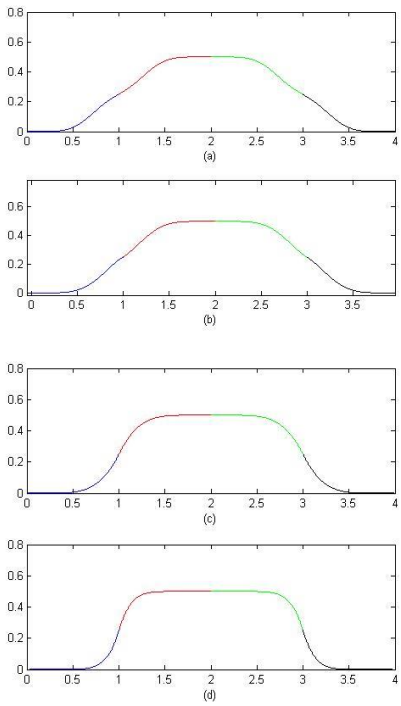

Figure 1: The quintic trigonometric basis functions for $\lambda = -2, \lambda = -1, \lambda = 0, \lambda = 1$

III. QUINTIC TRIGONOMETRIC BÉZIER CURVE

We construct the quintic trigonometric Bézier curve with shape parameter as follows:

Definition 3.1: Given the control points $P_i (i = 0,1,2,3)$ in R^2 or R^3, then

$$r(t) = \sum_{i=0}^{3} P_i\, b_i(t) \qquad (3.1)$$

$t \in [0,1]$, $\lambda \in [-2,1]$ is called a quintic trigonometric Bézier curve with shape parameter.

From the definition of the basis functions some properties of the Quintic trigonometric Bézier curve can be obtained as follows:

Theorem 3.1: The Quintic trigonometric Bézier curve (3.1) have the following properties:

(a) Terminal properties:

$$r(0) = \frac{1}{4}[P_0 + 2P_1 + P_2],$$
$$r(1) = \frac{1}{4}[P_3 + 2P_2 + P_1] \qquad (3.2)$$

$$r'(0) = \frac{\pi}{8}(3 + 2\lambda)(P_2 - P_0)$$
$$r'(1) = \frac{\pi}{8}(3 + 2\lambda)(P_3 - P_1) \qquad (3.3)$$

$$r''(0) = \frac{\pi^2}{8}(\lambda^2 + 6\lambda + 3)(P_0 - P_2)$$
$$r''(1) = \frac{\pi^2}{8}(\lambda^2 + 6\lambda + 3)(P_3 - P_1) \qquad (3.4)$$

(b) Symmetry : P_0, P_1, P_2, P_3 and P_3, P_2, P_1, P_0 defined the same curve in different parametrizations, that is

$$r(t; \lambda; P_0, P_1, P_2, P_3) = r(1 - t; \lambda; P_3, P_2, P_1, P_0) \qquad (3.5)$$

$t \in [0,1]$, $\lambda \in [-2,1]$.

(c) Geometric Invariance: The shape of the curve (3.1) is independent of the choice of coordinates, i.e., it satisfies the following two equations:

$$r(t; \lambda; P_0 + q, P_1 + q, P_2 + q, P_3 + q) = r(1 - t; \lambda; P_0, P_1, P_2, P_3) + q$$

$$r(t; \lambda; P_0 * T, P_1 * T, P_2 * T, P_3 * T) = r(1 - t; \lambda; P_0, P_1, P_2, P_3) * T \qquad (3.6)$$

where q is an arbitrary vector in R^2 or R^3 and T is an arbitrary $d \times d$ matrix, $d = 2$ or 3.

(d) Convex hull property: From the non-negativity and partition of unity of basis functions, it follows that the whole curve is located in the convex hull generated by its control points.

IV. SHAPE CONTROL OF THE QUINTIC TRIGONOMETRIC BÉZIER CURVE

For $t \in [0,1]$, we rewrite (3.1) as follows:

$$r(t) = \sum_{i=0}^{3} P_i\, C_i(t) + \frac{1}{4}\lambda^2 sin^2\frac{\pi}{2}t(1 - sin\frac{\pi}{2})^2(P_0 - P_2) + \frac{1}{4}\lambda^2 cos^2\frac{\pi}{2}t(1 - cos\frac{\pi}{2}t)^2(P_3 - P_1) + \lambda sin\frac{\pi}{2}t(1 - sin\frac{\pi}{2})^2\frac{(P_2 - P_0)}{2} + \lambda cos\frac{\pi}{2}t(1 - cos\frac{\pi}{2})^2\frac{(P_1 - P_3)}{2} \qquad (4.1)$$

where

$$C_0(t) = \frac{1}{4}(1 - sin\frac{\pi}{2}t)^3,$$
$$C_1(t) = \frac{1}{2}\left[1 - \frac{1}{2}(1 - cos\frac{\pi}{2}t)^3\right],$$
$$C_2(t) = \frac{1}{2}\left[1 - \frac{1}{2}(1 - sin\frac{\pi}{2}t)^3\right],$$
$$C_3(t) = \frac{1}{4}(1 - cos\frac{\pi}{2}t)^3.$$

Obviously, shape parameter λ affect curves on the control edge $P_0 - P_2, P_3 - P_1, \frac{P_2 - P_0}{2}, \frac{P_1 - P_3}{2}$. Therefore as the shape parameter λ increases, the quintic trigonometric Bézier curve approximates the control polygon. The parameter λ controls the shape of the curve (4.1). In figure 2, The quintic trigonometric Bézier curve $r(t)$ gets closer to the control polygon as the value of the parameter λ increases. In figure 2, the curves are generated by setting the values of λ as $\lambda = -2$ (blue solid), $\lambda = -1$ (black dotted), $\lambda = 0$ (green solid), $\lambda = 1$ (red solid).

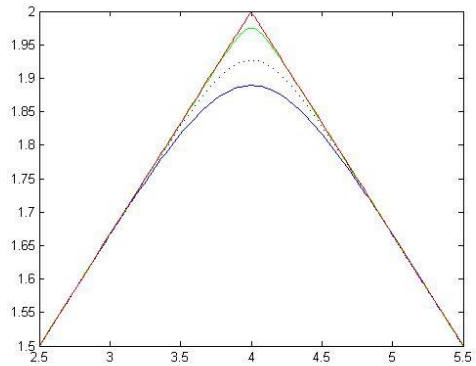

Figure 2: The effect on the shape of quintic trigonometric Bézier curve of altering the value of λ.

V. APPROXIMABILITY

Control polygons play an important role in geometric modeling. It is an advantage if the curve being modeled tends to preserve the shape of its control polygon. Now we show the relation of the quintic trigonometric Bézier curves and cubic Bézier curves with same control points.

Theorem 5.1: Suppose $P_0, P_1, P_2,$ and P_3 are not collinear; the relationship between quintic trigonometric Bézier curves $r(t)$ (3.1) and cubic Bézier curves $B(t) = \sum_{i=0}^{3} P_i \binom{3}{i} (1-t)^{3-i} t^i$ with the same control points $P_i (i = 0,1,2,3)$ are as follows:

$$r(0) = \frac{1}{4}[P_0 + 2P_1 + P_2], B(0) = P_0$$

$$r(1) = \frac{1}{4}[P_3 + 2P_2 + P_1], B(1) = P_3$$

$$r\left(\frac{1}{2}\right) - P^* = \frac{1}{2\sqrt{2}}\left(\sqrt{2}-1\right)^3\left(\sqrt{2}-\lambda\right)^2\left(B\left(\frac{1}{2}\right) - P^*\right) \quad (5.1)$$

where $P^* = \frac{1}{2}(P_1 + P_2)$

Proof: According to (3.2), we have

$$r(0) = \frac{1}{4}[P_0 + 2P_1 + P_2],$$

and

$$r(1) = \frac{1}{4}[P_3 + 2P_2 + P_1]$$

By simple computations,

$B(0) = P_0$ and $B(1) = P_3$

since

$$B(t) = (1-t)^3 P_0 + 3(1-t)^2 t P_1 + 3(1-t)t^2 P_2 + t^3 P_3$$

$$B\left(\frac{1}{2}\right) - P^* = \frac{1}{8}(P_0 - P_1 - P_2 + P_3) \quad (5.2)$$

and according to (5.2), we have

$$r\left(\frac{1}{2}\right) - P^* = \frac{1}{16\sqrt{2}}\left(\sqrt{2}-1\right)^3\left(\sqrt{2}-\lambda\right)^2(P_0 - P_1 - P_2 + P_3)$$

$$r\left(\frac{1}{2}\right) - P^* = \frac{1}{16\sqrt{2}}\left(\sqrt{2}-1\right)^3\left(\sqrt{2}-\lambda\right)^2\left(B\left(\frac{1}{2}\right) - P^*\right)$$

Then (5.1) holds.

Fig.3 shows the relationship between the quintic trigonometric Bézier curves curve and cubic Bézier curves. The quintic trigonometric Bézier curves is closer to cubic Bézier curve. The quintic trigonometric Bézier curve (blue solid) is closer to control polygon than the cubic Bézier curve (red solid) for all values of $\lambda \in [-2,1]$

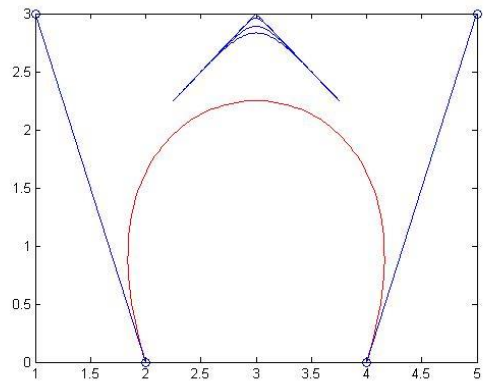

Figure 3: The relationship between the quintic trigonometric Bézier curve and cubic Bézier curve.

VI. CONCLUSION

In this paper, we have presented the quintic trigonometric Bézier curve with single shape parameter and analysis of quintic trigonometric Bézier curve are similar to the ordinary cubic Bézier curve. Each section of the curve only refers to the four control points and quintic trigonometric Bézier curve is closer to the cubic Bézier curve.

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Chanting: A Therapeutic Treatment for Sports Competitive Anxiety

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Abstract- Researches have shown that the sound generated through chanting has enormous positive effects on the human cognitive abilities. Therefore this study was taken to understand whether chanting (with/ without music) has any therapeutic effect on sports competitive anxiety (SCA). 84 NSO students of Kamala Nehru College (DU) were selected on the basis of homogeneity on Sports Competitive Anxiety Test (SCAT) developed by Martens et al 1990. The selected subjects were then divided into 3 groups namely Group-A (N= 32), Group-B (N=32) and Group-C (N= 20). All the 3 groups did 40 minutes of NSO activity, twice a week, for 8 weeks. While group-A did an extra session of chanting with light music for 20 minutes; group-B did an extra session of chanting with no music for 20 minutes and group-C did not perform any chanting activity over that period. The result of the study showed that all the three groups had significantly reduced their SCA after doing the chanting practices/ NSO activity. But when Scheffe Post Hoc multiple comparisons were done it was found that SCA of Group-C was significantly higher than the group-A and group-B, while there was no significant difference found between group-A and group-B. Therefore it was concluded that chanting significantly reduces the sports competitive anxiety and hence can be used as a therapeutic treatment to control it but which way of chanting is more beneficial, is still not clear. Hence this indicates a further need for research to know the most effective way of chanting practice to reduce the sports competitive anxiety.

Index Terms- Sports Competition Anxiety (SCA), Chanting, National Sports Organization (NSO)

I. Introduction

Sports and performance anxiety often go hand-in-hand. When a competitor 'freezes' in the big moment or commits an inexplicable error, anxiety, in one of its many guises, is very often the root cause. Anxiety is a natural reaction to threats in the environment and part of the preparation for the 'fight or flight' response. This is our body's primitive and automatic response that prepares it to 'fight' or 'flee' from perceived harm or attack. It is a 'hardwired' response that ensures survival of the human species. Sporting competition promotes similar psychological and bodily responses because there is often a threat posed towards the ego; your sense of self-esteem. Essentially, when the demands of training or competition exceed one's perceived ability, anxiety is the inevitable outcome.

Sport places a wide variety of stressors upon participants; it can be physically exhausting, it pitches you against superior opponents, hostile fans might verbally abuse you, the elements may need to be overcome and your emotional frailties are constantly laid bare for all to see. Many athletes become "pumped up" during competition, when the rush of adrenaline is interpreted as anxiety, and negative thoughts begin to swirl, it can have devastating effects on your ability to perform. Despite this, sport offers participants an opportunity for growth, a chance to push back personal boundaries, and a means by which to liberate the body and the mind.

Ostensibly, there is nothing damaging about the stress associated with a sporting contest, and in fact stress can be a very positive influence that leads us to tackle the challenges that make life far more rewarding. However, when we perceive stress to be negative, it causes anxiety and therefore, much depends upon how we view the demands placed upon us.

In this era of anxiety and materialism that there is intensive competition for achieving materialistic goals, there is more need for moral supplements. Chanting is the need of the hour especially during these modern times of stressful lifestyles. Chanting simply means singing (rhythmic speaking) certain sounds or words. Chanting calms our emotions and helps meditate better. Chanting has enormous positive effects on our body and mind. Chanting practices helps in tolerating hardships and removes many of agitation and anxiety that many people are affected by.

A research done by Alfred Tomatis of the French Academy of Science and Medicine found that chanting sounds have a therapeutic effect on the body. It soothes all our bodily systems and activates the body's natural healing process. It also plays a part in reversing heart disease.

According to a research done at the Cleveland University, USA, the rhythmic tones involved in chanting create a melodious effect in the body called the Neuro-linguistic effect [NLE]. When we know the meaning of the mantra we are reciting, it creates a Psycholinguistic effect [PLE] on the body. The NLE and the PLE effects are by-products of the production and spreading of curative chemicals in the brain. The research concludes that this is the real reason why chanting provokes curative effects in us. A study by Dr Alan Watkins revealed that while chanting, our heart rate and blood pressure dip to its lowest in the day. Doctors say that even listening to chants normalizes adrenalin levels, brain wave pattern and lowers cholesterol levels. Using chants as part of our exercise regimen, helps facilitate movement and flow of the body during exercise. Studies prove that making chants a part of our daily yoga can help achieve greater weight loss in a shorter span of time. Neuroscientist Marian Diamond from the University of California found that chanting helps block the release of stress hormones and increases immune function. It also

keeps our muscles and joints flexible for a long time. The body's energy and vitality are augmented by regular chanting. Dr Alan Watkins says when we chant, the vibration of the sound calms the nervous system and a profound sense of peace is obtained. It also de-stresses and facilitates better concentration and memory power. According to Dr Watkins, chanting promotes a sense of well-being and helps us bond better with people around us, especially when practiced in a group. It enhances our good virtues, by eliminating negative thoughts. We can thus enjoy whatever we do and achieve success easily. It helps control our mind and emotions.

As the previous researches have revealed that chanting therapies have physical, physiological and mental benefits but in regards to sports competitive anxiety, hardly any studies had been conducted. Therefore this study was taken to understand the therapeutic effects of chanting therapy on the sports competitive anxiety and also to study which way of chanting therapy i.e. with music or without music is more beneficial in regards to reduction of sports competitive anxiety.

II. Objectives and Hypothesis

The objectives of the study were to determine the therapeutic effect of chanting therapy on sports competitive anxiety of NSO students, Kamala Nehru College, University of Delhi and to understand which way of chanting therapy i.e. with music or without music is better to reduce the sports competitive anxiety of NSO students. Based on the literature reviewed, it was hypothesized that chanting therapy would have a significant effect on the reduction of sports competitive anxiety while there would be no significant difference in sports competitive anxiety between chanting therapy with music group and without music group.

III. Procedure and Methodology

For the purpose of the study 84 NSO students of Kamala Nehru College, University of Delhi, were selected on the basis of homogeneity on Sports Competitive Anxiety Test (SCAT) developed by Martens et al 1990. The selected subjects were then randomly divided into 3 groups namely Group-A (Chanting with Music Group, N= 32), Group-B (Chanting without Music Group, N=32) and Group-C (Control Group, N= 20). All the 3 groups did 40 minutes of NSO activity (Aerobics, Yoga or Kick Boxing), twice a week, for 8 weeks. While group-A did an extra session of 'OM' chanting with light music for 20 minutes; group-B did an extra session of 'OM' chanting with no music for 20 minutes and group-C did not perform any chanting activity over that period. After 8 weeks the Sports Competitive Anxiety Test (SCAT) was again administered to determine the therapeutic effect of chanting therapy. The administered questionnaire was quantified for obtaining the score of sports competition anxiety.

IV. Statistical Analysis

To determine the therapeutic effect of chanting therapy on sports competitive anxiety paired sample't' test was employed. While analysis of variance (ANOVA) and Scheffe post hoc tests were employed to compare the different ways of chanting therapies i.e. with music and without music. The hypothesis was tested at 0.05 level of significance.

V. Analysis of Data and Findings of the Study

Table- 1: Therapeutic Effect of Chanting Therapy on Sports Competitive Anxiety

GROUP		N	Mean± Std. Deviation	Percentage Reduction in SCA	Paired Differences		
					t	df	Sig. (2-tailed)
Group- A (Chanting with Music Group)	**Pre- SCA**	32	21.91± 2.68	**12.87%**	**13.855***	**31**	**0.001**
	Post- SCA	32	19.09± 2.02				
Group- B (Chanting without Music Group)	**Pre- SCA**	32	21.88± 1.95	**11.74%**	**13.475***	**31**	**0.001**
	Post- SCA	32	19.31± 1.80				
Group- C (Control Group)	**Pre- SCA**	20	21.90± 1.80	**3.20%**	**2.268***	**19**	**0.035**
	Post- SCA	20	21.20± 1.06				

* Significant at 0.05 level. SCA: Sports Competitive Anxiety, N: Sample Size

As indicated in table-1, all the three groups i.e. Chanting with Music Group, Chanting without Music Group and Control Group had reduced their sports competitive anxiety from the pre-test mean scores of 21.91± 2.68, 21.88± 1.95 and 21.90± 1.80 to the post-test mean scores to 19.09± 2.02, 19.31± 1.80 and 21.20± 1.06 respectively. These reduction were found to be significant as the paired sample't' values obtained were 13.855, 13.475 and 2.268 significant at 0.001, 0.001 and 0.035 level of significance. The above table clearly shows that all the three groups had significantly reduced their sports competitive anxiety but the

highest reduction was found in Chanting with Music Group as they had reduced their sports competitive anxiety by 12.87%, followed by Chanting without Music Group with reduction of 11.74% and the minimal reduction was found in the Control Group with 3.20%.

Fig- 1: Therapeutic Effect of Chanting Therapy on Sports Competitive Anxiety

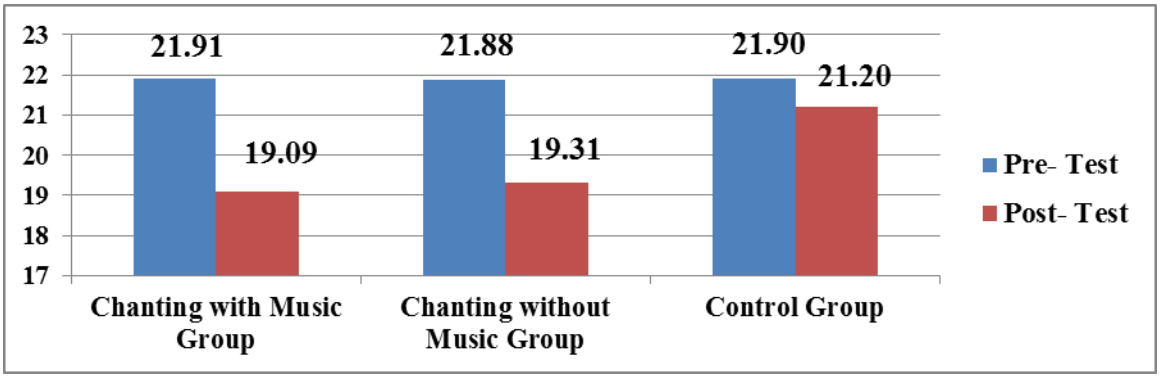

Table -2: Analysis of Variance for Pre and Post- Sports Competitive Anxiety between Chanting with Music Group, Chanting without Music Group and Control Group

		Sum of Squares	df	Mean Square	F	Sig.
Pre- Sports Competitive Anxiety	**Between Groups**	0.017	2	0.008	**0.002**	**0.998**
	Within Groups	402.019	81	4.963		
	Total	402.036	83			
Post- Sports Competitive Anxiety	**Between Groups**	61.528	2	30.764	**10.016***	**0.001**
	Within Groups	248.794	81	3.072		
	Total	310.321	83			

* Significant at 0.05 level.

Table-2 clearly reveals that there was no significant difference between Chanting with Music Group, Chanting without Music Group and Control Group at pre-test sports competitive anxiety score as the 'F' value obtained was 0.002 at $p>0.05$. But a significant difference was found between the groups at the post-test sports competitive anxiety score as the 'F' value obtained was 10.016 at $p<0.05$. Hence it indicates that the chanting therapy had significantly reduced the sports competitive anxiety of the NSO students. But which way of chanting is a better way to reduce sports competitive anxiety is discussed in table- 3.

Fig- 2: Analysis of Variance for Pre and Post- Sports Competitive Anxiety between Chanting with Music Group, Chanting without Music Group and Control Group

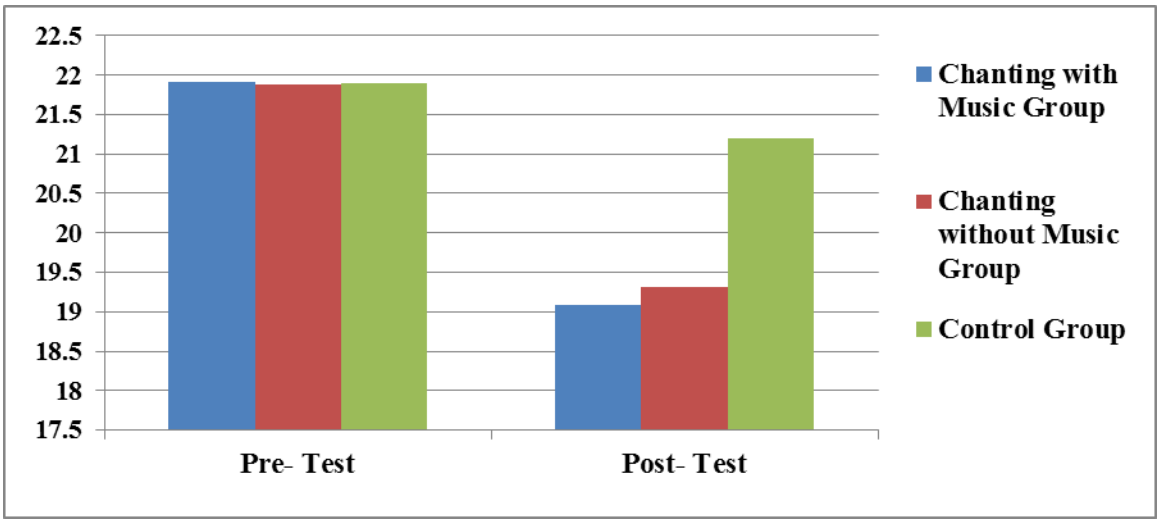

Table- 3: Scheffe Post Hoc Test of Sports Competitive Anxiety for Chanting with Music Group, Chanting without Music Group and Control Group

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Post- SCA	Chanting with Music Group	Chanting without Music Group	-0.219	0.438	0.883
		Control Group	-2.106*	0.500	0.001
	Chanting without Music Group	Control Group	-1.887*	0.500	0.001

* The mean difference is significant at the 0.05 level

The Scheffe Post-hoc analysis in table-3 indicates that Post-test sports competitive anxiety scores of Chanting with Music Group as well as Chanting without Music Group significantly differs with the Control Group as the mean difference obtained were 2.106 and 1.887 at $p<0.001$ respectively, while there was no significant difference obtained in the Post- test sports competitive anxiety scores of Chanting with Music Group and Chanting without Music Group as the mean difference obtained was 0.219 at $p>0.05$. Hence this table clearly indicates that statistically it is hard to tell that Chanting with Music is a better therapy than Chanting without Music, for the reduction of sports competitive anxiety though the sports competitive anxiety was found to be reduced a little higher in Chanting with Music Group when compared to Chanting without Music Group and Control Group.

VI. Discussion

The findings of the present study indicates that the sports competitive anxiety had been reduced by both the groups i.e. chanting with Music Group and Chanting without Music Group and hence the hypothesis stated that chanting therapy would have a significant therapeutic effect on the reduction of sports competitive anxiety was accepted. But as there was no statistical significant difference was found between chanting with Music Group and Chanting without Music Group the other hypothesis stated as there would be no significant difference in sports competitive anxiety between chanting therapies with music group and without music group was also being accepted. The study also revealed that the sports competitive anxiety of the control group was also got reduced it may be due to the physical exercise the group had done during their NSO activity (Aerobics, Yoga or Kick Boxing). The result of the study supports previous researches that chanting therapy has enormous positive effects on the human cognitive abilities and hence it helps in the reduction of stress, anxiety, depression and improves the self-confidence, self esteem etc. Hence further it is recommended that sports psychologists, counsellors, and coaches use the findings of the present study to design appropriate training programmes to help athletes acquire suitable chanting therapies/ coping strategies, to reduce the anxiety level of their students and athletes so as to enhance their academic performance as well as the performance on the field.

VII. Conclusion

Based on the findings of the present study it is concluded that both ways of chanting therapies i.e. with music and without music have significant therapeutic effect on the reduction of sports competitive anxiety. Though statistically both ways of chanting therapies did not significantly differs but based on the higher percentage reduction of sports competitive anxiety through chanting with music therapy it can be said that chanting with music has better therapeutic effect on sports competitive anxiety.

This study supports the therapeutic effect of chanting on the reduction of sports competitive anxiety and thus, such therapy may be recommended to reduce the anxiety of athletes in order to improve their competition performance.

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Environmental Sustainability through Green Supply chain management practices among Indian Manufacturing Firms with special reference to Tamilnadu

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Abstract- The escalating deterioration of the environment is a major concern for business organisations today. Green is a strategy implemented to improve the environmental sustainability and with supply chains evolving dynamically towards competitive advantage, Green Supply chain management practices has gained importance in business research. Though sustainability is the major concern in today's organisations, very little research has been done to investigate the GSCM practices in Indian Industries and their Environmental Performance.

An empirical study was conducted through survey method in 155 manufacturing Industries in Tamilnadu, India. The study investigates the pressures for implementing GSCM practices and the relationship between GSCM practices and Environmental Performance. With extensive review of literature, the research proposes a model that demonstrates the relationship between Green SCM pressures, Green SCM practices and Environmental Performance in manufacturing companies. Six external pressures on today's business organization relevant to India were considered for the study. GSCM practices include the Inbound/procurement practices, Design and production practices, Outbound practices and the Reverse logistics of the company was studied using a five point Likert scale. Rigorous statistical methods were used to validate and access the constructs. The method used was Path analysis using Smart PLS software. The results showed a significant positive relationship between the constructs. It implies that the Green SCM pressures that influence Green supply chain practices can improve environmental performance and hence enable organisations to be responsible citizens. The research empirically attempts to bring out the need for Green practices and environmental sustainability of organisations.

Index Terms- Environmental Sustainability, Green supply chain management, Green Pressures, Environmental Performance, GSCM Practices

I. Introduction

Changing environment and the deterioration of the natural resources has triggered organizations to identify, understand and manage the issues of environmental sustainability. This has led to new paradigms in supply chain management strategies, and this has shifted the attention towards the impact to the natural environment and the environmental performance of organizations. This shift in the supply chain management has evoked due to the growing social, political and legislative pressures. According to Ford Chairman, William Clay Ford Jr., "Sustainability is not a soft issue, or a passing fad. When people are empowered with knowledge and choices, they will do what's best for themselves, their families, and their communities. And in fiercely competitive global market where information is shared instantly, consumers will virtually have all the knowledge and choices in the world. Companies that don't do the right thing will find that they are not sustainable."

With growing environmental hazards this paper focuses mainly on the environmental sustainability of organizations. Worldwide industrialization has led to the destruction of the environment, industrial wastes severely damage and pollute the environment and cause ozone depletion, greenhouse effect and Antarctic icebergs melt. These issues have triggered the manufacturers on their substantial developments and production responsibilities towards a sustainable environment for all. Since corporations are vital organs of society, corporate interests pose serve societal concerns. Consumers are becoming more attuned to and involved in the growing green interests. With customer loyalty shifting towards environmentally friendly products, businesses are increasingly trying to make their supply chains greener by introducing sustainability strategies throughout their organizations and supplier networks.

Environmental issues under legislations and directives from customers have become an important concern for manufacturers in India. To combat these pressures and that from the society, customers and the stake holders and manufacturers have started to adopt a more systematic and integrated strategy of Environmental management in supply chain system. This is termed as Green Supply Chain Management (GSCM). GSCM is a management activity that crosses organizational boundaries and requires active integration and involvement from the supply chain partners.

II. Literature Review

Green Supply Chain Management:

Green Supply Chain Management (GSCM) can be defined as the management of the raw materials, parts /components and processes from suppliers to manufacturer to customers and

product take back with improvement to environmental impacts through life cycle stages. (Hu & Hsu(2010)). Sarkis et al.,(2005) also defines GSCM by adding the green component to supply chain management and hence it involves addressing the influence and relationships of supply chain management to the natural environment. It considers the environmental effects of all processes of supply chain from the extraction of raw materials to the final disposal of goods. With this integration, the GSCM practices strive to achieve what any individual organization on its own could not possibly achieve: minimized waste, minimized environmental impact while assuring maximized consumer satisfaction, and healthy profits.

The key practices worth noting from the previous research work are the concepts of green design, green operations, reverse logistics, waste management and green manufacturing (Guide & Srivastava(1998), Srivastava(2007)). The environmental laws and CSR practices and ISO 14000 certifications have improved the environmental practices in many Indian companies. But the question lies if the same has been extended to the supply chain .It is important to integrate the organizational environmental management practices into the entire supply chain to achieve a sustainable supply chain and maintain competitive advantage (Zhu et al., (2008), Linton et al., (2007)). Most of the research works on GSCM practices are fragments of a part of the Porter's value chain model. Emmet and Sood(2010) have classified GSCM practices as Green procurement and supply, Green production, Green packaging, Green marketing, Green Logistics and Supply loop. In this descriptive work a framework of the GSCM practices across five major functions-1)In-boundlogistics(Manish(2011), (Ninlawan et al.,(2010),Sanjeevkumar(2012), 2) Design and Production(Ninlaw(2010),Toke(2010),Sanjeevkumar(2012),Sarbjit Singh(2010),Halme et al(2002), 3) Out-bound logistics(Toke(2010)) ,4) Reverse logistics(Toke (2010),Sreevatsa(2007),Tonanont(2008)) and 5) Management support practices(Ninlawan et al.,(2010),Hu & Hsu(2010)) is conceptualized and studied.

GSCM Drivers:

Various research in the area of GSCM show that there are numerous drivers that influence the implementation of GSCM practices. Increasing scarcity of resources, building awareness among consumers, stringent laws that are more environment conscious and the demand from the export markets are posing real challenge to Indian companies today.(Vachon and Klassen, (2006); Srivastava, (2007)). Globalization has made is even more significant to the Indian industries as the majority of the world's manufacturing will be carried out in Asia, making India an integrated part of the Global supply chain. (US-AEP (1999)). But this tremendous growth opportunity to the country also brings equal environmental challenges (Rao, (2002)).Previous studies identified numerous drivers that have a potential to motivate organizations to adopt environmental practices. These drivers generally emanate from pressures of external and internal stakeholders such as government, investors, customers, suppliers, community groups and competitors (Donaldson & Preston, (1995), Cetinkaya et al., (2011), Cervera and Flores(2012),Carter & Jennings (2002)).

Increasing pressures from a variety of directions have caused the Indian supply chain managers to consider and initiate implementation of green supply chain management (GSCM) practices to improve both their economic and environmental performance. Some of earlier works investigating the GSCM pressures/drivers are an empirical analysis of 89 automotive enterprises within China show that the Chinese automobile supply chain enterprises have experienced high and increasing regulatory, market pressure, ecological pressures from governmental and competitive sources.(Zhu & Sarkis(2004)). Another research work conducted a moderated hierarchical regression analysis of data provided by 341 Chinese manufacturers and examined the relationships between GSCM practice, environmental and economic performance, incorporating three moderating factors market, regulatory, and competitive institutional pressures.(Zhu & Sarkis(2007)).

New government policies have prohibited products made from environmentally destructive materials and polluting processes. Companies that utilize environmentally destructive and/or polluting processes are not allowed to sell their goods and may be subject to financial penalties and criminal prosecution. Manufacturers have realized the importance of GSCM practices due to this regulatory pressure. Baird and Rowen (2010) and Zhu et al., (2008) have argued in their research work that changes in government policies have made the industry responsible for post disposal of products too, forcing the implementation of sustainable operations across the supply chain.

A global survey conducted by Boston Consulting Group in 2009 of more than 9,000 consumers, have inferred that 73 percent of consumers consider it important that companies have good environmental records and that a majority of those respondents are willing to pay a premium of 5 percent or more for green products. Consumer demand for environmentally friendly products has changed the attitude of the market. Companies are seeking to capture this market opportunity by minimizing their environmental impacts and/or selling environmentally friendly products. Christmann and Taylor (2001), Baird and Rowen(2010), Zhu et al., (2008) research has also shown that customer pressure is a primary driver for enterprises to improve their environmental image and practices. The practices of green purchasing and customer cooperation have developed the market for product take-back and product reintroduction (Van Hoek(1999)).

The literature indicates that there are nine basic drivers for green supply chain initiatives; regulations, customer pressures, expected business benefits, social responsibility, supplier pressures, competition, market demand, community pressures, and employee pressures. most of the available studies, on drivers for green supply chain initiatives, support the significant effect of the top four drivers as potential key drivers to green supply chain initiatives(Ninlawan et al(2010), Gyaneshwar(2010),Zhu & sarkis(2004),Ma jun(2010), some other studies found no significant effect of these drivers on green supply chain initiatives. Bowen et al. (2001),Zhu, Sarkis and Lai (2007). This study has considered the customer, export market, regulation and government policies, industrial group activities, competitors and stakeholders as the relevant drivers in Indian context and has investigated the impact on green supply chain initiatives.

III. Environmental Performance

Environmental performance is defined as the measure of reduction of substances and emissions that reduces environmental impacts caused by business organizations. Zhu et al(2004), Wu et al.,(2010), Ninlawan et al.,(2010), Sanjeev kumar et al.,(2012), Bhateja et al.,(2011),Sarkis(2003),Chein and Shih(2007).It also helps to improve efficiency and synergy among business partners and helps to enhance environmental presence, minimize waste and achieve cost saving (Rao and Holt, 2005) and good will.(Cervera and Flores(2012)). Environmental performance is measured in many research works. Researchers have proved that GSCM practices enhance environmental performance in organisations. (Chan et al., cited en Lou, 2011; Hu and Hsu, 2010; Efron, 2009). Cervera and Flores(2012), Ninlawan et al(2009), Zhu et al.,(2007).

VarioCorderio and Sarkis(1997), Walley and Whitehead (1994),Zhu et al., (2007),Zhu et al.,(2010), Montabon et al. (2007), Wagner et al., (2001) and Zhu et al., (2008) have found significant and positive relationships between GSCM practices and environmental performance.

IV. The Research Model

The conceptual framework from the extensive literature review is shown in Figure 1. The causal relationship between GSCM drivers, Green SCM practices and Environmental performance has been found in literature and is proposed to be tested empirically.

Figure 1: Proposed Model

Customer
Government regulations
Stakeholders
Competitors
Industry Groups
Export Market

Management Support
Inbound practices
Outbound practices
Design and Production
Reverse Logistics

Practices adopted by organisations across the supply chain from green inbound, green operational, green outbound and reverse logistics to work with suppliers to improve products or processes and increase the environmental performance of the supply chain is termed as the Green supply chain management practices. (Srivastava(2007),Svensson(2007), Zhu et al.,(2007),Ninlawan et al.,(2010),Sanjeev kumar et al.,(2012), Shang et al(2010),Zhu et al.,(2008), Toke et al(2010),Chung Hsiao(2008),Florida et al(2001),Bhateja et al(2011), Chein & Shih(2007)).

Since many manufacturers are implementing Green practices beyond their shop floor to meet green commitments it becomes imperative to check the influence of the GSCM drivers on Green SCM practices and their causal effect on the Environmental performance. Thus the following hypothesis is framed to test the relationship of GSCM drivers, GSCM practices and environmental performance in manufacturing industries.

H1: The link between GSCM drivers and Green SCM practices is positively associated.

H2: The link between Green SCM practices and environmental performance is positively associated.

V. Methodology

The study focused on the Green SCM drivers, GSCM practices and their impact on Environmental performance in Indian manufacturing industries. Based on the literature review the instrument was developed to measure GSCM drivers, Green SCM practices and Environmental performance with some alteration with expert consultations. The instrument was tested for reliability and validity. Five sub constructs as shown in Fig.1 where identified to define Green SCM practices ((Zhu et al., (2007),Ninlawan et al., (2010),Sanjeev kumar et al.,(2012)) and six variables for GSCM drivers were identified. Environmental performance was ascertained using six variables with expert intervention. (Zhu et al., (2007), Ninlawan et al., (2010))

The instrument used for the study consists of three parts, Part 1: The company profile that documented the demographics of the industry type, organization size, turnover, products manufactured. Part 2: The Green profile that analysed the critical practices in GSCM implemented in the organization on a five point scale to indicate the extent in which each item was practiced in the organization. Part 3: The Green SCM drivers and the environmental performance were captured on a five point scale. The Reliability is tested by the Cronbach alpha and the Convergent validity of each construct is examined by the AVE value. Constructs with an alpha score greater than 0.7 are accepted for accuracy (Nunnally,(1978)) and constructs with AVE value greater than 0.5 are said to have convergent validity and unidimentionality. (Chin (1995), Barclay et al., (1995), Chin et al., (2003)).

The list of member companies from CII (Confederations of Indian Industries), Tamilnadu chapter which comprised a list of

1182 companies was filtered to remove organisations having <100 employees, educational institutes, service companies and individuals. The data collected was administered with Senior / Top management executives over a period of 9 months in the state of Tamil Nadu, India. The respondents of the survey are key informants who are knowledgable in the field of Green and Lean practices in each firm.

Using G-power a sample with alpha of 5%, beta of 20% and the no. of largest predictors of 32 with a large effect sixe (f^2 = 0.35) measured to 111 samples. The study was conducted for a total number of 155 firms with an effective sample size of 9.7%).

Path modeling using Smart PLS 2.0 (beta) is used to test the path. The analysis of interdependent variables is done together. For e.g. consider the dependencies X--->Y--->Z. This solved together gives the solution different than when analysed as X-->Y and Y-->Z. This combined analysis is done using path analysis. This technique for path analysis doesn't make any assumptions about the distribution of the data and is non-parametric. (Wold(1989), Fornell (1982)). The main purpose of the theory is to examine the interrelationships between the constructs. Each relationship is a hypothesis to be tested. As a non-parametric method, the hypothesis cannot be directly tested. Testing is done by means of resampling method of bootstrap. The accepted value for t-coefficients depends on the assumed significance level. A commonly assumed significance level of two tailed 5% significance level has a t-value =1.96. If the computed value of t-statistic happens to be higher than the this it implies that the path being considered is significant.

VI. Discussions

The sample obtained belonged to the cross section of 8 sectors namely Automobile and Auto components (63), Textiles and Garments (56), Engineering and Electronics (36). Reliability and validity of the constructs are depicted in Table 1 which shows that Cronbach's alpha and the AVE value are higher than the required standards defined.

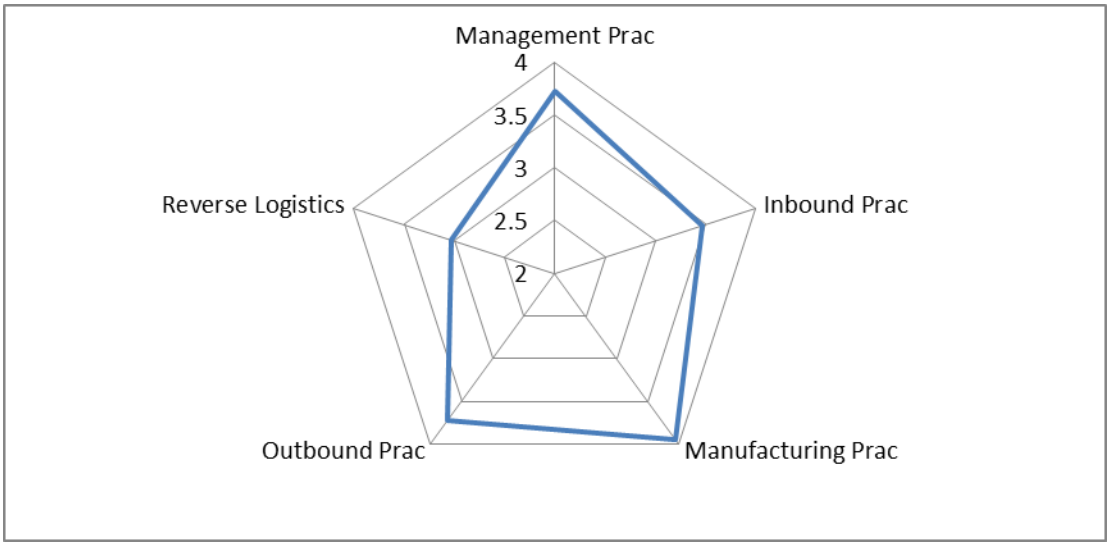
Table 1: Reliability & Validity

	AVE	Composite Reliability	Cronbachs Alpha	Communality	Redundancy
Gscm drivers	0.56	0.88	0.84	0.56	
Environemtal performance	0.74	0.95	0.94	0.74	0.31
Gscm practices	0.59	0.87	0.81	0.59	0.18

The Cronbach's alpha and AVE value for the three constructs Environmental performance, Green SCM practices and Gscm Drivers are above the defined standards and hence the constructs used in the study have proved to have Construct Reliability and Convergent Validity or Unidimentionality.

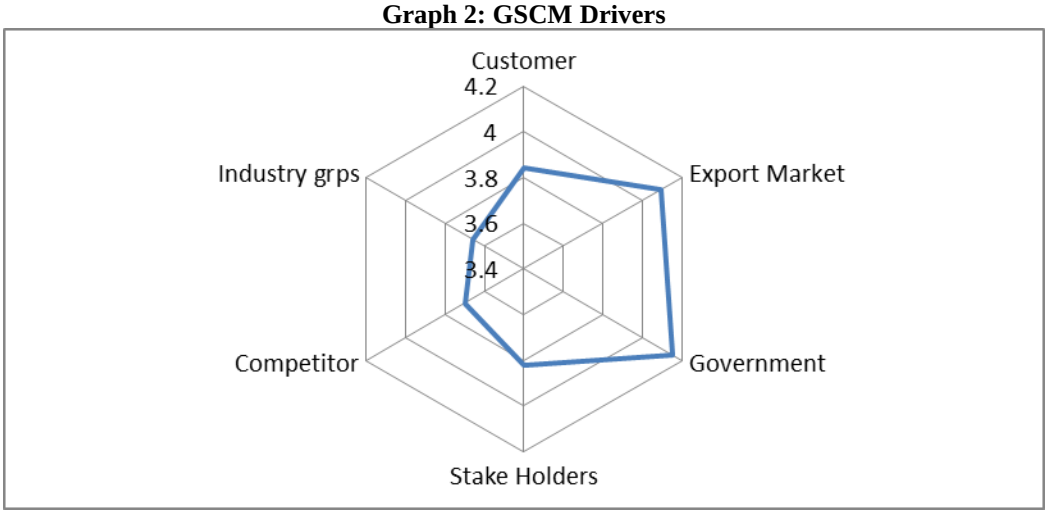
The mean score value of the constructs are studied to understand the extent of influence of the GSCM drivers and the level of implementation of GSCM practices in Indian Manufacturing companies. Graph 1 depicts the level of Implementation of GSCM practices and Graph 2 depicts the various drivers that influence the implementation of Green practices in the industries,

Graph 1: GSCM Practices



As seen in the Graph 1, the GSCM practices are adopted across the supply chain. Especially Manufacturing practices and Management support practices are relatively high which clearly depicts the notion that Environmental management systems are widely implemented in Indian manufacturing organization but mostly restricted within the company and are yet to be established strongly across the supply chain. Ninlawan et al.,(2010) in their study on Thai enterprises have also reported similar results. But Sanjeevkumar et al.,(2012) has studied various GSCM practices in Indian industries and have reported that the level of implementation of almost all the practices negatively. This may be due to the fact the study was conducted pertaining only to electronics industry in India. Bhateja et al., (2012), Hu and Hsu (2010), Ferguson (2000) also clearly supports a significant implementation of GSCM practices in manufacturing firms.

Graph 2: GSCM Drivers



The above graph clearly depicts the drivers for GSCM implementation in Indian Manufacturing companies. Government regulations and Export market requirements are the two major drivers. Many studies on GSCM drivers show similar results.(Seuring(2004),Chien & Shih(2009)). Ninlawan et al.,(2010).

A bivariate correlation was done to check the preliminary association between variable and the significance of the association using SPSS 16. The table below demonstrates the correlation between variables tested in the hypothesis.

Table 2: Correlation Coefficient

Variable	Correlation coefficient
GSCM drivers- GSCM Practice	0.622*
GSCM Practice – Environmental Performance	0.679*

*p<0.01

The above table shows that the correlation between variables is significant but the path has to be verified when the variables are put together in the model. Smart PLS was used and the bootstrap was conducted for 155 samples across 500 cases and the results are depicted in Table 3.

Table 3: Bootstrap Overview

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	Standard Error (STERR)	T Statistics (|O/STERR|)	Result
GSCM drivers- GSCM Practice	0.55	0.56	0.063	0.063	8.75	Significant
GSCM Practice – Environmental Performance	0.65	0.65	0.061	0.061	10.66	Significant

H1: The link between Green SCM drivers and Green SCM practices would be positively associated.

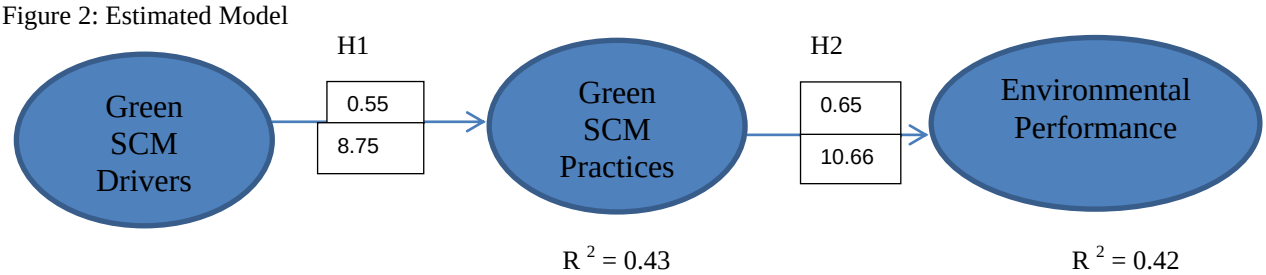
The relation was found to be significant (beta=0.55, t=8.75). The R^2 value is also 0.43 which shows a positive relationship. This reinforces the theory that an organization that adopt Green supply chain practices are influenced by the green SCM drivers of the company.

H2: The link between Green SCM practices and environmental performance would be positively associated.

The relation Green SCM practices and Environmental performance was found to be significant (beta=0.65, t=10.66). The R Square value is also 0.43 which shows a positive relationship.

Hence the research hypothesis was generally proven and the results show significance and the estimated model is depicted in Figure 2.

Figure 2: Estimated Model



Various researchers have also shown significant relationship among Green SCM drivers, Green SCM practices and Environmental Performance. (Zhang et al., (1997), Zhu and Sarkis (2004), Zhu et al., (2005), Zhu et al., (2010)).

The main purpose of the paper was to ascertain the extent of GSCM practices implementation, the influence of GSCM drivers on GSCM practices and their impact on environmental performance. Although the strength of the relationship is not very strong it still implies that there exists a positive relationship between GSCM drivers and practices and the causal effect on the environmental performance. These practices have contributed to the environmental performance of the organization making them environmentally sustainable. It is an emerging field in India its progress can be ascertained by in-depth research. Though logically there is great relationship between the constructs the weakness shown is due to the change in the level of implementation across the supply chain. Many industries have their environmental management active within the organization

and have improved their environmental performance. Practices like inbound, outbound and reverse logistics have scored relatively low which indicates that the level of implementation across the supply chain is low. Coordination with their partner companies with regard to environmental objectives is hence weak. This is of serious concern as the major participants of the survey are the large and medium sized companies and their non-involvement with their partners for environmental objective will only cause a bull whip effect of negative impacts. This clearly indicates the need for future research to develop an environmental performance assessment for companies incorporating the performance of their partners in the supply chain.

VII. Conclusion

The concern for environment and organizational sustainability are increasing but there are not much empirical analysis on the strategies and practices. This study mainly projects the relationship between Green supply chain management practices and Environmental performance of manufacturing industries. A model that explains the causal effect relationships through the primary data collected by the survey conducted in manufacturing industries in Tamilnadu, India. As stated by Hook (2000) GSCM is an important innovation that helps organisations develops "win-win" strategies that achieve profit and market share objectives by lowering their environmental risk and impacts, while raising their ecological efficiency. As companies increasingly outsource manufacturing and "purchase in" components, the earlier points in the supply chain makes an important issues in today's business. On the other hand handling customer inquiries and ensuring access to markets in the face of new dynamic challenges in the market with new regulations also requires understanding from the company on the outward arm of the supply chain. More importantly the closed loop strategy due to the advent of 'take back' regulations in various markets is extending the responsibility of capturing the product throughout its entire life cycle and across the supply chain. Hence GSCM implementation should be considered not just with in the organization but has to be extended to the supply chain for long term environmental sustainability.

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Trading in the Foreign Exchange Market (Forex): A Study on Purchase Intention

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Abstract- This study aims to identify factors affecting the consumers' purchase intention in the foreign exchange market among expatriates who live in Kuala Lumpur. This study is looking for measuring the level of purchase intention related to trust, context , content, internet usage and infrastructure of website in FOREX market. Self-administered questionnaires were administered to clients, IBs, and brokers in this market. The questionnaires were distributed to the FOREX traders in Kuala Lumpur - Malaysia. Results showed that the main factors affecting the consumer purchase intention are trust, content, context and infrastructure of FOREX website. The correlation test is used to determine the relationship between the trust, context of FX website, content of FX website, internet usage and infrastructure of the FX website with the consumer purchase intention. The result of this research can be useful for FOREX Brokers FOREX dealers, central banks and any financial institution to develop the quality of their services in order to gain more investors and the clients' loyalty to this market.

Index Terms- Foreign Exchange Market, Purchase Intention, Forex Website

I. Introduction

The currency exchange is significant for both the commercial and individual traders who earn money on the FOREX which is a superior pecuniary bazaar allocated to the foreign exchange market. The conceptual framework of this study was adapted from proposed model by Lin, 2007 and Julie Anne Lee, 2000. The Foreign Exchange Market (Forex, FX, or Currency market) is a form of exchange for the global decentralized trading of international currencies. The Forex market is normally called to Foreign Exchange Market. The Forex bazaar is decentralized, globally which is well known as "over–the-counter "monetary market. The foreign exchange market is the largest and greatest liquid financial market in the world.

There are new opportunities to business individuals or for big companies. However, Most of the internet users don't have enough information on FOREX market. Some of these consumers stay away of this market, because lack of trust, negative information about online shopping, and negative manner toward internet purchase since they believe this market has high risk and they always lose their money in it. Despite the fact that, customers or internet consumers are the main power of this market which brokers, IBs, foreign exchange companies and online banking systems attempt to attract them to trade in this market by spending more money to change clients believes. In that case in this study, researchers challenge to represent the relationship and impact of , Internet usage, content of FOREX websites, context of FOREX websites, infrastructure of FOREX websites, and trust variables to consumer purchase intention on the Foreign Exchange market.

This study paper supplements the limited group of present literature by presenting a theoretical model that can be adopted to examine the internet usage, trust, content, context and infrastructure of the website in the FOREX. An easy model is constructed and used to estimate the determinants that affecting trusts and the structure of the website. In addition, this study supports previous untried comments as well as providing a new conceptual framework for consumer purchase. The target market of the FOREX is the traders and investors of the foreign exchange market. This study focuses on the determinants of the Expatriates clients (those who live in Kuala Lumpur, Malaysia) purchase intention in the FX market in respect of the target market.

II. Literature Review

Understanding of the consumer behavior is important for marketing management, nonprofit and social organizations, improve government agency performance, and investigation consumer behavior (Khan, 2006). Consumer behavior focuses on how individuals make decisions to spend their available resources (time, money, effort) on consumption related items (Schhiffman, 1997). Consumer behavior is a study of the processes involved when individuals or groups select, purchase, use, or dispose of products, services, ideas, or experiences to satisfy needs and desires (Solomon, 1996; Belch, 1978). A process of trading starts in the minds of the consumer or traders, which leads to the finding of alternatives between products or services that, can be acquired with their relative advantages and disadvantages.

At present, this period of time is the age of information technology. People use the computers in the extensive capacity of the network. Computers and networks are being used for commercial and domestic determinations, for government work, for buying and selling, for recording and repossessing information, for an electronic announcement with the greatest of ease, and they are used all over the world (Khan, 2006). Providing profitable links through the internet therefore has swiftly become the major apprehension for many businesses (Chuan and Chuan, 2007). By adopting online business, traders can make money such as devastating moment and corporeal barriers, minimizing business expenses and modified goods or

services information to consumers through the appearance of websites (Udo and Marquis, 2001, 2002; Vijayasarathy 2004). During period one of the financial markets which, growth constantly is the foreign exchange market. E-business has changed the decision making of the consumer and the physical activities associated with the decision making process have been reduced extremely. Consumers using the Internet can improve the execution of their business. They can produce and use business opportunities with greater efficiency and speed. They can generate business value. It gives the consumer advantage of getting better quality products by using interconnected networks, greater consumer satisfaction and delight and greater economy is guaranteed. It saves time and gives greater speed of transactions and delivery .These changes not only the thinking of the consumer, but can bring vast changes in the consumer behavior. The use of E-business in banks and FOREX market in the transfer of money within minutes all over the world, not only saves time, but also saves interest on the money which takes days to get transferred from one bank to the other across the world (Khan, 2006). Needless to say, service quality affects customers' online experience (Sorooshian, Salimi, Salehi, Nia, & Sazmand Asfaranjan, 2013) and it is shown how friendly and desirable online environment positively affect users' e-loyalty and retention and it helps attracting more potential clients (SazmandAsfaranjan, Shirzad, Baradari, Salimi, & Salehi, 2013).

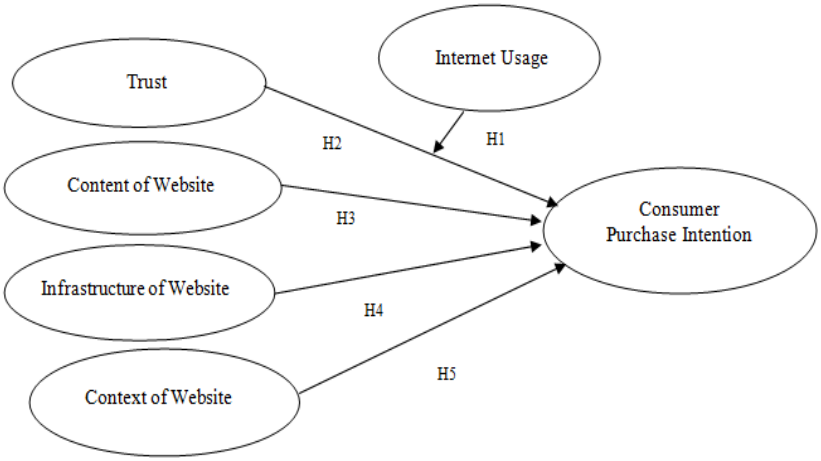
Traditional business methods of using paper and post are becoming out of date and the same transactions now take a matter of minutes. The success of online marketing is determined by the degree to consumer utilization of the internet during their decision making process, mainly acquisition of product information. According to the summary of past researches, the determinants of consumer purchasing intention and the sources from which they were adopted present on the below table.

Table 1. Conceptual Framework

Construct	Definition	Sources
Consumer Purchasing intention	The decision-making process and Physical activity involved in oak-wiring, evaluating, using and disposing of goods and services	Schiff man and Lazar,1997; Khan,2006;Triandis,1994, 1980; Landon,1974;
Internet Usage	The addition of the Internet to the electronic media atmosphere has transformed interest in the question of media attention	Robert LaRose, 2002
Trust	others willingness and ability to deliver on their obligations	McKnight,Cummings and Chervany 1998;Ratnasingham,1998; Francisco,PaulaLuna,Francisco, 2005.
Context of website	Site involvement, which taps a Behavioural response, not a personality dimension	Balabanis and Reynolds,2001; Harvin,2000;Francisco, PaulaLuna, Francisco, 2005.
Content of website	The material in Web site.' This may Include documents, data, applications, e-services, images, audio and video files, personal Web pages, archived e-mail messages, and more.	MarkShelstad,2005;Francisco, Paula Luna,Francisco, 2005.
Infrastructure of Web site	The highest quality equipment and Maintains	Pauline Ratnasingam, 2004; VladimirZwass,2006;Bruce K.Forbes,2002;Francisco,PaulaLuna, Francisco, 2005.

III. Methodology

Figure 1. Conceptual Framework



3.1 Hypothesis

H1. Increasing degrees of trust will increase the consumers' purchase intention on Foreign Exchange market.

H2. Site involvement (context) positively increases consumers' purchase intention on The Foreign Exchange market.

H3.Site materials (content) positively increase consumers' purchase intention on Foreign Exchange market.

H4. The quality of the Site (Infrastructure) positively increases consumers' purchase intention on the Foreign Exchange market.

H5. Context of the website positively affects consumers' purchase intention on the Foreign Exchange market.

The data are collected from the questionnaire that has been distributed to the respondents through the hard copies among Expatriate respondents who have been living in Kuala Lumpur, Malaysia. There were 100 questionnaires distributed and all completed. The questionnaire is using the *Likert scale* to measure the respondent's level of agreement and likelihood over statements in the questionnaire.

Table 2 Frequency Table (Gender)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	56	56.0	56.0	56.0
	Female	44	44.0	44.0	100.0
	Total	100	100.0	100.0	

Table 3 Frequency Table (Age)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 20 years	4	4.0	4.0	4.0
	21 years - 25 years	10	10.0	10.0	14.0
	25 years - 30 years	18	18.0	18.0	32.0
	31 years - 35 years	24	24.0	24.0	56.0
	35 years - 38 years	24	24.0	24.0	80.0

	More than 38years	20	20.0	20.0	100.0
	Total	100	100.0	100.0	

In our sample, 24% are between the ages of 25-34 year of age which as same followed by 24% of respondents on the age of 35-38 year of age. From the descriptive result, it is easily identified that the most existing age was between 25 and 35. The lowest percentage of respondents belongs to who are less than 20 years old with 4%. The ages 21-25 years, 25-30 years and more than 38 years were 4%, 10%, 18%, and 20% respectively.

Table 4. Frequency (Education)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lower than high school	1	1.0	1.0	1.0
	High School - Vocational Level	2	2.0	2.0	3.0
	Diploma Level	7	7.0	7.0	10.0
	Undergraduate Level	25	25.0	25.0	35.0
	Graduate Level	31	31.0	31.0	66.0
	Master Degree	22	22.0	22.0	88.0
	Doctor of Philosophy degree	12	12.0	12.0	100.0
	Total	100	100.0	100.0	

With regards to education, based on Table 4, there was only one respondent with an education level which is lower than high school which produces a percentage of 1.1%, which is a very means result, since mostly educated people only use FOREX market. 2% of the respondents' education level were high school or vocational level, 7% on diploma level, 25% of Undergraduate level, 31% Graduate level and research main respondents were on master degree with 22%, and 12% were listed as PhD level.

Table 1 Frequency Table (Monthly Household Income)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 2000 Rm	2	2.0	2.0	2.0
	2500 Rm – 5000 Rm	28	28.0	28.0	30.0
	5000 Rm – 10000 Rm	44	44.0	44.0	74.0
	More than 10000 Rm	26	26.0	26.0	100.0
	Total	100	100.0	100.0	

Table 6 Frequency (Internet usage during week)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than once a week	23	23.0	23.0	23.0
	About once a week	29	29.0	29.0	52.0
	Two or three times a week	21	21.0	21.0	73.0
	Others	27	27.0	27.0	100.0
	Total	100	100.0	100.0	

The amount of monthly household income for consumers mostly was around 5000 Rm - 10000 with 44% and was followed by more than 2500 Rm – 5000 Rm with 28% that the difference in their percentage is roughly significant. Moreover, the percentage of monthly household income for people who earn between 5000 - 10000 Rm . These all prove us consumers on FOREX market have approximately the middle range of high monthly household income. The percentage of monthly Household income for less than 2000 Rm was 2%, for more than 10000 Rm was 2% . As it is illustrated in the above Table 11, for question " How many times do you use the internet in a week for the last six months " is the highest frequency percentage is 29% at least about once a week and the lowest percentage is 21% belong to people at least using they are using 2 or 3 times a week .

Table 5 Frequency Table (Internet Usage in Six months)
How many hours do you spend using the internet every month for the last six months

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 1 hour	3	3.0	3.0	3.0
	1hour-5hours	14	14.0	14.0	17.0
	5 hours - 15 hours	15	15.0	15.0	32.0
	15 hours - 25 hours	23	23.0	23.0	55.0
	25 hours - 35 hours	15	15.0	15.0	70.0
	35 hours - 45 hours	14	14.0	14.0	84.0
	More than 45 hours	16	16.0	16.0	100.0
	Total	100	100.0	100.0	

It is shown, the maximum time the respondents use was 15 hours – 25 hours with 23% and the minimum time of usage less than 1 hour by 3% .However there is no significant differences in usage of internet, percentage in most items are between 14% - 16%. A descriptive study is undertaken in order to ascertain and be able to describe the characteristics of the variables of interest in a situation.

Table 7 Descriptive Statistics

	N	Min	Max	Mean	Std. Deviation
I am the only person to trade in the foreign exchange market.	99	2	5	3.49	.919
My family would also trade in the foreign exchange market.	100	2	5	3.16	.748
My friends would also trade in the foreign exchange.	100	1	5	3.11	1.348
When I open an account, I should buy and trade in the Forex market.	100	2	5	2.93	.856
How likely of trading stock based on foreign exchange products used regularly.	100	2	5	4.17	.995
How Likely of trading foreign exchange products based on stock owned.	100	2	5	3.44	.845
How Satisfied do you think you would be after trading in foreign exchange?	100	2	5	3.48	.959
What is your overall evaluation of the foreign exchange market?	100	2	5	3.59	.900
This is the foreign exchange market is Trustworthy.	100	3	5	3.67	.726
I trust in the benefits of the decisions of this foreign exchange market.	100	1	5	3.21	1.122
This Foreign exchange market keeps its promises and commitments.	100	2	5	3.45	.657
This foreign exchange market keeps customers' best interests in mind.	100	2	5	3.83	1.138
This foreign exchange market would do the job right if not monitored.	100	2	5	3.21	.671

I trust this foreign exchange market.	100	2	5	3.42	.843
The foreign exchange websites looks are organized.	100	2	5	3.78	.675
The foreign exchange websites use fonts are properly.	100	2	5	4.44	.729
The foreign Exchange website uses colour are properly	100	2	5	3.85	.672
The content of foreign exchange the websites are useful	100	2	5	3.83	.792
The content of foreign exchange the websites are complete	100	2	5	3.00	.725
The Content of foreign exchange the websites are clear	100	2	5	3.67	.792
The content of foreign exchange the websites are current.	100	3	5	4.33	.711
The content of foreign exchange the websites are concise.	100	3	5	4.08	.825
The Content of foreign exchange the website is accurate.	100	2	5	3.22	.786
The foreign exchange website seems to be easy to navigate through.	100	2	5	3.11	.852
The foreign exchange websites are always up and available.	100	2	5	4.07	.832
Foreign exchange web pages load faster in this website.	100	2	5	3.67	1.111
Valid N (listwise)	99				

Based On the descriptive analyses we need to look at the mean value of each question to find out the respondent how answered to the question and from their view agreed or disagreed. Based on our mean value we can say that our respondents have agreed (positive view) toward "I am the only person to trade in the foreign exchange market "as the mean value was 3.49. The second question is "My family would also trade in the foreign exchange market." and toward mean value with 3.16 shows respondent have agreed and have positive view. "My friends would also trade in the foreign exchange." had 3.11 in mean value so showed that have agreed .Based on our mean value we can say that our respondents have agreed through "When I open an account , I should buy and trade in the Forex market ." As the mean value was 2.93, because of the mean value close to 3.00 so it means respondents have agreed. Our mean value to 4.17 in "How likely of trading stock based on foreign exchange products used regularly " showed that respondent is likely to this question ." Through on our mean value we can say that our respondents have agreed (positive view) toward " How Likely of trading foreign exchange products based on stock owned ." The mean value was 3.49. The respondent agreed in "How Satisfied do you think you would be after trading in foreign exchange ?" With mean value 3.48 .It that shows they are likely satisfied. Base on our mean value we can say that our respondent have agreed towards "What is your overall evaluation of the foreign exchange market?" As the mean value was 3.59 .The mean value of "This is the foreign exchange market is Trustworthy." Has 3.67 .It showed the respondents have agreed toward the question?

Our Mean value was " I trust in the benefits of the decisions of this foreign exchange market ." 3.21 . It showed the respondent have agreed to be benefit able of the market .The question "This Foreign exchange market keeps its promises and commitments. " The respondents have agreed with mean value 3.45. Based on our mean value, we can say that our respondent has positive view to the "This foreign exchange market keeps customers' best interests in mind . " With 3.83 .Based on of mean value we say our respondent has positive view to "This foreign exchange market would do the job right even if not monitored. " With 3.21. The respondent trust to the foreign market as we can see on our mean value of " I trust this foreign exchange market ." with 3.42 .Based on our mean value which obviously show our respondent has a positive view of "The foreign exchange website looks organized ." with 3.78 ."The foreign exchange website uses fonts properly. " with mean value 4.44 shows the respondent has a positive view about website fonts .Based on our mean value the respondent has positive view to " The foreign Exchange website website uses colour properly " with 3.85 .

The respondent agrees to based on the mean value of " The content of foreign exchange the website is useful " with 3.83 .Based on our mean value our respondent has agreed of " The content of foreign exchange the website is complete " to have a positive view with 3.00 .Our mean value of " The Content of foreign exchange the website is clear " with 3.67 has been shown our respondent have agreed . Based on our mean value our respondent has agreed of "The content of foreign exchange the website is current. " With 4.33 .It shows respondents are mostly likely. Based on our mean value of "The content of foreign exchange the website is concise. " With 4.08. The respondent shows have agreed likely and has positive view. Our mean value of "The Content of foreign exchange the website is accurate." With 3.22 shows our respondents have agreed. Based on our mean value of our respondent has agreed of "The foreign exchange website looks easy to navigate through. " With 3.11. The mean value of our respondent of "The foreign exchange website is always up and available." With 4.07 . Our respondent has agreed to about this question .Based on our mean value of our respondent has agreed of "Foreign exchange web pages load faster in this website . " With 3.67.

Cross-Tab Analyses

A cross tab report shows the relationship between two or more survey questions and its provide us with a side-by-side comparison of how different groups of respondents answered your survey question.

Table 8 My friends would also trade in the foreign exchange.
* Gender Cross tabulation*

		Gender		Total
		Male	Female	
My friends would also trade in the foreign exchange.	Very Unlikely	9	7	16
	Unlikely	16	8	24
	Neutral	3	3	6
	Likely	22	19	41
	Very likely	6	7	13
Total		56	44	100

Its table 8 has been shown relation between Gender and the question "My friends would also trade in the foreign exchange market ". 22% of Male and 19% of female are mostly likely and the lowest percentage in relationship in 3% where is belonged to both male and female who are neutral .

Table 9 "When I open an account , I should buy and trade in the Fx market"
* Gender Cross tabulation*

		Gender		
		Male	Female	Total
When I open an account, I should buy and trade in the Forex market .	Unlikely	22	14	36
	Neutral	18	21	39
	Likely	13	9	22
	Very Likely	3	0	3
Total		56	44	100

Here in table 16 shows gender and the question "When I open an account ,I should buy trade in the Forex market " relationship .The most percentage for male is 22% who answered unlikely and for females is neutral by 21% . The Minimum percentage belongs to both genders in Very likely by 3% and 0% in male and female.

Table 10 Gender Cross tabulation
"I trust in the benefits of the decisions of this fox market."
* Gender Cross tabulation *

		Gender		
		Male	Female	Total
I trust in the benefits of the decisions of this foreign exchange market.	Strongly Disagree	2	5	7
	Disagree	11	6	17
	Neutral	20	21	41
	Agree	15	5	20
	Strongly Agree	8	7	15
Total		56	44	100

The last table for cross-tab test 17, test " I trust in the benefits of the decisions of this foreign exchange market " with gender . The maximum male responded percentage is neutral with 20% and in the same part of the female is 21%.The minimum percentage is 2% for male in strongly disagree and 6% of female in disagree part.

Independent T-Test Analysis

The t-test is used to compare the values of the means of two samples and test whether it is likely that the samples are from populations having different mean values. When two samples are taken from the same population it is very unlikely that the means of the two samples will be identical. When two samples are taken from two populations with very different means values, it is likely that the means of the two samples will differ. Our problem is how to differentiate between these two situations using only the data from the two samples.

Table 11 Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
I trust in the benefits of the decisions of this foreign exchange market.	Male	56	3.29	1.057	.141
	Female	44	3.11	1.205	.182
The foreign Exchange website uses colour properly	Male	56	3.86	.672	.090
	Female	44	3.84	.680	.103

The Sig. (2-Tailed) value in "I trust in the benefit of the decision of this foreign exchange market " is 0.449 . This value is more than .05 . Because of this, we can conclude that there is no significant difference between two groups .So we accept the Null.

Table 12 Independent Samples Test

		Levene's Test for Equality of Variances		T-test for Equality of Means			
		F	Sig .	t	Sig. (2-tailed)	Mean Difference	Std . Error Difference
I trust in the benefits of the decisions of this foreign exchange market .	Equal variances assumed	.012	.915	.760	.449	.172	.226
	Equal variances not assumed			.748	.457	.172	.230
The foreign Exchange website uses color properly	Equal variances assumed	.212	.646	.119	.905	.016	.136
	Equal variances not assumed			.119	.905	.016	.136

The Sig.(2-Tailed) value in " The foreign exchange website uses color properly " is .905 .This value is more than .05 . Because of this, we can conclude that there is no significant difference between two groups. So we accept the Null.

Table 132 ANOVA
How likely of trading stock based on foreign exchange products used regularly.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.143	5	.629	.631	.676
Within Groups	93.617	94	.996		
Total	96.760	99			

The output of the ANOVA analysis there is no significant difference between our group means. We can see that in this example the significance level is 0.676, which is more than 0.05. Therefore, there is no significant difference in the mean between the different groups .So we accept Null because there is no difference.

Table 14 ANOVA

		Sum of Squares	Df	Mean Square	F	Sig.
What is your overall evaluation of the foreign exchange market?	Between Groups	3.071	5	.614	.773	.572
	Within Groups	74.719	94	.795		
	Total	77.790	99			
This foreign exchange market keeps its promises and commitments.	Between Groups	1.457	5	.291	.630	.677
	Within Groups	43.453	94	.462		
	Total	44.910	99			
I trust this foreign exchange market.	Between Groups	4.691	5	.938	1.343	.253
	Within Groups	65.669	94	.699		
	Total	70.360	99			
This foreign exchange market keeps customers best interest in mind.	Between Groups	1.690	5	.338	.249	.939
	Within Groups	127.750	94	1.359		
	Total	129.440	99			
The foreign exchange website uses fonts properly.	Between Groups	2.439	5	.488	.911	.477
	Within Groups	50.311	94	.535		
	Total	52.750	99			

There are 5 question tested in Anova analysis . It All question sig. Shows all more than 0.05 .When sig. is more than 0.05 shows there is no difference between groups .So we accept the Null. According to the results of respondent's answers, most of the Expatriate respondents who were satisfied with the FOREX market which they're regularly traded on it. That drives us to a finding that when the clients of foreign exchange are satisfied in dealing with their trades and online services which are provided for them on meta-trader platform and FOREX website by brokers, there will be a generated clients transaction intention to invest and trade with this broker. The results of the analysis were well-matched with previously conducted research.

IV. Conclusion

Data analysis shows that the majority of the respondents had agreed that they trust to their FOREX market provides (Brokers), and they are likely to invest and trade in this market .This result shows that trust is an essential factor that affects the clients transaction intention in the Foreign exchange. In other words, customers who feel safe in executing their online transactions in the foreign exchange market, they may become interested and continue their cooperation with a broker. The relationship between trust and purchase intention is positive, based on the analysis which was conducted on the respondents" answers. The majority of respondents who had agreed that, they trust to their brokers and foreign exchange market. In other words, when a client trusts to the broker, he/she is most probably satisfied in executing online transactions with it. This relationship can be explained by the importance of the online services security, since most of the transactions consist of clients capitals and their confidential information. The results suggest that web users transaction intention is greatly influenced by trust towards the FOREX website. The results highlighted the importance of the trust in purchase intention (Gefen 2000, Lin, 2007, McKnight, 2002, Pavlou, 2003).

In the matter of influence of the context of FOREX web site with purchase intention on foreign exchange in Expatriate customer, the analysis of respondents answers showed that the relationship between the context of FX website and purchase intention is positive. In addition, the majority of respondents who had agreed, that the design interface (context) of their FOREX brokers website is good. Therefore designing an effective website is able to attract as well as retaining web users, which has become an important task for brokers and website managers (Vijayasarathy 2004).

The third factor that was studied which affects the purchase intention in this research is the content of the FOREX website. The analysis of the respondents answers differs from most of the previously conducted research. This research analysis shows that the content of FOREX website doesn't have a positive relationship with the purchaser's intention on FOREX market . There are many reasons that may have affected this result which is different from other study researches. As previously mentioned in this research, the bloom of the foreign exchange market among Expatriate who lives In Malaysia .

The last factor that was studied which affect the purchase intention in this research is the infrastructure of FOREX website. Data analysis shows that the majority of the respondents had agreed that the infrastructure of FOREX website (speeding up load speed, keeping web servers up at all time) is important for them when they connected to the live market in the meta-trader platform. The relationship between infrastructure of FOREX website and purchase intention is positive, based on the analysis which was conducted on the respondents answers. Nevertheless, these results were different from the results of Lin (2007) study about the effect of the online stickiness on purchase intention. According to Lin (2007), website managers should emphasize the content of the website more significantly than the design interface (context) and infrastructure. However, in this research, results showed that the trust, context and infrastructure of the website are more important than the content of the website in FOREX market. In

addition, base on prior experiential studies which also established that web users intention to revisit the website was meaningfully influenced by user positive attitude towards the website (Lin and Lu 2000, Moon and Kim 2001, Chen, 2002, Vijayasarathy 2004). As well, a good online experience will lead to deep- down pleasure; go along with by a lost track of time (Hoffman and Novak 1996).

This means that to raise the web user's intention towards a FOREX website, website managers need to enhance the websites efficiency (e.g. speeding up load speed, keeping web servers up at all time) as well as developing the trustworthiness. This study paper supplement the limited pool of current literature by presenting a theoretical model that can be adopted to examine the consumers' purchase intention in the foreign exchange market. A simple model is constructed and used to estimate the determinants that affecting purchase intention. Since there are a very few number of researches on the FOREX market , this study tries to focus on the determinants that affect the consumers (traders or clients) purchase intention in the foreign exchange market among Expatriate people who live in Kuala Lumpur . In addition, thus the study supports previous experimental observations as well as providing a new conceptual framework of consumers purchase intention on FOREX market. Consequently, this study investigates the factors that affected the acceptance of online trading in the FOREX market. More intensive studies can be carried out to examine other factors which affect the level of purchase intention related to the FOREX market. Also it can be recommended that an appropriate stratified random sample may be used to compare several FX brokers using a large sample. With an increased sample size a more detailed empirical study among independent variables and dependent variables that have multiple categories can be performed. Potential correlations between some independent variables needs to be reported in future studies as well as the level of significance between independent variables and purchase intention. A qualitative research method may provide a different perspective of purchase intention and contribute more in depth the understanding of FOREX traders and clients' needs.

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Consumer Perceptions of Food Franchise: A Study of McDonald's and KFC

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Abstract- Globalization and modernization has redefined the Indian fast food industry and today people can be seen consuming food out of their homes moving towards superior and convenient options. The demand for fast food is on uptrend. Increase in the disposable income of the burgeoning upper middle class has contributed to the growth of food industry. Food franchises have made significant inroads into the franchising industry. Franchising is perceived as a beeline to expansion and growth of a business.

The present study is an attempt to study the consumers' perception about two important food franchise, McDonalds and KFC. The study is an explorative study based on primary data collected from 150 respondents in Thane city through a structured questionnaire.

Various factors like variety of food items, quality, taste, ingredients etc are analyzed to study consumer perception about food franchise. The study revealed that price of the food items affect the frequency of visits to food outlets.

Index Terms- Globalization, Consumer Perceptions, Food Franchise

I. Introduction

The food service industry is broadly divided into two sectors, the organized sector and the unorganized sector. The former include food court, retail food chain, etc, while the latter include dhabas and roadside stalls. The organized sector is mainly recognized by its ambience, hygiene and quality of food and services. India has witnessed an exponential rise in the per capita income during the last decade. The rise in income levels and the changing lifestyle of generation Y and Z, has made junk food an inextricable part of their life. Consuming food in a superior food retail outlet has become comprehensible to the general public. Although, the density of fast food chains in the developing countries is less as compared to developed countries, there is an obvious increase in the number of food outlets in India during the last decade.

Further, globalization and modernization has redefined the Indian fast food industry. The burgeoning middle class, rise in urbanization and increasing youth spending has added new dimensions to the growth of franchising business. The concept of franchising is deep-rooted in the minds of potential entrepreneurs. Franchising provides an opportunity to young enterprising persons to undertake a business venture. The leading sector where franchise model is gaining popularity includes education and training, food and beverages, apparels, beauty and salons, entertainment, healthcare fitness and so on.The food franchise industry in India is highly geared towards expansion path. Franchising is reckoned as the fastest and the cheapest route of brand popularization. The ability to stretch customer base is a function of exhaustive market research, often undertaken by identifying the needs and expectations of customers and satisfying their demands. High and frequent customer traffic is a unique characteristic of food franchising. The increase in mall culture has enabled the food and beverages industry to gain momentum. The penetration and outreach of food franchise in different parts of various cities is linked with the development of the economy, as it strongly indicates the rise in purchasing power of the consumers.

There has been a significant change in the consumption pattern of the young generation. While frequent visits to a particular food outlet often depend on the factors like taste, ambience, quick service etc, approximately 10 percent of the customers visited the outlet not out of choice but due to its convenient location. Ninety percent of the customers choose a food outlet on the basis of their past experiences. Nevertheless, the role of advertising and marketing in increasing the number and frequency of visits of customers cannot be denied.

The present study aims to analyze the consumer perceptions of two fast food franchises, McDonalds and KFC, which has registered immense growth in the last decade. Consumers perception is considered as a pivotal determinant of the frequency of visit to a the consumer attitudes towards fast food and to analyse the impact of foreign chains on the emerging fast food preferences in India. The growth of franchise depends upon its popularity amongst the consumers, and consumers perception depends upon various factors like price, quality etc. The research will unearth the factors responsible for the satisfaction of customers of McDonald's and KFC. Further, the research also determines the buying behaviour of consumers in context with fast food.

II. Literature review

Schlosser E. (2001**)** pointed out the most frequently reported reasons for eating at fast-food restaurants were fast food is quickly served. Laroche and Parsa (2000**)** found that that people decide to choose fast food restaurant because they like the taste and prefer instant satisfaction of their taste buds. Fast food restaurant include a wide range of quick and fast service, brands and take only short period to serve it. Consumer make their choice of brands in multi brand situation is one of least understood yet important phenomenon in the marketing of Quick

Service Restaurant - Fast Food Restaurant. French SA et al, (2001) pointed out that visiting fast food restaurant is to spent time with family and friends. Drewnowski and Spectre, (2000) contends that one of the factor that influences consumption of fast food is by socio-economic status. There is a difference between people who have high income with people who is have low income. Usually people with low economic status prefer roadside stalls which are inexpensive; hygiene is not a criterion for them. On the other hand, high income people select branded restaurants as hygiene and nutrition both the factors are important for them. Herman and Polivy, (1984**)** emphasizes that one factor that influences the choice of fast food restaurants depends upon whether they are from rural area or urban area. He observed that as the density of fast food restaurants is low in rural areas the consumption of fast food in retails outlet is less. Dr. Qian Sun at el (2012), found that that 'visual aesthetics' is now as equally important to the consumer decision making process in India as the traditional elements of price and functionality. However, the study suggests that intrinsic factors are still far more important than extrinsic ones in the Indian consumer decision making process. Xiaoling (Martine) Guo (2011) et al found that consumer perceives both utilitarian and expressive functions of the brand in China. For Chinese consumers, brands accomplish various functions such as "recall of past experiences", "quality sign" and "identify". Moreover, "recall of past experiences" is a unique brand function for Chinese consumers and has a positive impact on brand loyalty.

III. Research Objectives

1. To identify the factors affecting the choice of Indian young consumers for fast food.
2. To study the consumption pattern towards fast food with respect to the frequency of visits, choice of fast food outlets.
3. To analyse the consumer perception about two popular Food Franchisee McDonald's and KFC in thane city.

IV. Research Methodology

The present study evaluates the consumer perception towards food franchisee in India. The data were collected using a structured questionnaire. The population of the study consisted of college students in Thane city. A sample of 150 respondents was selected through convenience sampling basis. The samples for the study consisted of youth segment in the age group between 18-25 years as food outlets are more popular amongst these groups. Out of the total sample size 137 respondent's data was considered valid for the purpose of analysis. Primary Data was collected using a pre designed, structured and close ended questionnaire to explore the perception of 150 respondents who were the customers of McDonald's and KFC in Thane city of Maharashtra State.

Data was subjected to various statistical tools for the purpose of analysis. SPSS software was used for analyzing the data. The conclusions were drawn on the basis of paired samples statistics.

V. Hypothesis

Variables chosen for research

1. variety of products
2. Speed of service
3. Accuracy in service
4. Price
5. Taste of products
6. Ingredients
7. Packaging
8. Attitude of Staff
9. Location
10. Additional Information
11. Customer Service
12. Opening Hours

The hypothesis was framed on the basis of above twelve variables for the purpose of analysis.

H_O: There is no significant association between the above selected variables and satisfaction level of customers of Mc Donald's and KFC.

$H_{1:}$ There is a significant association between the above selected variables and satisfaction level of customers of Mc Donald's and KFC.

VI. Analysis of Results

The data was analyzed using paired sample statistics at 5 % level of significance. It was found that variety, Speed, ingredients, packaging, attitude of staff and additional information are having equal satisfaction level when compared between McDonalds and KFC. Whereas for accuracy in service, price, taste, location, customer service and opening hours don't have equal level of satisfaction for the both.

The average ranks of these 12 criterion showed that McDonalds have better level of satisfaction for accuracy in service, price, taste, location, customer service and opening hours.

Table 1: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	a	3.38	125	1.156	.103
	m	3.41	125	1.245	.111
Pair 2	b	3.43	122	1.044	.095
	n	3.48	122	1.062	.096
Pair 3	c	3.65	120	1.074	.098
	o	3.43	120	1.113	.102
Pair 4	d	3.31	121	1.197	.109
	p	2.98	121	1.231	.112
Pair 5	e	4.15	121	1.030	.094
	q	3.82	121	1.118	.102
Pair 6	f	3.84	121	1.118	.102
	r	3.69	121	1.154	.105
Pair 7	g	3.79	121	1.140	.104
	s	3.78	121	1.114	.101
Pair 8	h	3.43	123	1.131	.102
	t	3.37	123	1.073	.097
Pair 9	i	3.80	122	1.050	.095
	u	3.49	122	1.173	.106
Pair 10	j	3.32	115	1.105	.103
	v	3.14	115	1.206	.112
Pair 11	k	3.78	123	.996	.090
	w	3.46	123	1.182	.107
Pair 12	l	3.90	122	.983	.089
	x	3.46	122	1.137	.103

Table 2: Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	a & m	125	.199	.026
Pair 2	b & n	122	.204	.024
Pair 3	c & o	120	.470	.000
Pair 4	d & p	121	.258	.004
Pair 5	e & q	121	.205	.024
Pair 6	f & r	121	.286	.002
Pair 7	g & s	121	.292	.001
Pair 8	h & t	123	.423	.000
Pair 9	i& u	122	.348	.000
Pair 10	j & v	115	.355	.000
Pair 11	k & w	123	.392	.000
Pair 12	l & x	122	.344	.000

Table 3: Paired Samples Test

Comparison between		Paired Differences					t	df	Sig. (2-tailed)	Null Hypothesis Result
					95% Confidence Interval of the Difference					
McDonalds	KFC	Mean	Std. Deviation	Std. Error Mean	Lower	Upper				
Pair 1	Variety	-.024	1.521	.136	-.293	.245	-.176	124	.860	Accept
Pair 2	Speed	-.049	1.329	.120	-.287	.189	-.409	121	.683	Accept
Pair 3	Accuracy	.225	1.126	.103	.021	.429	2.189	119	.031	Reject
Pair 4	Price	.331	1.480	.135	.064	.597	2.457	120	.015	Reject
Pair 5	Taste	.331	1.356	.123	.086	.575	2.681	120	.008	Reject
Pair 6	Ingredients	.149	1.358	.123	-.096	.393	1.205	120	.231	Accept
Pair 7	Packing	.017	1.342	.122	-.225	.258	.136	120	.892	Accept
Pair 8	Attitude of staff	.065	1.186	.107	-.147	.277	.608	122	.544	Accept
Pair 9	Location	.311	1.273	.115	.083	.540	2.702	121	.008	Reject
Pair 10	Additional-information	.183	1.315	.123	-.060	.426	1.489	114	.139	Accept
Pair 11	Customer service	.325	1.211	.109	.109	.541	2.978	122	.004	Reject
Pair 12	Opening hours	.443	1.220	.110	.224	.661	4.007	121	.000	Reject

Table 4: Average ranks by customers for the satisfaction level for the 12 criterions

Criterion	Variety	Speed	Accuracy	Price	Taste	Ingredients	Packing	Attitude of staff	Location	Additional Information	Service	Opening hours
McDonalds	3.4	3.445	3.64	3.31	4.14	3.87	3.8	3.49	3.86	3.4	3.8	3.92
KFC	3.413	3.488	3.41	2.98	3.81	3.7	3.8	3.37	3.5	3.2	3.5	3.47

VII. CONCLUSION

This study finds that consumers attach great importance to various factors such as quality of food, facility layout, service quality – speed and cleanliness. But all factors are not equally important while choosing a food franchise. Hence we can say that good taste and good ingredients are most important factors whereas additional information is least important factor for the consumers. There is a moderate positive correlation observed between satisfaction level of price of McDonald's products and the frequency of the visits to McDonalds. It means more the consumer is satisfied with the pricing, more they visit the outlet. According to most of the consumers, taste and quality of ingredients of the food items are the most important factors. Although most of the factors of consumers' perception are idiosyncratic, there are few factors where all the consumers formed a common opinion.

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ON GENERALIZED PSEUDO-PROJECTIVE ϕ-RECURRENT $N(k)$-CONTACT METRIC MANIFOLD

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Abstract: The object of the present paper is to study generalized pseudo-projective ϕ-recurrent $N(k)$-contact metric manifold.

Key Words: $N(k)$-contact metric manifold, η-Einstein manifold, generalized pseudo-projective ϕ-recurrent manifold, constant curvature.

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1. Introduction

In 1988, S. Tanno [11] introduced the notion of k-nullity distribution of a contact metric manifold as a distribution such that the characteristic vector field ξ of the contact metric manifold belongs to the distribution. The Contact metric manifold with ξ belonging to the k-nullity distribution is called $N(k)$-contact metric manifold and such a manifold is also studied by various authors. Generalizing this notion, in 1995 Blair, Koufogiorgos and Papantoniou [3] introduced the notion of a contact metric manifold with ξ belonging to the (k,μ)-nullity distribution, where k and μ are real constants. In particular if μ=0, then the notion of (k,μ)-nullity distribution reduces to the notion of k-nullity distribution. Later in 2008, De, Gazi, [6] studied ϕ-recurrent $N(k)$-contact metric manifold.

In this paper we study Generalized pseudo-projective ϕ-recurrent $N(k)$-contact metric manifold. Here we show that Generalized pseudo-projective ϕ-recurrent $N(k)$-contact metric manifold is an η-Einstein manifold, and we find a relation between the associated 1-forms A and B. We also prove that the characteristic vector field ξ and vector field ρ associated to the 1-forms A and B are co-directional. Finally we prove that a generalized pseudo-projective ϕ-recurrent $N(k)$-contact metric manifold is of constant curvature.

2. Contact Metric Manifold

A (2n+1)-dimensional manifold M^{2n+1} is said to admit an almost Contact structure if it admits a tensor field ϕ of type $(1,1)$, a vector field ξ and a 1-form η satisfying

(2.1) $\quad (a)\ \phi^2(X) = -X + \eta(X)\xi, (b)\ \eta(\xi) = 1, (c)\ \eta\circ\phi = 0, (d)\ \phi\xi = 0.$

An almost contact metric structure is said to be normal if the induced almost complex structure J on the product manifold $M^{2n+1}\times \boldsymbol{R}$ defined by

$$J(X, f\frac{d}{dt}) = (\phi X - f\xi, \eta(X)\frac{d}{dt})$$

is integrable, where X is tangent to M, t is the coordinate of $\boldsymbol{R}$ and f is a smooth function on $M \times \boldsymbol{R}$. Let g be a compatible Riemannian metric with almost contact structure (ϕ, ξ, η),
that is

(2.2) $$g(\phi X, \phi Y) = g(X, Y) - \eta(X)\eta(Y).$$

Then M becomes an almost contact metric manifold equipped with an almost contact structure (ϕ, ξ, η, g). From (2.1) it can be easily seen that

(2.3) $$(a)\ g(X, \phi Y) = -g(\phi X, Y), (b)\ g(X, \xi) = \eta(X)$$

for all vector fields X, Y. An almost contact metric structure becomes a contact metric structure if

(2.4) $$g(X, \phi Y) = d\eta(X, Y),$$

for all vector fields X, Y. The 1-form η is then a contact form and ξ is its characteristic vector field. We define a $(1,1)$ tensor field h by $h = \frac{1}{2}\, £_{\xi}\phi$, where £ denotes the Lie-differentiation. Then h is symmetric and satisfies $h\phi = -\phi h$. We have $Tr.h = Tr.\phi h = 0$ and $h\xi = 0$. Also,

(2.5) $$\nabla_X \xi = -\phi X - \phi h X,$$

holds in a Contact metric manifold. A normal contact metric manifold is a Sasakian manifold. An almost contact metric manifold is Sasakian if and only if

(2.6) $$(\nabla_X \phi)(Y) = g(X, Y)\xi - \eta(Y)X, \qquad X, Y \in TM$$

where ∇ is the Levi-Civita connection of the Riemannian metric g. A contact metric manifold M^{2n+1} (ϕ, ξ, η, g) for which ξ is a killing vector is said to be a K-contact manifold. It is well known that the tangent sphere bundle of a flat Riemannian manifold admits a contact metric structure satisfying $R(X, Y)\xi = 0$ ([2]). On the other hand, on a Sasakian manifold, the following holds:

(2.7) $$R(X, Y)\xi = \eta(Y)X - \eta(X)Y.$$

As a generalization of both $R(X, Y)\xi = 0$ and the Sasakian case; D.Blair, T. Koufogiorgos and B. J. Papantoniou [3] considered the (k, μ)-nullity condition on a Contact metric manifold and gave several reasons for studying it. The (k, μ)- nullity distribution $N(k, \mu)$ of a Contact metric manifold M is defined by

$$N(k, \mu) : p \to N_p(k, \mu) = \{W \in T_pM : R(X, Y)W = (kI + \mu h)(g(Y, W)X - g(X, W)Y)\},$$

for all $X, Y \in TM$, where $(k, \mu) \in R^2$. A contact metric manifold M^{2n+1} with $\xi \in N(k, \mu)$ is called a (k, μ)-manifold. In particular on a (k, μ)-manifold, we have

(2.8) $$R(X, Y)\xi = k[\eta(Y)X - \eta(X)Y] + \mu[\eta(Y)hX - \eta(X)hY].$$

On a (k, μ)-manifold $k \leq 1$. If $k = 1$, the structure is Sasakian ($h = 0$ and μ is indeterminant) and if k < 1, the (k, μ)-nullity condition determines the curvature of M^{2n+1} completely [3]. Infact, for a (k, μ)-manifold, the condition of being a Sasakian manifold, a k-contact manifold, $k = 1$ and $h = 0$ are all equivalent. The k-nullity distribution $N(k)$ of a Riemannian manifold M is defined by

$N(k): p \rightarrow Np(k) = \{Z \in TpM : R(X,Y)Z = g(Y,Z)X - g(X,Z)Y\},$

k being a constant. If the characteristic vector $\xi \in N(k)$, then we call a contact metric manifold an $N(k)$-contact metric manifold. If $k = 1$, then $N(k)$-contact metric manifold is Sasakian and if $k = 0$, then $N(k)$-contact metric manifold is locally isometric to the product $E^{n+1} \times S^n(4)$ for n > 1 and flat for $n = 1$. If $k < 1$, the scalar curvature is $r = 2n(2n - 2 + k)$. If μ = 0, then a (k, μ)-contact metric manifold reduces to a $N(k)$-contact metric manifold.

In $N(k)$-contact metric manifold the following relations hold:

(2.9) $$h^2 = (k - 1)\phi^2, \qquad k \leq 1,$$

(2.10) $$(\nabla_X \phi)(Y) = g(X + hX, Y)\xi - \eta(Y)(X + hX),$$

(2.11) $$R(\xi, X)Y = k[g(X,Y)\xi - \eta(Y)X],$$

(2.12) $$S(X,\xi) = 2nk\eta(X),$$

(2.13) $$S(X,Y) = 2(n - 1)g(X,Y) + 2(n - 1)g(hX,Y) + [2(1 - n) + 2nk]\eta(X)\eta(Y), \qquad n \geq 1,$$

(2.14) $$r = 2n(2n - 2 + k),$$

(2.15) $$S(\phi X, \phi Y) = S(X,Y) - 2nk\eta(X)\eta(Y) - 4(n-1)g(hX,Y),$$

(2.16) $$(\nabla_X \eta)(Y) = g(X + hX, \phi Y),$$

(2.17) $$R(X,Y)\xi = k[\eta(Y)X - \eta(X)Y],$$

(2.18) $$\eta(R(X,Y)Z) = k(g(Y,Z)\eta(X) - g(X,Z)\eta(Y)].$$

Definition 2.1. ([13]) A $N(k)$-contact metric manifold is said to be locally pseudo-projective ϕ-symmetric if

(2.19) $$\phi^2((\nabla_W \bar{P})(X,Y)Z) = 0,$$

for all vector fields X, Y, Z, W orthogonal to ξ.

Definition 2.2. ([13]) A $N(k)$-contact metric manifold is said to be pseudo-projective ϕ-recurrent if there exists a non-zero 1-form A such that

(2.20) $$\phi^2((\nabla_W \bar{P})(X,Y)Z) = A(W)R(X,Y)Z$$

for arbitrary vector fields X, Y, Z and W, where $\bar{P}$ is a pseudo-projective curvature tensor given by .

(2.21) $$\bar{P}(X,Y)Z = aR(X,Y)Z - b[S(Y,Z)X - S(X,Z)Y] - \frac{r}{(2n+1)}\left[\frac{a}{2n} + b\right][g(Y,Z)X - g(X,Z)Y]$$

where R is the curvature tensor, and r is the scalar curvature. If the 1-form A vanishes, then the manifold reduces to locally pseudo projective ϕ-symmetric manifold.

Definition 2.3. A $N(k)$-contact metric manifold is said to be generalized pseudo-projective ϕ-recurrent if its curvature tensor $\bar{P}$ satisfies the condition

(2.22) $$\phi^2\big((\nabla_W \bar{P})(X,Y)Z\big) = A(W)P(X,Y)Z + B(W)[g(Y,Z)X - g(X,Z)Y],$$

where A and B are two 1-forms, B is non-zero and these are defined by

$$A(W) = g(W, \rho_1), \qquad B(W) = g(W, \rho_2),$$

and ρ_1, ρ_2 are vector fields associated with 1-forms A and B, respectively.

3. Generalized Pseudo-Projective ϕ-Recurrent $N(k)$-Contact Metric Manifold

Let us consider a Generalized pseudo-projective ϕ-recurrent $N(k)$ −contact metric manifold. Then by virtue of 2.1(a) and (2.22) we have

$$-((\nabla_W \bar{P})(X,Y)Z) + \eta((\nabla_W \bar{P})(X,Y)Z)\xi = A(W)\bar{P}(X,Y)Z + B(W)[g(Y,Z)X - g(X,Z)Y], \tag{3.1}$$

from which it follows that

$$-g((\nabla_W \bar{P})(X,Y)Z,U) + \eta((\nabla_W \bar{P})(X,Y)Z)\eta(U) = A(W)g(\bar{P}(X,Y)Z,U) + B(W)[g(Y,Z)g(X,U) - g(X,Z)g(Y,U)]. \tag{3.2}$$

Let {ei}, $i = 1, 2, \ldots, 2n+1$ be an orthonormal basis of the tangent space at any point of the manifold. Then putting $X = U = \{e_i\}$ in (3.2) and taking summation over $i, 1 \leq i \leq 2n + 1$, we get

$$(\nabla_W S)(Y,Z) = A(W)\left[S(Y,Z) - \frac{r}{2n+1}g(Y,Z)\right] + 2nB(W)g(Y,Z). \tag{3.3}$$

Replacing Z by ξ in (3.3) and using (2.12), we have

$$(\nabla_W S)(Y,\xi) = A(W)\eta(Y)\left[2nk - \frac{r}{2n+1}\right] + 2nB(W)\eta(Y). \tag{3.4}$$

Now we have,

$$(\nabla_W S)(Y,\xi) = \nabla_W S(Y,\xi) - S(\nabla_W Y,\xi) - S(Y,\nabla_W \xi).$$

Using (3.4) and (2.16) in the above relation, it follows that

$$(\nabla_W S)(Y,\xi) = -2nkg(\phi W + \phi hW,\ Y) + S(Y,\ \phi W + \phi hW). \tag{3.5}$$

In view of (3.4) and (3.5), we have

$$S(Y,\phi W + \phi hW) = 2nkg(\phi W + \phi hW, Y) + A(W)\eta(Y)\left[2nk - \frac{r}{2n+1}\right] + 2nB(W)\eta(Y). \tag{3.6}$$

Replacing Y by ϕY in (3.6), and after a brief simplification, we get

$$S(Y,W) = 2[(n + k - 1) + n(k-1)(nk+n-1)]g(Y,W) + 2[(n-1)(k-1) - n(k-1)(nk+n-1)]\eta(Y)\eta(W)$$

or,

$$S(Y,W) = ag(Y,W) + b\eta(Y)\eta(W), \tag{3.7}$$

Where $a = 2[(n + k - 1)] + n(k-1)(nk + n - 1)$,
$b = 2[(n-1)(k-1) - n(k-1)(nk + n - 1)]$ are constants.
Therefore we state the following:

Theorem 3.1. A Generalized pseudo-projective ϕ-recurrent $N(k)$-contact metric manifold is an η-Einstein manifold with constant coefficients.

Now putting $Y = Z = ei$ in (3.2) and taking summation over i, $i = 1, 2, \ldots, 2n + 1$, we get

$$\begin{aligned} &-(a-b)(\nabla_W S)(X,U) - b\nabla_W r g(X,U) + \frac{dr(w)}{2n+1}\left(\frac{a}{2n} + b\right)[2ng(X,U)] \\ &\quad + (a-b)(\nabla_W S)(X,\xi)\eta(U) + b\nabla_W r\eta(X)\eta(U) - \frac{dr(W)}{2n+1}\left(\frac{a}{2n} + b\right)[2n\eta(X)\eta(U)] \\ &\quad = A(W)[(a-b)S(X,U) + brg(X,U)] - \frac{r}{2n+1}\left(\frac{a}{2n} + b\right)2ng(X,U)] \\ &\quad + 2nB(W)g(X,U). \end{aligned} \tag{3.8}$$

Putting $U = \xi$ in (3.8) we have,

$$A(W)\left[2nk(a-b)\eta(X) + br\,\eta(X) - \frac{r}{2n+1}\left(\frac{a}{2n} + b\right)2n\,\eta(X)\right] + 2nB(W)\eta(X) = 0. \tag{3.9}$$

Putting $X = \xi$ in (3.9) we have,

$$B(W) = \left[kb - ka - \frac{br}{2n} - \frac{r}{2n(2n+1)}(a + 2nb)\right]A(W). \tag{3.10}$$

This leads to the following theorem:

Theorem 3.2. *In a generalized pseudo-projective ϕ-recurrent N(k)-contact metric manifold (M^{2n+1}, g), the 1-forms A and B are related as in (3.10)*

Now from (3.1) we have

$$\begin{aligned} (\nabla_W \bar{P})(X,Y)Z &= \eta((\nabla_W \bar{P})(X,Y)Z)\xi \\ &\quad - A(W)\bar{P}(X,Y)Z - B(W)[g(Y,Z)X - g(X,Z)Y]. \end{aligned} \tag{3.11}$$

This implies,

$$\begin{aligned} a(\nabla_W R)(X,Y)Z &= a\eta((\nabla_W R)(X,Y)Z)\xi - aA(W)R(X,Y)Z \\ &\quad + b[(\nabla_W S)(Y,Z)\eta(X) - (\nabla_W S)(X,Z)\eta(Y)]\xi \\ &\quad - b[(\nabla_W S)(Y,Z)X - (\nabla_W S)(X,Z)Y] \\ &\quad - bA(W)[S(Y,Z)X - S(X,Z)Y] \\ &\quad + \frac{r}{2n+1}\left[\frac{a}{2n} + b\right]A(W)[g(Y,Z)X - g(X,Z)Y] \\ &\quad - B(W)[g(Y,Z)X - g(X,Z)Y]. \end{aligned} \tag{3.12}$$

From (3.12) and the Bianchi identity we get

$$\begin{aligned} &aA(W)\eta(R(X,Y)Z) + aA(X)\eta(R(Y,W)Z) + aA(Y)\eta(R(W,X)Z) \\ &\quad = bA(W)[S(X,Z)\eta(Y) - S(Y,Z)\eta(X)] - \frac{r}{2n+1}\left[\frac{a}{2n} + b\right]A(W)[g(X,Z)\eta(Y) - g(Y,Z)\eta(X)] \end{aligned}$$

$$+bA(X)[S(Y,Z)\eta(W)-S(W,Z)\eta(Y)]-\frac{r}{2n+1}\left[\frac{a}{2n}+b\right]A(X)[g(Y,Z)\eta(W)-g(W,Z)\eta(Y)]$$
$$+bA(Y)[S(W,Z)\eta(X)-S(X,Z)\eta(W)]-\frac{r}{2n+1}\left[\frac{a}{2n}+b\right]A(Y)[g(W,Z)\eta(X)-g(X,Z)\eta(W)]$$
$$+B(W)[g(Y,Z)\eta(X)-g(X,Z)\eta(Y)]+B(X)[g(W,Z)\eta(Y)-g(Y,Z)\eta(W)]$$
$$+B(Y)[g(X,Z)\eta(W)-g(W,Z)\eta(X)]. \tag{3.13}$$

By virtue of (2.8), we obtain from (3.13) that

$$aA(W)[k[g(Y,Z)\eta(X)-g(X,Z)\eta(Y)]+aA(X)[k[g(W,Z)\eta(Y)-g(Y,Z)\eta(W)]+aA(Y)[k[g(X,Z)\eta(W)-[g(W,Z)\eta(X)]$$
$$=bA(W)[S(X,Z)\eta(Y)-S(Y,Z)\eta(X)]-\frac{r}{2n+1}\left[\frac{a}{2n}+b\right]A(W)[g(X,Z)\eta(Y)-g(Y,Z)\eta(X)]$$
$$+bA(X)[S(Y,Z)\eta(W)-S(W,Z)\eta(Y)]-\frac{r}{2n+1}\left[\frac{a}{2n}+b\right]A(X)[g(Y,Z)\eta(W)-g(W,Z)\eta(Y)]$$
$$+bA(Y)[S(W,Z)\eta(X)-S(X,Z)\eta(W)]-\frac{r}{2n+1}\left[\frac{a}{2n}+b\right]A(Y)[g(W,Z)\eta(X)-g(X,Z)\eta(W)]$$
$$+B(W)[g(X,Z)\eta(Y)-g(Y,Z)\eta(X)]+B(X)[g(Y,Z)\eta(W)-g(W,Z)\eta(Y)]$$
$$+B(Y)[g(W,Z)\eta(X)-g(X,Z)\eta(W)]. \tag{3.14}$$

Putting $Y=Z=e_i$ in (3.10) and taking summation over $i,\ 1\le i\le 2n+1$, we get

$$(a)\ A(W)\eta(X)=A(X)\eta(W)$$
$$(b)\ B(W)\eta(X)=B(X)\eta(W), \tag{3.15}$$

for all vector fields X, W.

Replacing X by ξ in (3.11) we get

$$(a)A(W)=\eta(W)\eta(\rho_1)$$
$$(b)B(W)=\eta(W)\eta(\rho_2), \tag{3.16}$$

for any vector field W, where $A(\xi)=g(\xi,\rho_1)=\eta(\rho_1)$ and $B(\xi)=g(\xi,\rho_2)=\eta(\rho_2)$, $\rho_1$and ρ_2 being the vector fields associated to the 1-forms A and B.

From (3.15) and (3.16), we can state the following theorem:

Theorem 3.3. *In a generalized pseudo-projective ϕ-recurrent N(k)-contact metric manifold, the characteristic field ξ and the vector fields ρ_1 and ρ_2 associated to the 1-forms A and B respectively are co-directional and the 1-forms A and B are given by (3.16).*

4. 3-dimensional Generalized Pseudo-Projective ϕ-Recurrent $N(k)$ −Contact Metric Manifold

In a 3-dimensional $N(k)$ −contact metric Manifold (M^3, g), we have

$$R(X,Y)Z=\left(\frac{r}{2}-2k\right)[g(Y,Z)X-g(X,Z)Y]+\left(3k-\frac{r}{2}\right)[g(Y,Z)\eta(X)\xi$$
$$-g(X,Z)\eta(Y)\xi+\eta(Y)\eta(Z)X-\eta(X)\eta(Z)Y]. \tag{4.1}$$

$$S(X,Y)=\left(\frac{r}{2}-k\right)g(X,Y)+\left(3k-\frac{r}{2}\right)\eta(X)\eta(Y). \tag{4.2}$$

Using (4.1) and (4.2) in (2.21), we get

$$\bar{P}(X,Y)Z = \left[(a+b)\left(\frac{r}{2}-2k\right)\right][g(Y,Z)X - g(X,Z)Y] + (a+b)\left(3k-\frac{r}{2}\right)[\eta(Y)\eta(Z)X$$
$$(4.3) \qquad -\eta(X)\eta(Z)Y] + \left(3k-\frac{r}{2}\right)[g(Y,Z)\eta(X)\xi - g(X,Z)\eta(Y)\xi].$$

Differentiating the equation (4.3) covariantly, we get

$$\begin{aligned}(\nabla_W\bar{P})(X,Y)Z &= \left[\frac{adr(W)}{2}+\frac{bdr(W)}{2}-\frac{dr(W)}{2n+1}\left(\frac{a}{2n}+b\right)\right][g(Y,Z)X - g(X,Z)Y] \\ &\quad -\frac{adr(W)}{2}[g(Y,Z)\eta(X)\xi - g(X,Z)\eta(Y)\xi] \\ &\quad -\left[\frac{adr(W)}{2}+\frac{bdr(W)}{2}\right][\eta(Y)\eta(Z)X - \eta(X)\eta(Z)Y] \\ &+a\left[3k-\frac{r}{2}\right][g(Y,Z)(\nabla_W\eta)(X)\xi + g(Y,Z)\eta(X)(\nabla_W\xi) \\ &\quad - g(X,Z)(\nabla_W\eta)(Y)\xi - g(X,Z)\eta(Y)(\nabla_W\xi)] \\ &\quad + (a+b)\left[3k-\frac{r}{2}\right][(\nabla_W\eta)(Y)\eta(Z)X + (\nabla_W\eta)(Z)\eta(Y)X \\ &\quad - (\nabla_W\eta)(X)\eta(Z)Y - (\nabla_W\eta)(Z)\eta(X)Y].\end{aligned} \tag{4.4}$$

Noting that we may assume that all vector fields X, Y, Z, W are orthogonal to ξ and using (2.1), we get

$$\begin{aligned}(\nabla_W\bar{P})(X,Y)Z &= dr(W)\left[\frac{10a}{21}+\frac{5b}{14}\right][g(Y,Z)X) - g(X,Z)Y)] \\ &\quad +a\left[3k-\frac{r}{2}\right][g(Y,Z)(\nabla_W\eta)(X) - g(X,Z)(\nabla_W\eta)(Y)]\xi.\end{aligned} \tag{4.5}$$

Applying ϕ^2 to the both sides of (4.5) and using (2.1), we get

$$\phi^2(\nabla_W\bar{P})(X,Y)Z = dr(W)\left[\frac{10a}{21}+\frac{5b}{14}\right][g(Y,Z)X - g(X,Z)Y]. \tag{4.6}$$

Using (2.22), the equation (4.6) reduces to,

$$\begin{aligned}A(W)\bar{P}(X,Y)Z &+ B(W)[g(Y,Z)X - g(X,Z)Y] \\ &= dr(W)\left[\frac{10a}{21}+\frac{5b}{14}\right][g(Y,Z)X - g(X,Z)Y].\end{aligned} \tag{4.7}$$

Putting $W = \{ei\}$, where $\{ei\}$, $i = 1, 2, 3$, is an orthonormal basis of the tangent space at any point of the manifold and taking summation over i, $1 \leq i \leq 3$, we obtain

$$\bar{P}(X,Y)Z = \lambda[g(Y,Z)X - g(X,Z)Y], \tag{4.8}$$

where $\lambda = \left[\frac{dr(e_i)}{A(e_i)}\left(\frac{10a}{21}+\frac{5b}{14}\right) - \frac{B(e_i)}{A(e_i)}\right]$ is a scalar, since A and B are non-zero 1-forms. Then by Schur's theorem λ will be a constant on the manifold. Therefore, (M^3, g) is of constant curvature λ. Thus we get the following theorem:

Theorem 4.4. *A 3-dimensional Generalized pseudo-projective ϕ-recurrent N(k)-contact metric manifold is of constant curvature.*

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Impact of Chemathoate Nutritional Index of Freshwater Fish, *Cyprinus Carpio*

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Abstract- The freshwater fish, *Cyprinus carpio,* exposed to acute exposure period (Lethal concentration for 96 hours = 4.369 ppm) and ½ and 1/4th sub lethal concentrations (2.185 and 1.092 ppm) of chemathoate for 30 days. The protein content various tissues of fish was observed after exposure period. Acute exposure caused a significant decrease the protein content in testis, ovary and brain and insignificant decrease in intestine, muscles, liver and gills, whereas increased protein level was observed in kidney. The two sub lethal concentrations are caused to decrease of protein content in ovary, brain, intestine, muscles, gills and liver for over 30 days exposure period, whereas protein level in testis of fish was increased to 1/4th concentration of LC50 and decrease of protein content was noticed at ½ LC50 concentration of chemathoate.

Index Terms- Chemathoate, Cyprinus carpio, Protein content, Nutritive value

I. Introduction

Indiscriminate use of various agriculture pesticides and enter into the aquatic environment and adversely affect the non target organisms. Pesticides in water cause damage to biotic life especially to fish (Mance, 1987). Fishes are very sensitive to a wide variety of toxicants in water. Various species of fish show uptake and accumulation of many contaminants or toxicants such as various pesticides and heavy metals. Among these, pesticides have been found to be highly toxic not only to fishes but also to fish food organisms. Pesticides produce many physiological and biochemical changes in the freshwater fauna by influencing the activities of several enzymes and metabolites (Janardana Reddy, 2011). It has also been reported that acute and chronic toxicities of pesticides caused biochemical alterations in organs (Hatai et al. 2005; Rawat et al., 2002; Ikem et al. 2003; Janardana Reddy, 2012).

Beaumont et al. (2000); Almeida et al. (2001); Choudhary and Gaur (2001) and Janardana Reddy (2011, 2012, 2013) have discussed the variations in biochemical indices in various tissues of fishes with toxic effects of different heavy metals and pesticides. Therefore it is evident from the literature that the extensive work has been carried out on the toxic effects of pesticides on metabolic indices of fishes, very little work has been done on biochemical indices of carp fish, *Cyprinus carpio*. So the present work has been designed to assess the extent of alterations of protein content in fish treated with chemathoate toxicity.

II. Research and Elaborations

The freshwater fish *Cyprinus carpio* were collected from the freshwater fish breeding and culture centre, Kalyanidam, near Tirupati. Fishes were acclimatized in dechlorinated and well aerated ground well water supplied by the university, for two weeks. During acclimatization they were fed daily with pieces of live earthworms. The holding water was changed daily. The average temperature of water was 26±1ºC. The LC50 values are determined by following the guidelines given on committee of toxicity tests with aquatic organisms. Stock solutions of the test compounds and their dilutions were made according to the guidelines given in the standard methods (APHA, AWWA, WEF, 1998). The test species were also selected as recommended by these standard methods. The water was continuously aerated before putting in the fish to remove any residual chlorine. The fish were fed daily during conditioning period. Duration of the static acute bioassays was 96 h. Toxicity range finding was by pre experiments carried out in aquaria containing 10 fish. The LC50 values are calculated by Probit Analysis Method Finney (1971).

The acclimatized fishes were exposed to acute lethal concentration (4.369 ppm) for 96h and ½ and 1/4th sub lethal concentrations (2.185 and 1.092 ppm) for 30 days. Simultaneously a control group of healthy fishes were maintained constantly (Table-1). At the end of the each exposure period, fish were stunned to death and target organs such as different tissues viz. gill, liver, gonads, brain, kidney, intestine and muscles were dissected out and were processed for the biochemical estimations. Protein content was estimated by Folin phenol reagent method (Lowry et al., 1951).

III. Results and Discussion

In the present study observed that chemathoate caused a significant decrease in total protein content in testis, ovary and brain and least decrease in intestine, liver, gills and muscles, whereas increased protein level was observed in kidney at acute exposure to lethal concentration (4.369 ppm) of chemathoate for 96 hours. The two sub lethal concentrations (1/4th and ½ sub lethal of LC_{50}) caused a decrease in the level of protein content in ovary, brain, intestine, muscles, gills and liver of fish, *Cyprinus carpio* (Table-2). Therefore in testis protein level increased at 1.092 ppm and decreased in 2.185 ppm exposure periods. Sub lethal exposures have accelerated to increase the protein level with decrease in the pesticide concentration i.e. increased protein level in ovary, testis, intestine, gills, brain and liver, whereas decreased amount of protein in muscles and kidney were observed at low concentration (1/4th of LC50).

Decrease in protein content after exposure to chemathoate may be attributed to the improvement of protein synthesis and or increase in the rate of its degradation to amino acids which may be fed to TCA cycle through aminotransferases probably to cope up with high energy demands in order to meet the stress condition. The decrease in protein content suggests an increase in proteolytic activity and possible utilization of its products for metabolic purpose. Similar findings were reported by Kale et al (1999) proteins are the main source of energy there degradation is to cope with high energy demand augmented during malathion stress in *Cyprinus carpio.* Also the total protein level showed decreased trend in Nile Tilapia (*Oreochromis niloticus*) in response to the treatment of cypermethrin by Korkmaz et al.(2009). In *Clarius gariepinus* exposed to cyhalothrin decreased protein observed by Ogueji and Auta (2007). Atamanlap et al. (2002) reported decrease in protein content in rainbow trout (*Oncorhynchus mykiss*) due to contaminated environment condition.

Yogana et al. (1981) reported decrease in protein content of muscles after DDT treatment in the fish *Clarias batrachus*. Reddy et al. (1991) observed decreased level of protein in brain, liver and muscles of fenvalerate exposed fish *Cyprinus carpio.* Saxena et al. (1989) observed decreased level of protein in gonads of *Channa punctatus* after fenitrothion and carbofuran exposure. Shinde et al. (2002) has also been reported the decrease of protein content in ovary of *Notopterus notopteus* treated with heavy metals. Singh and Bhati (1994) reported progressive decrease in the protein content with increase in exposure time in liver of *Channa punctatus* under 2, 4-D stress. Similar results were observed during present investigation. The changes in protein content may be due to damage caused to hepatic tissue and increased proteolysis. Ghousia and Vijayaraghavan (1995) reported decrease in protein content of dimethoate intoxicated fish (*Clarias batrachus*) indicated physiological adaptability of the fish to compensate for pesticide stress. To overcome the stress the animals require high energy, this energy demand might have led to the stimulation of protein catabolism. Rajyashree (24) also observed decline in protein level in liver, muscles, gills and brain during carbamide exposure of *Labeo rohita.* Das et al. (1999) observed marked decrease in the protein content of various tissues like kidney and muscles and slight increase in the protein content of brain and gills in cypermethrin treated fish, *Channa punctata*. Susan et al., (1999) have also reported a significant decrease in protein content under sub lethal concentrations of fenvalerate in the gills of *Catla catla.*

Proteins are the main energy sources and play an important role in the maintenance of blood glucose. Initially insignificant alternation of proteins at the end of 96 hours was observed in the tissues suggesting that the fish tend to resist the sudden stress for shorter duration, later with increases of time the decrease of protein content. Mastan and Rammayya, (27) are stated that the survival ability of animals exposed to stress mainly depends on their protein synthetic potential and the degradation of protein suggests the increase in proteolytic activity and possible utilization of their products for metabolic purposes and cause damage to tissues.

In the present study the decreased protein content during chemathoate exposure may be due to increased catabolism (Ghousia and Vijayaraghavan, 1995) and decreased anabolism of proteins (Khare and Singh, 2002). The reducing trend of protein content may be attributed to metabolic utilization of ketoacids to gluconeogenesis pathway for the synthesis of glucose or for the maintenance of osmotic and ionic regulations Schmidt (1975). The alteration in protein value in liver may also be related to some structural changes in the liver, the arrangement of hepatic cords leading to the alterations of liver metabolism. Decrease in protein content could possibly be due to protein breakdown and suggests decrease in protein is due to damage of hepatic tissue and an intensive proteolysis.

The present study proved that the chemathoate is highly toxic and had a detrimental impact on the responses of *Cyprinus carpio* at sub lethal concentrations and any alterations caused by the pesticides may lead to variations of total proteins in fish. A decrease in the protein content during exposure to chemathoate is indicating the decrease of the nutritive value of fish that leads to decrease of market demand of fish, so the aquaculture scientists have to monitor the release of pesticides in to the aquaculture field.

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Table 1: Physico-chemical parameters of water used in experiments

S. No	Parameter	values
1	Turbidity	8 Silica units
2	Electrical conductivity	28ºC 814 microohms/cm
3	pH value at 28ºC	7.8
4	Total Hardness (as CaCO3)	256mg/L
5	Calcium Hardness (as N)	74mg/L
6	Sulphate (as SO4)	Trace
7	Chloride (as Cl)	36mg/L
8	Fluoride (as F)	1.6mg/L
9	Iron (as Fe)	Nil
11	Dissolved Oxygen	8.5-10ppm
12	Temperature	26ºC

Table 1: Variations in protein content in Cyprinus carpio treated with lethal and sub lethal concentrations of chemathoate.

Tissues	Control	Lethal Exposure Period (4.369ppm)	Sub lethal Exposure Periods	
			½ LC50=2.185	1/4th LC50=1.092
Intestine %change	31.797 ± 0.834 ----	21.346 ± 0.924 (-32.867)	20.274 ± 1.057 (-36.239)	15.123 ± 0.960 (-52.438)
Ovary %change	30.233 ± 0.841 -----	12.819 ± 0.595 (-57.599)	18.263 ± 0.710 (-39.592)	15.447 ± 0.483 (-48.907)
Testis %change	28.934 ± 0.588 -----	21.236 ± 1.105 (-26.605)	16.519 ± 0.536 (--42.907)	29.896 ± 0.734 ns (+3.329)
Gill %change	26.837±0.325 -----	18.365 ± 0.554 (-31.568)	17.192 ± 1.364 (-35.939)	15.362 ± 0.530 (-42.758)
Liver %change	27.079±0.689 ------	18.892 ± 0.498 (-30.233)	16.545 ± 0.935 (-38.901)	13.804 ± 0.982 (-49.023)
Kidney %change	17.682 ± 0.209 ------	23.732 ± 1.213 (34.215)	15.437 ± 0.739 (-12.696)	13.937 ± 0.388 (-21.179)
Muscle %change	11.96 ± 0.241 ------	9.721 ± 0.199 (-18.741)	8.243 ± 0.176 (-31.095)	6.758 ± 0.184 (-43.509)
Brain %change	23.732 ± 1.213 -------	12.682 ± 0.209 (-46.562)	19.075 ± 0.123 (-19.623)	21.125 ± 0.173 (-10.985)

Values are mean ± SD of six individual observations.
Each Tissue sample was pooled from six individual animals.
All values are significant at $p<0.05$; ns =not significant.

BER Performance of "OFDM-IDMA" Comparison to OFDM for Femtocell

Sandeep Kumar Dwivedi, Vaibhav Purwar, Sanjiv Mishra

Abstract- In increase in system capacity and data rates can be achieved by getting the transmitter and receiver closer to each other. In wireless communication system, with the increase of data rate the distortion of the received signal caused by multipath fading channel become a major problem. OFDM (orthogonal frequency division multiplexing) technique is a solution of this problem in wireless communication. OFDM provides much more bandwidth efficiency as compared to conventional multicarrier modulation schemes. Simulation results are based on MATLAB completely.

In wireless communication, in increase in system capacity and data rates can be achieved by getting the transmitter and receiver closer to each other. This paper summarizes the main concept of of femtocells that is covered in literature and major challenges are also described. The femtocell base station also called as femtocelll access point is fully user deployed and reduces the operational cost, interferences.

Index Terms- Femtocell, OFDM Interference management, OFDM-IDMA.

I. Introduction

OFDM is a digital modulation schame in which a wideband signal is split in to a number of narrowband signals.Because the symbol duration of a narrowband signal will be larger than that of a wideband signal, the amount of time dispersion caused by multipah delay spread is reduced.OFDM is a multicarrier modulation scheme in which multiple user symbols are transmitted in parallel using different orthogonal subvarriers. The conventional multicarrier modulation techniques suffer from bandwidth inefficiency due to use of guard interval or spacing between adjacent channels.Our aim is here to achieve high data rate by using limited avalaible frequency bandwidth efficiency [1] [2].

IN femtocell, femto means 10^-15. Because femtocells are much smaller than the standard Macro cell cellular tower. Femtocell is a small, inexpensive, 3G base station that is sold by a customer from the operator. After that, it is installed in customers home or offices and connected to the network operator via broadband connections. it can be plug and play by the customers .when the mobile phone arrives under the coverage area of femtocell, phone switches over from macrocell to femtocell automatically. when phone leaves the coverage area of femtocell, phone switches over from femtocell to macrocell automatically. Femtocell can provide a better solution for the indoor coversge problem. Basically due to small cell radius, the distance between transmitter and receiver is reduced, hence transmitted signal is less attenuated and in turn receiver can receive a good receive signal strength. The quality of a signal at the receiver is measured in terms of SINR. The SINR is a function of the transmitted power from the desired base station, transmitted power from interfering transmitters, shadowing, fading, and path losses. This attenuation is more prominent at higher frequencies that are commonly used in 3G technology for their high bit rate operations [3] [4].

II. Working Principle of Femtocell Network

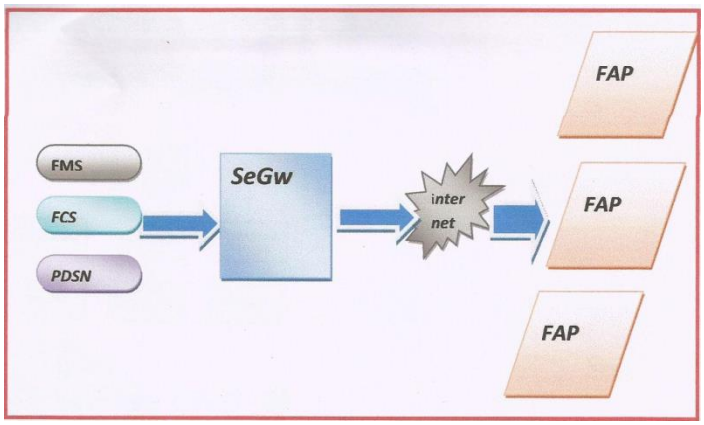

Figure. 1 Working Principle of Femtocell Network

Femtocells are an emerging technology adopted by the operators to enhance 3G connectivity and a new step for 4G wireless communication systems .Femtocell are ssecured devices installed in the customers home and office and connect the mobile phone to the mobile network operators network using an existing broadband connection [4].

1. Mobile Station- It is end user device or physical equipment used by the customer to acess the telecommunication services. It includes mobile handset and SIM.

2. Access Network- Access network enables the connection between the core network and itself. There are different components are used in access network such as antennas which is called NODE-B and Radio network controller controlling the NODE-B. This combination of components forms radio network system.

3. Core Network- This section is divided in to two parts such as circuit switched and packet switched. circuit switched services are connection oriented whereas packet switched services are connectionless services. The core network provides routing of telecommunication traffic, voice, SMS, data. For authentication and to identify the home user HLR is used and to identify the visitor user VLR is used [5] .

III. Security In Femtocell Network

Security in any wireless communication system is first requirement. In Femtocell network, SeGw, called security gateway provides internet security to the femtocell users by using IP security protocol. IP protocol is a network layer protocol in OSI model. The IP encrypted HNB (HOME NODE-B). traffic enters in to the core network via the SeGw. It authenticates the HNB first and estsblish further security .All the data are transferred to core network. The connectivity between core network and SeGw provides sure security for femtocell users [1].

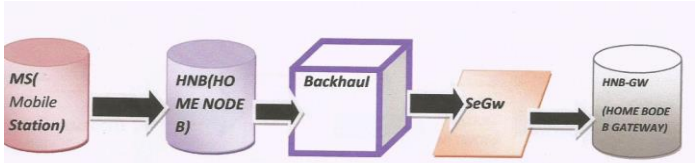

Figure.2 Security in Femtocell network

Advanced timing over [acket (TOP) technology supports bothIEEE1588-2008 andNTPv4 protocols to provide high performance and cost efficient synchronization for femtocell access point.

TOP is installed on the core network, RNC (server side) and on each femtocell access point (client side).when installed in the RNC TOP works like time server and provides time reference for femtocell access point. across the packet network. every packet sent from the RNC containing time that the packet was launched in to the network. When the RNC receives a packet from a femtocell client, it automatically returns a acknowledgement message including the reception time of the packet. The femtocell client uses an acknowledgement message as a reference to adjust its own clock. Figure 4 shows the clock synchronization from the RNC to femtocell client [2].

IV. Reasons of ISI in Wireless Communication

In wireless communication ISI (Inter Symbol Interference) is the major problem,ISI is caused by high data rate transmission using conventional transmission schemes. Multipath propagation and bandlimited channels are the two factors causing ISI [3].

1. Multipath propagation-when the signal reaches the receiver end propagating through different paths, this is called Multipath Propagation. The time taken by the signal to reach the receiver end from transmitter end is directly proportional to the distance between the transmitter and receiver .Due to different path lengths for multipath propagation the delay time of received signal at the receiver end varies.

2. Band limited Channel-Band limited channel is a channel whose frequency response is zero above and below a certain cut-off frequency. When the signal is passed through such a channel the frequency components above the cut-off frequencies are completely removed therefore the removal of higher frequency components due to band limited channel making the time domain pulse spread. The distortion due to pulse spreading is referred as ISI.

V. Comparison of OFDM

1. *OFDM vs. CDMA*

Table 1.Comparison of CDMA and OFDM [1]

PARAMETERS	OFDM	CDMA
Near Far Effect	Insensitive	Sensitive
Synchronization	Yes	No
Crosscell Interference	Sensitive	Mitigated
Intercell Interference	NO	Sensitive
Treatment for ISI	Cyclic Prefix	Rake Receiver
To achieve high data rate	High order Modulation	Difficult

2. OFDM vs. IDMA

Table 2 Comparison of OFDM and IDMA [1]

PARAMETERS	IDMA	OFDM
Near Far Effect	MUG	Insensitive
Synchronization	NO	NO
Crosscell Interference	Mitigated	Sensitive
Intercell Interference	Suppressed by MUD	NO

VI. OFDM Principle

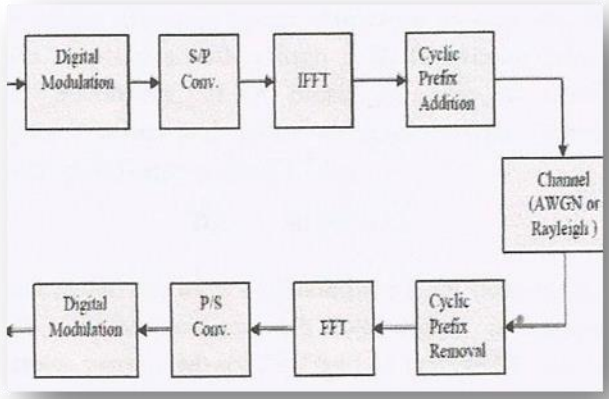

Figure 3 Working Principle of OFDM System

As shown in above figure, First the transmitted data is digitally Modulated using modulation schemes. Mostly QAM and PSK digital modulation schemes are used to modulate the transmitted signal. The output of the modulator is converted in to parallel signal. By this techniques signal is transmitted through subcarriers which are orthogonal to each other Due to orthogonality property, sub channels are not overlapped to each other, and ICI (Inter channel Interference) problem is reduced. The output of the serial to parrel converter is then applied to

IFFT (Inverse Fast Fourier Transform) .By using IFFT the spectral representation of the data is transferred in to time domain, which is much more computationally efficient. The Cyclic prefix scheme is used at the output of the IFFT [3].

VII. CYCLIC PREFIX

Cyclic prefix is a process of addition of a guard period to the start of each symbol. This guard period is a cyclic copy that extends the length of the symbol waveform. The addition of cyclic prefix to each symbol solves both ICI and ISI problems. From figure 1,

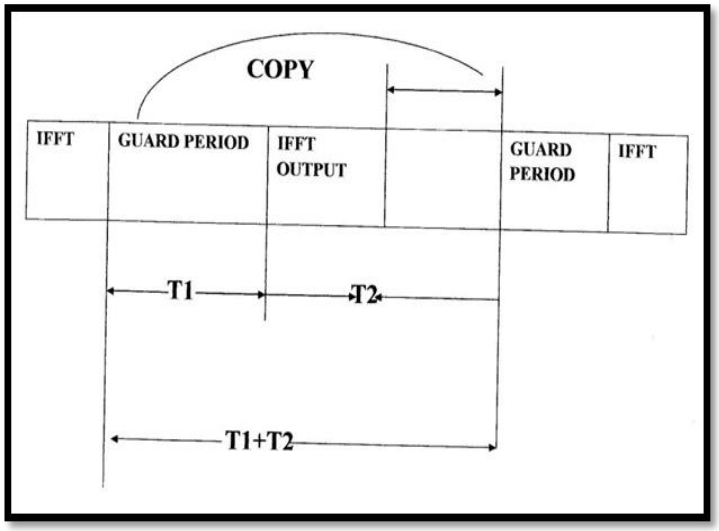

Figure 4 Concept of cyclic prefix

After that, the digital data is transmitted over the channel. At the Receiver side the reverse process is adopted as shown in the figure.2 we can see that the guard period is T1.When the guard period is not added the symbol period of IFFT output is T2 only. But when Guard period is added at the output of IFFT, then the symbol period is T1+T2. Therefore, the symbol period of transmitted data is increased, and ISI is reduced [4] [5].

VIII. OFDM-IDMA PRINCIPLE

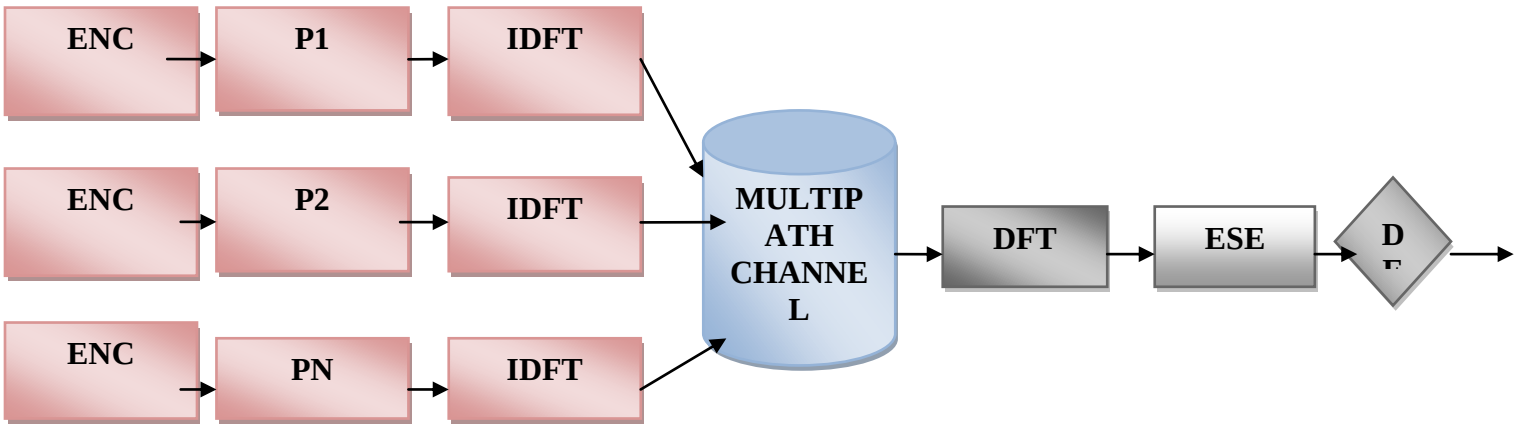

Figure 5 Working Principle of OFDM-IDMA System

The IDMA receiver complexity over multi-path channels is related to the channel length. Recently, OFDM-IDMA was proposed as an alternative to plain IDMA over multi-path channels. OFDM-IDMA inherits most of the merits of OFDM and IDMA. The key advantage of OFDM-IDMA is that MUD can be realized efficiently with complexity per user independent of the channel length and the number of users, which is significantly lower than that of other alternatives.

IX. SIMULATION RESULTS

BER Performance of OFDM system

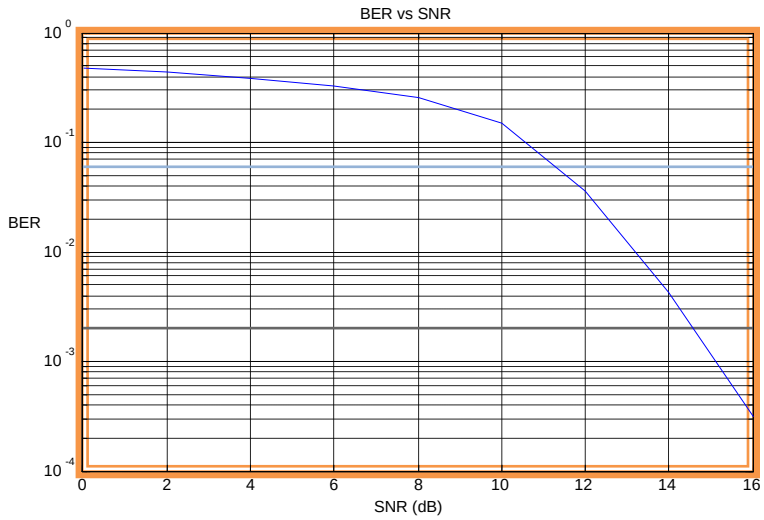

Figure 6 BER Performance of OFDM system

BER Performance of OFDM-IDMA

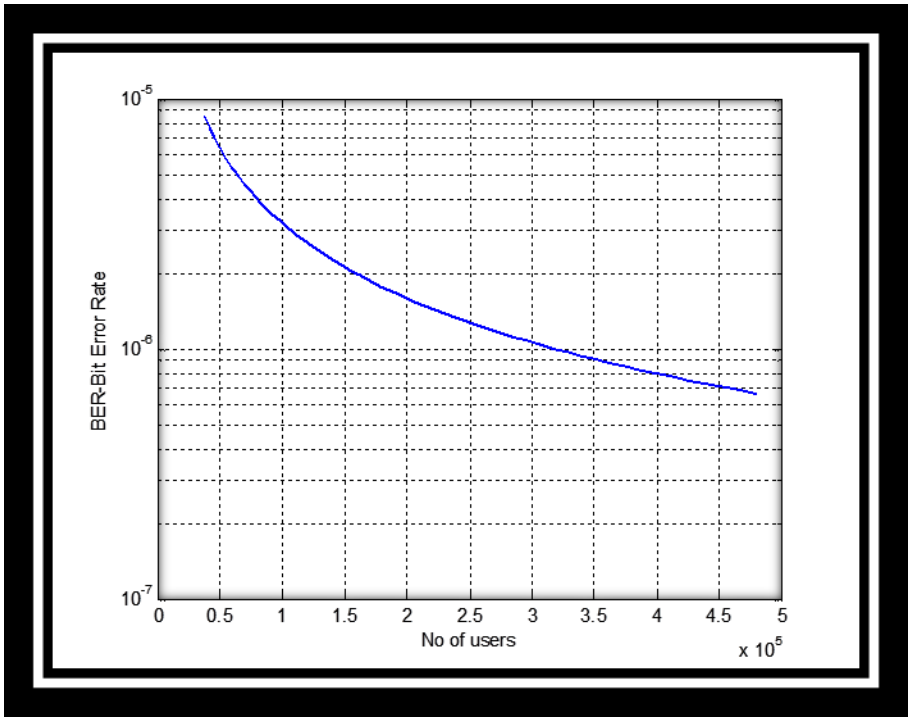

Figure 7 BER performance of OFDM-IDMA

X. CONCLUSION

In this paper we explained the problem of ISI and ICI in wireless communication and also discuss the Solution for it and this is OFDM system with Cyclic Prefix scheme. Now if we use Raised cosine filter with BPSK technique, the BER can be reduced and ISI is reduced. But we use OFDM-IDMA System, we find that by using OFDM-IDMA system Both ISI and ICI

problems are reduced. Therefore, OFDM-IDMA offers better BER performance tham IDMA and OFDM.

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Measures to combat Malaria in colonial Mysore

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Abstract- Princely State of Mysore in India was under the British colonial rule during 1881 to 1947.This historical research article aims to document the role of Princely Mysore State in campaigning against the outbreak of Malaria. The methodology adopted is the historical perspective. Modus operandi adopted by the Princely Mysore state to counter the deadly epidemic is also highlighted. There has been a remarkable progress in the prevention, control and eradication and adapted vigorous measures to eradicate the disease. The article also deals with the large sums of money spent by the State, the epidemic disease regulation passed, a separate intensive health campaign formed, health camps, special officers appointed, a laboratory, separate hospitals established and various precautionary measures adopted. Infectious diseases still remain among the leading causes of death worldwide. New findings show similarities among H1 N1, Dengue and Malaria.

I. Introduction

Malaria is an Arthropod- borne infectious and protozoan disease, caused by infection with parasites of the genus Plasmodium and transmitted to man by female Anopheline mosquito. **It is estimated that every 30 seconds a child dies of Malaria today, Malaria is attracting more attention as a serious global problem because currently no vaccine.** In Mysore State Malaria struck and spread over the state very frequently**,** the plantation and paddy laborers were affected by Malaria due to unhealthy weather conditions, increasing rains, poor sanitary facilities**.**[4] In **1897 the British Doctor Ronal Ross reported his remarkable discovery in India** and he was **awarded the Nobel Prize** for Medicine in 1902, "20 August 1897, known as the mosquito day the day he made his discovery.[5]

Malaria appearance in Mysore: first made its appearance during 1920, and spread with increasing virulence in every direction of the state. Severity of the epidemic reached its height in the first year of the outbreak.

Preventive measures: Public health department of Mysore played an important role in disease prevention, and it involved with several health activities. There was serious shortage of medical personal and medical facilities in India and especially in Mysore state. To provide more medical facilities and to protect the people both in rural and urban areas the princely state of Mysore adopted certain measures to prevent the disease.

The state was divided into Urban, Rural, City and District health units each being placed under an assistant commissioner, who was assisted by a medical officer of the grade of an assistant surgeon.[6]

Under the auspices of the International Health Division of the **Rockefeller Foundation of America, a health survey** of the State with special reference to **malaria was undertaken in 1927** and for this purpose the services of **Dr. Sweet** of the same Foundation were obtained.[7]

The formation of a separate **committee of Health campaign** to overcome such diseases, Special health officers were appointed, a laboratory was provided. [8]

Special act: To protect the people of the state government passed **Mysore Epidemic Diseases Act,** II in the year **1897**.[9] Government adopted vigorous measures to check the spread of the disease by making provision for the treatment of the disease in special hospitals.

II. Curative Measures

Special Hospitals: The permanent hospitals were established in the state called **Epidemic Disease Hospitals** at Bangalore in 1891, in 1898 at KGF and Mysore in 1926 working throughout the year to treat patients. Five buildings were constructed with accommodation for 66 patients. Roof of Mangalore tiles, corrugated iron & bamboo tatty sides

Temporary hospitals and health camps were established whenever there was an outbreak.

A Chemical laboratory was founded in 1895 at Bangalore to give laboratory support in order to investigate the outbreak of the epidemic diseases for Chemical analyses and experiments. Blood and spleen examinations were done. **The collection of rainfall, temperature and vital statistics data was also continued.**

Special Relief: Chemical disinfection was carried out generally & disinfection by desiccations was introduced as on experimental measure.

Arrangements were made for the **distribution of Multi vitamin tablets**. The **30 medical units with the special officers** of medical were deputed to tour frequently in the affected areas to take immediate action in case of outbreak of Epidemics. [10]

Neem leaves fumigation was undertaken in the infected localities as a further measure of control.[11]

4 Proceedings of Mysore representation Assembly 1903 K.S.A Bangalore.

5 WHO (2008), World Malaria Report 2008.

6 Mysore Gazett, Government Press Bangalore, vol-III. Page no 1454

7 Rao Sham M, Modern Mysore, Vol-VI p. 418.

8 Sham Roa, Modern Mysore Vol – II, Bangalore p. 233

9 Ibid

10 1940, P.21, Administrative Reports of Mysore State,. Divisional Archives, Mysore

11 1947, P.142, Administrative Reports of Mysore State,. Divisional Archives, Mysore

Four medical graduates of the State were deputed for training in sanitation to America. As a result of the spleen survey conducted by Dr. Sweet,

Malaria experimental stations three in number were established one at Nagenhalli in the Mysore taluk the second at Mudigere and the third at Hiriyur during the year 1920.

A Rural Health Unit also was established at Mandya, as an experimental measure. For the purpose of determining the staff, equipment and budget get necessary for organizing Health Units in all the taluks eventually.

The League of Nations Malaria Commission who visited the State in December 1929 at the invitation of the Durbar studied the malaria-control work at the experimental stations at Nagenhalli and Mudigere and the anti- malarial work in the Bangalore City and expressed their **appreciation** of the manner in which the problem was being studied. The Rockefeller Foundation lent in 1930 the services of Mr. J.J. Sweet, the Consultant in Health Department.

A Board of Health was created to advise the Government one of the main features of the scheme of reorganization was the constitution of Bureau of Epidemiology and Communicable diseases.[12] **Bureau of Malariology** was constituted in the Health Department. This bureau under took institutional studies and research in Malaria. It directs and supervises the execution of preventive and control measures of Malaria. It also started **training the staff** and looks to regular supply of material and technical equipment. This bureau was in close co-operation with the Rockefeller Foundation of America. It organized a malaria research station at Sakleshpur.[13]

Mosquito control work was started at Nagenhalli and Mudigere by using **'Paris-green' on all the anopheline breeding areas** within a radius of a mile from the center of the town were regularly treated at weekly intervals with Paris green diluted to a one percent mixture with dust or ash or both. The efficacy of the dusting of Paris green was regularly checked by larval catches. Quality spleen and blood examinations were done in the peripheral zone.[14]

In addition to the use of Paris green**,** experiments were conducted on **larvicidal fish 'Gambusia' used successfully** for the eradication of anopheline larvae breeding in wells. Actual results showed that the fish compare favorably with Paris green as a larval control measure in wells. It is, therefore, proposed to gradually it introduced them into all the wells and tanks of the state**.** A malaria survey of Mysore City was made and recommendations for malaria control work in the City were submitted during the year 1934.[15]

Quinine factory was established at Mysore in the year 1930, intensive treatment with **Plasmoquine and Tataqunine** was recommended as the only possible immediate remedy.

Anti malaria operations were continued during the year 1932 in Bangalore and Mysore. Paris green was applied to open sheets of water and Gambusia fish in the case of wells. After an initial year of observation, an experiment in the use small weekly dozes of **plasmoquine** compound was tried in Marikanave village.

Measures were adopted to check the spread of the disease by the systematic administration of **free distribution of quinine to schoolchildren** was started.

Pits and hollows were all drained to prevent stagnation of water and breeding of mosquitoes. Removal of rank vegetation and destruction of cactus was also undertaken. In the Civil and Military Station, oiling pools and ponds carried out anti- malarial work systematically and in addition draw-wells were stocked with larvicidal fish supplied by the Health Department of the State.[16]

The Superintendent, Bureau of Epidemiology and Communicable Diseases, undertook a Special spleen survey of the State and of the 1,717 children he examined 67 showed enlarged spleens of various sizes, the spleen rate being 3-9 against 11-.7 in 1930. Malaria survey of the under mentioned towns or rural areas of the State were done during the year 1932 and recommendations made for controlling the disease: (1) Sivanasamudram (2) Akkihebbal (3) Chatnahalli (4) Hoskote (5) Bhadravati(6) T.Narsipur and (7) Irwin Canal Area (Ibid)

A sample prepared at the **Government Industrial and Testing Laboratory** was found quite satisfactory. By the use of Gambusia (larvicidal fish).All the tanks wells in the Irwin Canal area were also stocked with Gambusia. Quinine was distributed free to patients suffering from malaria in this area and a spleen survey was made of 57 villages

Special malaria surveys and Malaria control work and general mosquito control operations were continued in villages. Five thousand two hundred and fifty-four wells were re-stocked with Gambusia fish.

Prof. Buxton of the London School of Tropical Medicine and **Mr. Dyer**, Sanitary Engineer of the Rockefeller Foundation, visited Mysore, Mandya, Nagenahalli and Hiriyur in the course of their malaria tour.

Fortnightly conferences were started and twenty-one conferences held on the anti-malaria operations. Engineering methods, such as cement-plastering and stone riveting of the sides and bed of the rivers undertaken.[17] Anti-malaria engineering works such as canalization of water courses with cement-plastering, stone-revetment, started in 1937.[18] Malaria control continued to receive, the close attention of the Department more than Rs. 2.35 lakhs being spent on anti-malaria works in various areas of the State. The scheme of Anti-Malaria measures in the extended area, comprising of 314 villages was sanctioned.[19]

In 1945 Pyrethrum-spraying for the prevention of malaria was found to yield very satisfactory results. A total quantity 319 gallons of **pyrethrum** was prepared in the Public Health Institute and an extent of **150 acres of land was planted with pyrethrum by the Forest Department**. The scheme was introduced for the control of malaria in a group of 198 villages and to cover 314 villages at a cost of about Rs. 1, 98,000 per

[12] Rao Sham M, Modern Mysore, Vol- II, p- 418 n 419.
[13] Rao Hayavadan C, Mysore Gezetteer, Vol-IV, p. 447.
[14] Vital Statistics and Medical Services, MAR, 1930, P. 63.
[15] Progress of Sanitation MAR, 1934, p. 136.

[16] Progress of Sanitation, MAR, 1932, p. 139 - 140.

[17] Vital Statistics and Medical Services, MAR, 1938, p. 152 and 153.
[18] Administration Report of Mysore, 1940, p. 154. Divisional Archives Mysore.
[19] Administration Report of Mysore, 1940, p. 21. Divisional Archives Mysore.

annum. Government has sanctioned a further sum of Rs.15 lakhs for carrying out the second stage of the scheme which involves canalizing 61 valleys and depleting 58 tanks in the area.[20]

Bureau of Malariology: The department of Malariology was created in the **Medical Colleges, and Lectures in Malariology** were given to the students Mysore, and Bangalore.

Health Units: In addition to the Krihnarajasagar Health Committee that was functioning, three more committees, the Sakrebyle Project Committee the Marconahalli and Nugu Committees were constituted**.** A systematic bi-annual spleen survey of all villages within the health unit areas was arranged during the year, 1947.[21] Malaria control works were continued in Maralvadi, Banavar, Taverekere, Tiptur, Kanagal, Thippagondanahalli, Princess Krishnajammanni Sanatorium, Jog, Sakleshpur, Koppa, Anandapuram, Sorab, Heggadadevankote, Mudigere, Mandya, Bhadravati, Belur and other places and in Bangalore and Mysore Cities. The schemes for Dugganahalli, Sowlanga and health units for Kadur District were sanctioned.[22]
An itinerant dispensary, with one Sub Assistant Surgeon & 4 compounders were working in Malaria affected villages in the remote areas.[23]

Bureau of health Education was established in the year **1930**. The primary function is to provide scientific knowledge to people about health problems and to bring about changes in life styles and risk factors of disease and create awareness of health needs problems through a programme of public health information. Propaganda by means of lectures on malaria was carried on in Kannada, Tulu and Tamil, the lectures being invariably given with the aid of moving picture films. An epidemic of fever in some villages of Kolar Taluk situated along the over- flow channels connecting the Polar series of tanks was investigated in June 1930. The staff of the unit visited 97 villages of the Periyapatna taluk.[24] Organized a large number of cinema shows. 5000 copies of leaflets, booklets, posters were distributed, and all prepared by the Department and were warning against diseases.[25]

III. Conclusion

There was a marked decrease in the incidence of Malaria with this rapid implementation of the modern system of measures.

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[20] Administration Report of Mysore, 1945, p. 142-145. Divisional Archives Mysore.
[21] Administration Report of Mysore, 1947, p. 142. Divisional Archives Mysore.
[22] Administration Report of Mysore, 1947, p. 145. Divisional Archives Mysore.
[23] June 1939, Mysore Information Bulletin.
[24] Ibid
[25] Mysore Information Bulletin, July 1940.

Study of the red algae growth *Gracilaria multipartita* (Clemente) Harvey (Rhodophyceae, Gracilariales) of the Moroccan Atlantic coast

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Abstract- The monitoring morphological changes of *G. multipartita* fronds during the study period, shows that the maximum growth was reached in June 2012. This summer form is characterized by large fronds with regular and abundant branches. After growth arrest during the summer, a new growth phase more or less pronounced depending on the year is observed in autumn. Fronds then degenerate to make room for new growth in January on perennial disk. The study indicates that it would be possible to exploit the species in June, before the fronds begin to degenerate.

Index Terms- *Gracilaria multipartita* - Thallus - Growth - Atlantic Coast - Morocco

I. Introduction

In Morocco, seaweed processing is one of the most dynamic of the operating and processing industry sectors seafood products. This industry ensures the strongest marine products and places Morocco in the 3rd place worldwide for the production of agar. This dynamism will result in the marketing of new products, such as "Quick Soluble Agar" or agaroses.

The genus *Gracilaria* represents 60% of the biomass treated in the world. The yield of agar of this kind is very important and can reach up to 40.7% (*G. asiatica*). It lends itself well to aquaculture (Perez, 1997). Aquaculture of *Gracilaria* in Chile has placed this country in the first world rank agar producers (Buschmann et al., 2001). *Gracilaria multipartita* (Clemente) Harvey is widespread in Morocco (Gayral, 1958; El Gourji, 1999; Benhyssoun et al, 2002). It presents a high-quality agar (Givernaud et al. 1999).

The present work focuses on the study of the development cycle of this species to determine good times to harvest in three study stations.

II. Materials and methods

II.1. Collection stations

The study area is located along the Moroccan Atlantic coast, it is located between the coordinates 33 ° 25 'N and 32 ° 50'S. We selected three stations in this part of research: Lahdida (North of Azemmour), Moulay Abdellah and Sidi Abed (Figure 1).

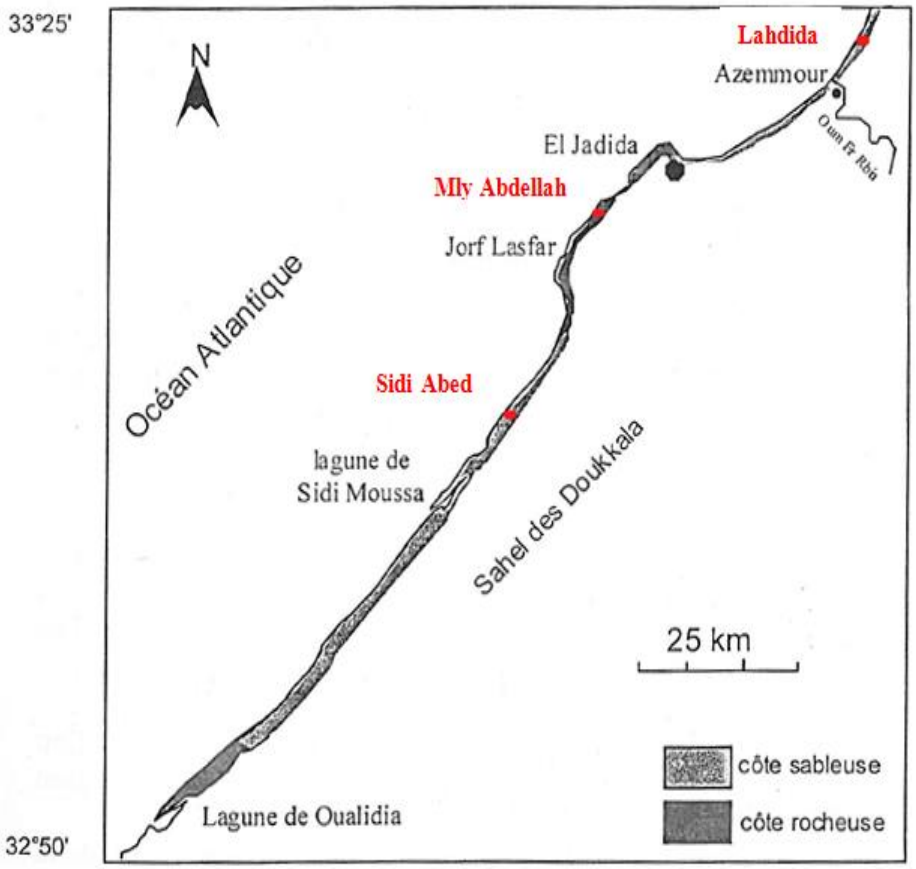


Figure 1: Geographical Aspects of the three study sites.

We chose these three stations among others for the following reasons:

- Stations number was limited to three for difficulties reasons of sampling.
- Stations were too separated to cover the entire coastline Doukkala-Abda.
- Lahdida station was chosen to evaluate the effect of silting caused by the Oued Om Er rbie mouth.
- Mly Abdellah station was chosen to evaluate the pollution effect by discharges of the phosphate complex Jorf Lasfar.
- Sidi Abed station was chosen as reference station by its distance from the pollution and algae raising activities intensively.

II.2. Material used

The red algae species concerned with the biological study is *Gracilaria multipartita*. This agarophyte has a flattened frond branched subdicotomiquement. The identification of *Gracilaria* is very confusing; It was confirmed by molecular analysis using the DNA sequence encoding the rRNA of the small subunit of the ribosome (18SrDNA) and by spacer of rubisco claimed the Coleman and Goff method (Benhissoune S. et al., 2002).

II.3. Methods

The harvest of the red algae species *Gracilaria multipartita* was carried out monthly in three geographically separated stations: Lahdida (North Azemmour), Moulay Abdellah and Sidi Abed. The parameters measurement considered in the biology evolution of the species studied was performed on 100 randomly fronds harvested in natural beds, and are:

- The frond length (cm), it was determined by measuring the frond length;
- The frond mass (g) was determined by weighing each frond using a balance with a precision gram;
- The total number of branches (RT) is counted for each thallus.

III. Results

III.1. Growth analysis of *Gracilaria multipartita*

III.1.1. Qualitative analysis of growth

The monitoring morphological changes fronds of *G. multipartita* during the study period, shows that the maximum growth was reached in June 2012. The monthly variation in growth during an annual cycle is described below:

- **June 2012**, the algae reach its maximum size. This summer form is characterized by large fronds with regular and abundant branches.
- **July 2012**, well developed thalli undergo apical usury which results in a loss of branches.
- **August-September 2012**, the fronds further decrease in size and have a damaged appearance due to the presence of necrosis points at different locations in fronds.

- **October 2012**, there is a growth resumption resulting in an increase in size. But branches number decreases and axes have a hail form.

-**November-December 2012**, thalli undergo partial degradation. First there was a fall ends of the branches that carry the cysts. Axes become weak and brittle due to intercropping necrosis and end by fragmenting under the action of waves. At the end of this period, the fronds are reduced to their fixing disk marking the end of the life cycle of the fronds.

- **January 2013**, the fronds grow from the attachment disk. The size thallus is reduced to less than 2 cm. The principal axes do not wear ramifications of second order and upright base is small and sparsely branched.

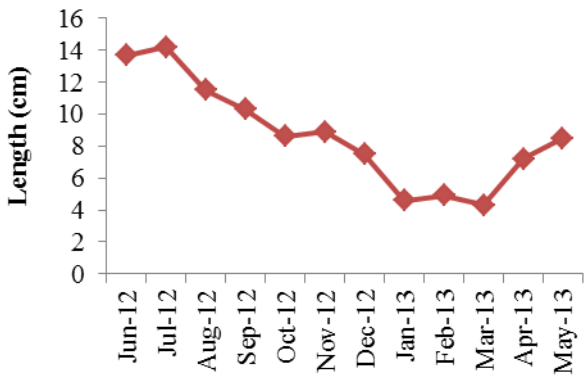
- **February-March 2013**, the algae has the winter characteristics form (reduced size, axes spindly, cylindrical and undeveloped branches).

- **April 2013**, the ramifications are flattening and widening. They become abundant and developed. Their ends are rounded and form acute angles with the main axis.

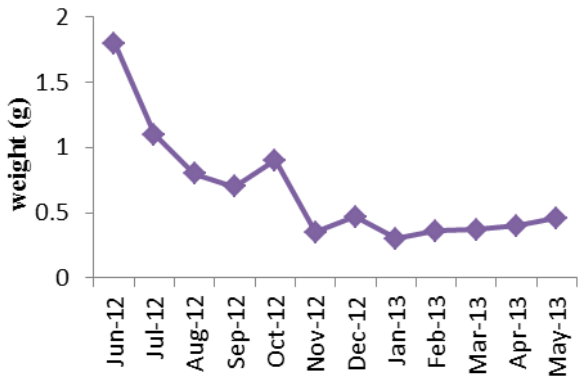
-**May 2013**, the thalli are flattened and the ramifications are abundant and developed. Apical growth is maximum and gives supple and long axes.

III.1.2. Quantitative growth analysis

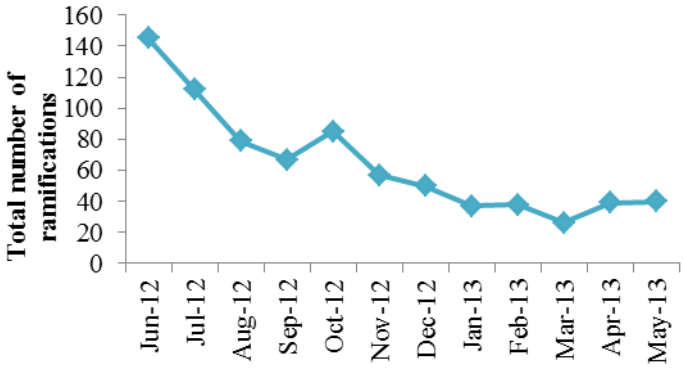
III.1.2.1. in Moulay Abdellah station



a) Average length of fronds



b) Average weight of thalli



c) Average Number of ramifications

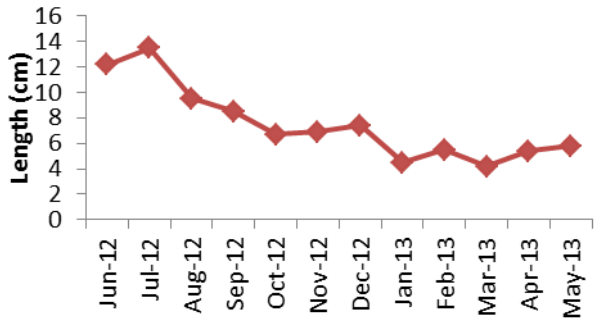
Figure 2: Seasonal variation of the average length, the average weight of thalli, and the average total number of ramifications of *G. multipartita* collected at Moulay Abdellah during an annual cycle.

- **Average length of fronds:** July shows the best thalli length (Figure 2a). Periods of high growth in length are recorded from March to July (with a maximum of 14.2 cm in July) and in September (with a maximum of 10.3 cm). The shorter lengths were recorded in winter, with a minimum of 4.3 cm during the months from January to March.

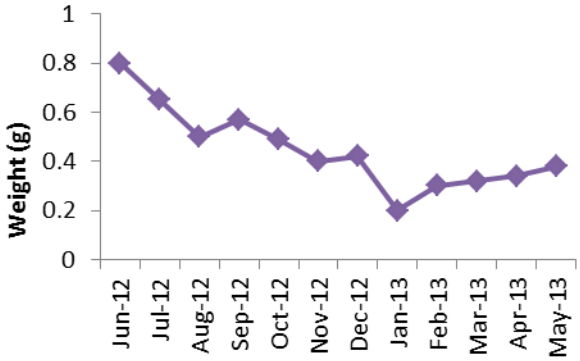
- **Average weight of thalli:** Thalli weight varied from a seasonally (Figure 2b). The low growth in winter, undergoes a slight increase between March and May, and becomes significant from May to a maximum of 1.8 g in June. After a decrease in weight during the summer a second smaller growth peak is recorded in October (0.9 g / individual). Thereafter, the thalli weight decreases to a minimum of 0.3 g / individual in January.

- **Analysis of the average number of ramifications:** The variation curve of the total number of ramifications follows a comparable weight thalli evolution (Figure. 2c). The average number of ramifications is minimal between January and March. It increases slightly between March and May, then becomes more important from May to reach the maximum in June (145 branches per individual), then declines thereafter to reach a minimum of 50 branches per individual in December.

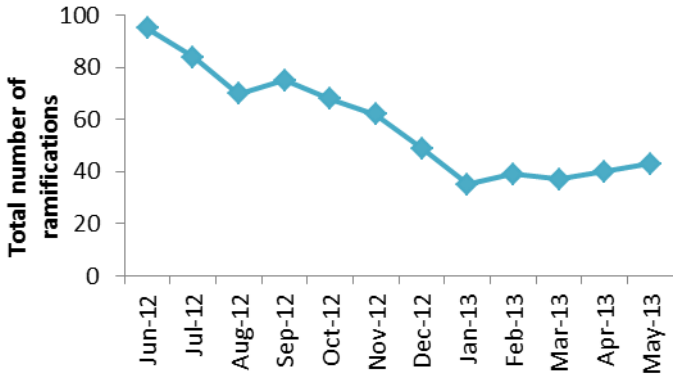
III.1.2.2. in Lahdida station



a) Average length of fronds



b) Average weight of thalli



c) Average Number of ramifications

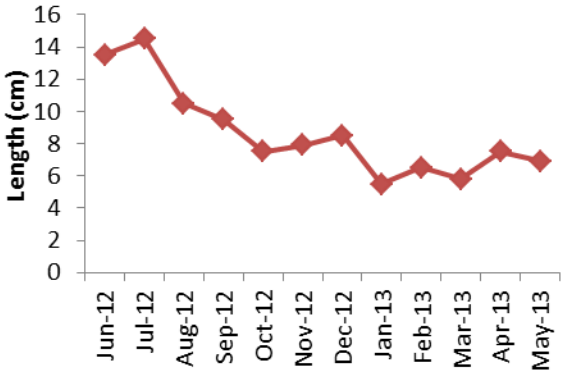
Figure 3: Seasonal variation of the average length, the average weight of thalli, and the average total number of ramifications of *G. multipartita* collected at Lahdida during an annual cycle.

- **Average length of fronds:** We note that July has very good growth in length. Periods of high growth in length (Figure 3a) are recorded from March to July (with a maximum of 14.2 cm in July) and September (with a maximum of 8.5 cm). The shorter lengths were recorded in winter with a minimum of 4.5 cm in the months from January to March.

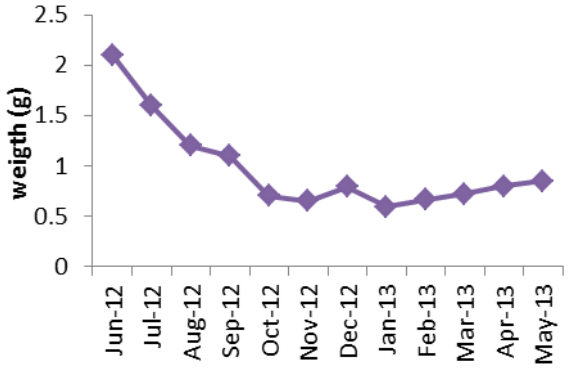
- **Average weight of thalli:** The weight growth undergoes a slight increase between March and May and becomes important from May to a maximum of 0.8 g in June (Figure 3b). After a weight decrease during the summer, a second smaller growth peak is recorded in September (0.57 g / individual). Thereafter, the thalli weight decreases to a minimum of 0.2 g / individual in January.

- **Analysis of the average number of ramifications:** The average number of ramifications is minimal between January and March (Figure 3c). It increases slightly between March and May and becomes more important from May to reach the maximum in June (95 ramifications per individual) and declines thereafter to reach a minimum of 49 ramifications per individual in December.

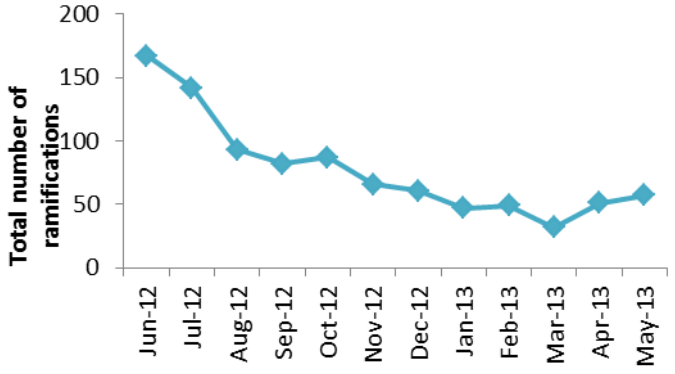
III.1.2.3. in Sidi Abed station



a) Average length of fronds



b) Average weight of thalli



c) Average Number of ramifications

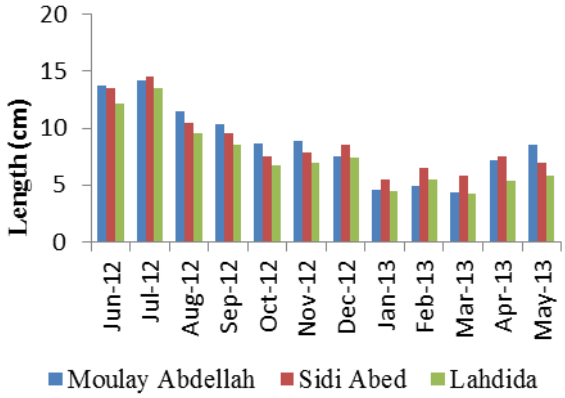
Figure 4: Seasonal variation of the average length, the average weight of thalli, and the average total number of ramifications of *G. multipartita* collected at Sidi Abed during an annual cycle.

- **Average length of fronds:** Seasonal variation in the length of fronds shows that July had the best growth in length (Figure 4a). From March to July, there was a significant increase in length (with a maximum of 13.5 cm in July) and in September (8.5 cm). The winter period is characterized by the lowest lengths (4.5 cm in January).

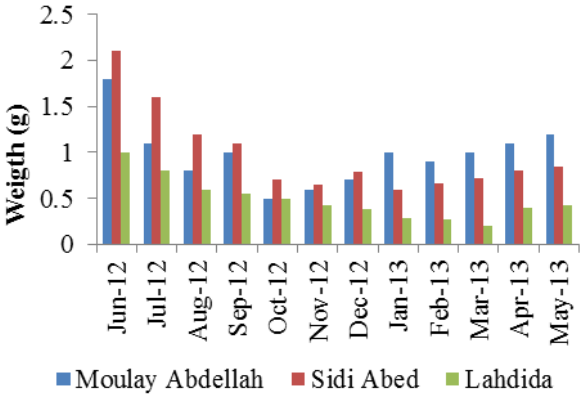
- **Average weight of thalli:** Seasonal changes in weight of *G.multipartita* thalli shows that weight increases slightly between March and May and reaches its maximum in June (0.8 g). Then, it decreases to a minimum in January (0.2 g), (Figure 9b).

- **Analysis of the average number of ramifications:** The average number of branches is low between January and March (Figure 4c). Then increases slightly to reach its maximum in June (95 ramifications per individual). The winter period is characterized by a decrease in the average total number of ramifications to reach its minimum in January (35 ramifications per individual).

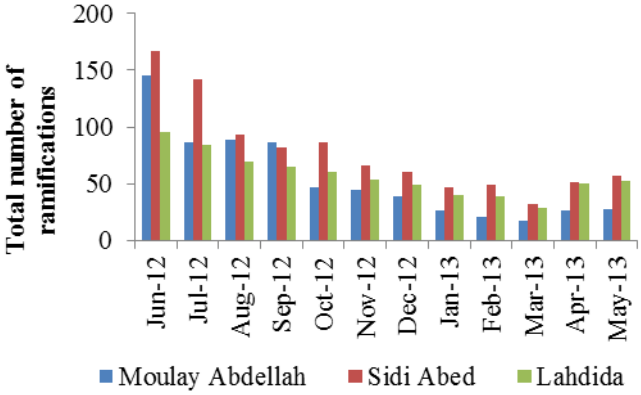
III.1.2.4. Comparisons between three stations



a) Average length of fronds



b) Average weight of thalli



c) Average Number of ramifications

Figure 5: Seasonal variation of the average length, the average weight of thalli, and the average total number of ramifications of *G. multipartita* collected at three stations during an annual cycle.

- **Average length of fronds:** The best time for growth in optimum length recognized in the three stations was during June-July 2012 (with a maximum in July) (Figure 5a). During the winter, there was a decrease in average length to reach minimum sizes between January and March. From this latter, there is length regeneration in the three study stations.

- **Average weight of thalli:** The evolution curve of the average weight of *G. multipartita* thalli shows a weight increase from March, peaking in June in three stations (Figure 5b). Then, the length parameter decreases during the winter to reach the minimum during the period between January and March.

- **Analysis of the average number of ramifications:** For the evolution of the average total number of ramifications, we note that the richest ramifications period began from April to July (maximum in June), and then decreases to a minimum during the period between January and March. Then, we note a slight increase from March to May (Figure 5c).

IV. Discussion

The species *G. multipartita* has low growth in winter and active growth in spring-summer and lightweight in autumn, similar results concerning growth periods were obtained by (Engel-RC Palmiter, 2000). From September to October fronds become fragmented and disappear and in winter the individuals are in disc form. Pondevida et al. (1996) showed that *G. cervicornis* biomass in Brazil has a maximum growth during the summer and a minimum in winter. The same results were

observed by Luhan MRJ (1996) for *G. heteroclada* and *G. baillinae*. Lee T. M., et al. (1999) distinguished in *G. tenusitipitata* a summer form with developed thalli and a very small in winter. Molloy F. J. and J. Bolton J. (1996) showed that the biomass production of *Gracilaria* species is higher in summer than in winter and attributed this difference to the significant increase in summer light intensity. The growth cycle study of *G. multipartita* shows that it is similar to that of other species also present in the study site; *Gelidium sesquipedale* (Hassani L. M. 2000), *Hypnea musciformis* (Chikhaoui M., 2001) et *Gigartina pistillata* (Amimi A., 2002). Similar results for the species *G. gracilis* growth period in the Cap Gris-Nez (France) region are indicated by (Engel-RC Palmiter, 2000). From September to October, the fronds become fragmented and disappear. Individuals then pass the winter in the disk form. During the year, the available light energy, which is considered the main factor responsible for photosynthesis, is also subject to seasonal variations. During the year, the available light energy, which is considered the main factor responsible for photosynthesis, is also subject to seasonal variations. According Friedlander M., et al. (1987), the growth rate is highly dependent on the temperature for *G. tikvahiae* and after (Lapointe B.E., 1981) according (Lapointe BE, 1981), the *G. multipartita* growth is dependent on light intensity. This light effect was also observed in *G. verrucosa* (Whyte J.N.C. et al., 1981).

V. Conclusion

The *G.multipartita* growth cycle is similar to that of *G. sesquipedale*, Best growth phase *G. multipartita is* recorded at the end of June-July (maximum growth). The exploitation of this species should be carried from this moment with a harvest period reduced at two months maximum to allow the algae grow in autumn. It is important to avoid, for this species, management errors encountered during the operation of *G. sesquipedale*. It must, in particular, respect the disk fixing the species is thalli perennial part ensuring the production of new fronds each year. The exploitation should be accompanied by populations monitoring to evolve the regulations depending on the natural resource response for both red algae (*G.multipartita* and *G.sesquipedale* species).

Thankful

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Application of algebra in Peterson Graph

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Abstract- In this work basic concepts of algebraic Graph theory and its properties are reviewed and extended to related concepts, of incidence matrix in Graph and Incidence matrix in a Peterson graph and its properties.

Index Terms- Peterson graph – Incidence matrix – Rank of the incidence matrix for a Peterson graph.

I. Introduction

Algebraic graph theory can be viewed as an extension to graph theory in which algebraic methods are applied to problem about graphs. Graph theory has found many applications in engineering and science such as chemical electrical civil and mechanical engineering, architecture, Management and control, communication, operation Research and computer Science.

A graph is completely determined by Specifying either its adjacency structure or its incidence structure.

Computer is more adopted at manipulating numbers than at recognising picture. It is a standard practice to communicate the specification of a graph to a computer matrix form.

This paper deals with Peterson graph and its properties with Incidence matrix and finding the Rank of the incidence matrix in a Peterson graph.

Definition 1

The degree of a vertex V_i in a graph G is the number of lines incident with v_i and is denoted by deg (v_i)
A vertex of degree '0' is called an Isolated point.
A Vertex of degree '1' is called the pendent Vertex.

Definition 2

For any graph G we defined δ (G) = min (deg v /v∈V(G) }
Δ (G) = max (deg v /v∈V(G) }
If all the Vertices of G have the Same degree r than
δ (G) = Δ (G) = r
Then G is called a regular graph of degree r
A regular graph of degree 3 is called a Cubic graph

Definition 3

Peterson graph is a 3- regular graph of 10 vertices and 15 edges.

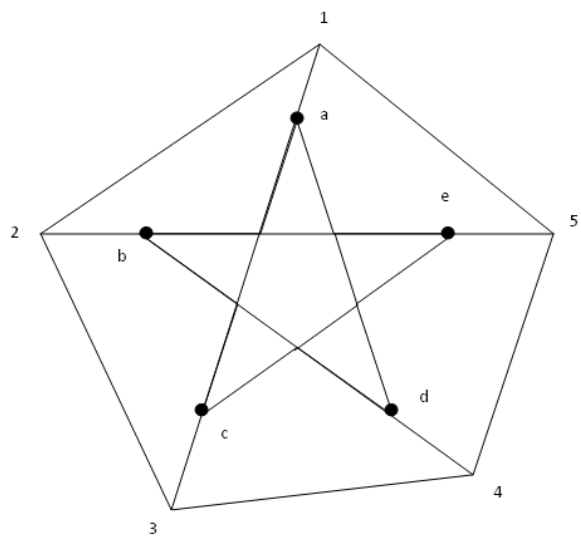

Figure 1

Peterson graph is a 3-regular graph

Definition 4

Incidence matrix, of a graph G With n vertices m edges and without self-loops is an n x m matrix A = (aij)

Whose n rows correspond to the 'n' vertices and the 'm' columns correspond to a m edges such that.

$$a_{ij} = \begin{cases} 1 & \text{if } j^{th} \text{ edge } m_j \text{ is incident on the } i^{th} \text{ vertex} \\ 0 & \text{otherwise} \end{cases}$$

It is also called vertex - edge incidence matrix and is denoted by A (G)

The incidence matrix contains only two types of elements 0 and 1.
It is a Binary matrix

Properties of the incidence matrix:

1. Every edge is incident on exactly two vertices. Each column of A has exactly two one's
2. The number of ones in each row equal the degree of the corresponding vertex.
3. A row with all Zeros represents Isolated Vertex.
4. Parallel edges in a graph produce identical columns in its incidence matrix.
5. The number of ones (or) number of Zeros are the same in every row in a incidence matrix Then the graph is regular.

6. If a graph G is disconnected and Consists of two components G_1 and G_2 The incidence matrix A(G) of a graph G can be written in a block diagonal form.

$$A(G) = \begin{pmatrix} A(G_1) & 0 \\ 0 & A(G_2) \end{pmatrix}$$

Where A (G_1) and A (G_2) are the incidence matrices of components G_1 and G_2

7. Permutation of any two rows (or) columns is an incidence matrix Simply corresponds to relabeling the vertices and edges of the same graph.
8. The incidence matrix A is defined over a field It is a Galois field module 2 It is denoted by GF (2)

Definition 5

Two graphs are said to be Isomorphic they have

(i) The same number of Vertices
(ii) The same number of edges
(iii) An equal number of vertices with a given degree

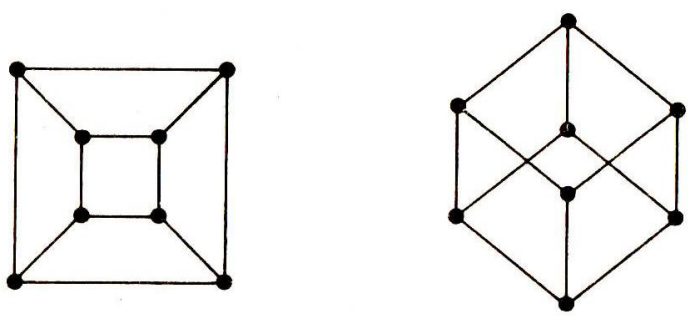

Figure 2: Isomorphic graph

Figure 3 : Peterson graph . Isomorphic to some other graphs

Theorem 1

Two graphs are Isomorphic if and only if their incidence matrices differ only by permutation of rows and columns

Proof :

Let G_1 and G_2 are Isomorphic graphs and $I(G_1)$ & $I(G_2)$ are the incidence matrices

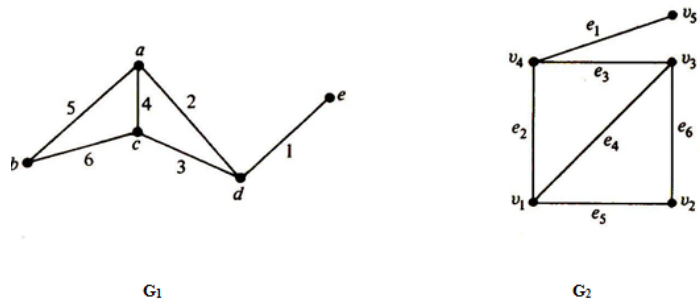

Figure 4

Incidence matrix of G_1 whose order 5 X 6.

$$I(G_1) = \begin{array}{c} \\ a \\ b \\ c \\ d \\ e \end{array} \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

Incidence matrix of G_2 whose order 5 x 6

$$I(G_2) = \begin{array}{c} \\ V_1 \\ V_2 \\ V_3 \\ V_4 \\ V_5 \end{array} \begin{pmatrix} E_1 & E_2 & E_3 & E_4 & E_5 & E_6 \\ 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

It is clear that the incidence matrix of G_1 and G_2 differ only by the permutation of column 5 and column 6.

Let the graphs G_1 and G_2 be isomorphic Then there is a one-one correspondence between the vertices and edges in G_1 and G_2 such that the incidence relation is preserved.

Thus $I(G_1)$ and $I(G_2)$ are either same or differ only by permutation of rows and columns.

Conversely permutation of any two rows (or) columns in an incidence matrix simply corresponds to relabeling the vertices and edges of the same graph.

Hence the theorem

Rank of the incidence matrix:

Let G be a graph and A(G) be its incidence matrix. Now each row in A(G) is a vector over G_F (2) in the Vector space of a graph G . Let the row Vector be denoted by (A_1 A_2 …….. A_n) Then

$$A(G) = \begin{bmatrix} A_1 \\ A_2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ A_n \end{bmatrix}$$

Since they are exactly two ones in every column of A The sum of all these Vector is Zero.

∴ Then the Vectors A_1, A_2 …… A_n are linearly dependent Therefore rank of A(G) <n
rank of A (G) ≤ n-1

Theorm (2)

If A (G) is an incidence matrix of a Connected graph G with n vertices then rank of A (G) is n -1

Proof:

Let G_1 be a connected graph with n=3.

Incidence matrix of G_1 is $A(G_1)$whose order is 3 x 2.

$$A(G_1) = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \end{array} \begin{array}{c} \begin{array}{cc} e_1 & e_2 \end{array} \\ \begin{bmatrix} 1 & 0 \\ 1 & 1 \\ 0 & 1 \end{bmatrix}_{3x2} \end{array}$$

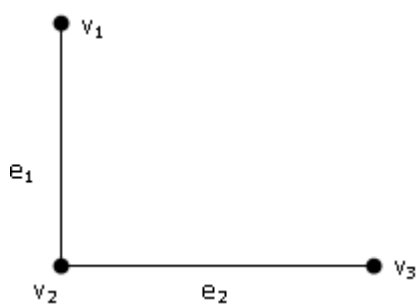

Figure 5: G_1

$$= \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} = 1$$

$$= \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = 1 \quad \& \quad \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = 1$$

Determinant of all possible minor matrices are not equal to zero.

⇒ Rank of $A(G_1)$ = 2. Similarly for n vertices.

$$A(G) = \begin{bmatrix} A_1 \\ A_2 \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ A_n \end{bmatrix}$$

Clearly rank A (G) ≤ n-1 - (1)

Consider the sum of any m of these row Vector m ≤ n-1

Since G is connected A (G) cannot be partitioned in the form

$$A(G) = \begin{bmatrix} A(G_1) & 0 \\ 0 & A(G_2) \end{bmatrix}$$

Such that $A(G_1)$ has m rows and $A(G_2)$ has n-m rows

Then there exist a number of m x m sub matrix of A (G) for m≤ n-1

Such that the modulo 2 sum of these m rows is equal to Zero.

As there are only two elements and 1 in this field the addition of all vectors taken m at a time for m= 1,2 …….. n-1 gives all possible linear combination of n-1 row vector. Thus no linear combination of m row vector of A for m ≤ n-1 is Zero.

∴ Rank of A(G)≥ n-1 ---- (2)

From (1) & (2) ; Rank of A (G) = n-1

Hence the theorem.

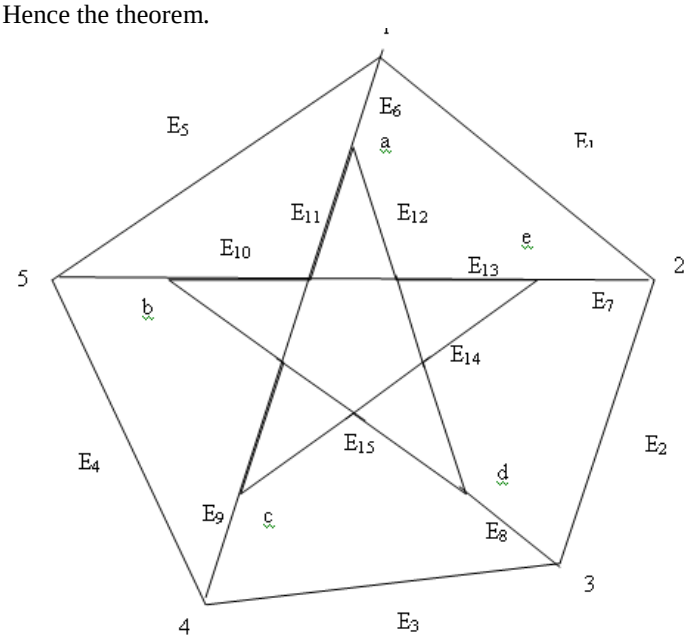

Figure 6

$$
\begin{array}{c}
\\ a \\ b \\ c \\ d \\ e \\ 1 \\ 2 \\ 3 \\ 4 \\ 5
\end{array}
\begin{array}{c}
\begin{array}{ccccccccccccccc} E_1 & E_2 & E_3 & E_4 & E_5 & E_6 & E_7 & E_8 & E_9 & E_{10} & E_{11} & E_{12} & E_{13} & E_{14} & E_{15} \end{array} \\
\begin{pmatrix}
0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 1 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\
1 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}
\end{array}
$$

10 x 15

II. Results

i) Every edges incident with exactly two vertices, then each column of the Incidence matrix of the Peterson graph has exactly two ones

ii) Every row has three ones (or) twelve Zero.
$\Rightarrow$ Peterson graph is 3-regular graph

iii) Sum of the each row is three it is equal to the degree of the corresponding vertex.

iv) The incidence matrix of a Peterson graph is defined over a field.

Galois field modulo 2 (or) GF(2) Such that the set (0,1) with operation addition modulo 2

0+0 = 0
1+0 =1
0+1 =1
1+1 =0

And multiplication modulo 2

0.0 =0
0.1=0
1.0 =0
1-1 =1

v) By theorem 2 : The rank of the incidence matrix of the Peterson graph is 9

Determinant value of the all sub matrix of order 10 x 10 is zero .

Determinant Value of the all sub matrix of order 9 x 9 is non-Zero.

Rank of the incidence matrix of the Peterson graph is 9.

III. Conclusion

To conclude that it is without doubt the Peterson graph is the generalization of the ordinary connected graph. From the nature of the Peterson graph many properties similar to those of ordinary connected graphs with the application of algebra can be extracted.

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Mucormycosis of Intestine in an Immunocompetent Individual

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Abstract- Mucormycosis is a relatively uncommon opportunistic infection caused by fungus Mucor. This usually occur in association with diabetes, leukemia , lymphoma , following long term use of corticosteroids and cytotoxic drugs.We present a case of gastrointestinal mucormycosis in a 40 year old immunocompetent patient with a mass in the jejunum mimicking Gastrointestinal stromal tumor(GIST).

Index Terms- Intestine , Mucormycosis

I. Introduction

Mucormycosis is a rare invasive fungal infection caused by Mucorales of class Zygomycetes that occurs in immunosuppressed individuals .[1] Rhinocerebral and pulmonary involvements of this infection are the most common followed by gastrointestinal (GI) infections. All parts of the intestine are vulnerable to infection, with stomach, ileum and colon most commonly involved. . Primary GI mucormycosis is an uncommon disease associated with a high mortality rate, as they are usually diagnosed late .[2]

II. CASE REPORT

A 40 year old male presented with abdominal pain and abdominal mass of 4 months duration. His routine investigations including blood sugar was normal. There was no history of any significant illness or drug intake in the past. On examination an ill defined mass measuring 3x 4 cm was present in the para umbilical region.USG abdomen showed a thickening in the wall of the jejunum forming a mass.Clinical diagnosis of gastrointestinal stromal tumor was made and the jejunum with the lesion was resected.On gross examination the segment of jejunum with mesentery measured 55 cm in length and weighed 591 grams. Jejunum appeared dilated and on cut section showed circumferential thickening of the bowel wall with ulcerated mucosa and black necrotic areas.

Fig 1. Segment of intestine showing black necrotic areas in the wall

On histopathological examination the entre thickness of the bowel wall showed granulomatous reaction with eosinophils and multinucleated foreign body giant cells .The granulomas and giant cells showed empty looking wide and non-septate fungal hyphae. The fungal stains PAS and Methenamine silver highlighted the thin walled broad aseptate fungal hyphae.

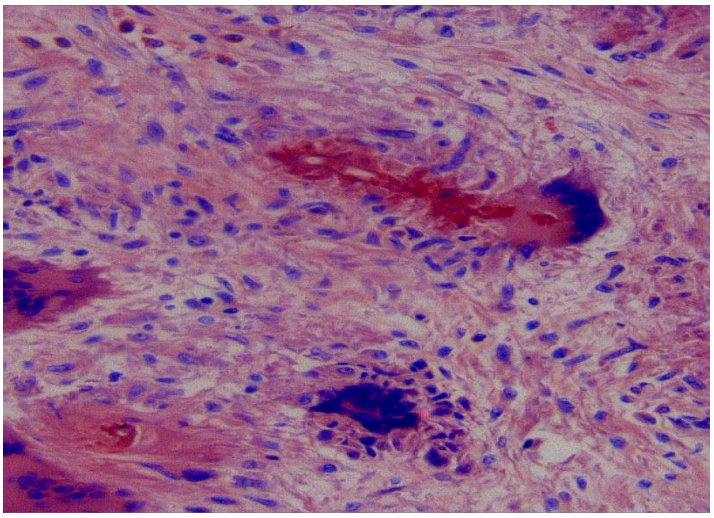

Fig 2.Empty looking fungal hyphe surrounded by granulomas and giant cells H&Ex200

Fig 3 Thin walled broad aseptate fungal hyphae .Methenamine silver x 400

Thrombosed blood vessels with hyphal invasion was seen. The mesenteric lymph nodes also showed granulomatous reaction with eosinophils and fungal hyphae. A diagnosis of Gastrointestinal mucormycosis was made based on the above findings.

III. DISCUSSION

Mucormycosis ,also known as phycomycosis or zygomycosis was first reported by Paultauf in 1885. It is a rare invasive fungal infection ,most often seen in immunosuppressed patients. Mucormycosis of the gastrointestinal tract is rare. It mainly occurs in infants or children, who are extremely malnourished. It is thought to arise from ingestion of the fungi.[1]Some patients with mucormycosis have no identifiable risk factors as in the present case. [2]

Mucorales and Entomophthorales, the two orders of the class zygomycetes, are closely related fungi with different manifestations .Mucorales are opportunistic fungi, that cause rapidly disseminating, often fatal infection in immunocompromised and diabetic patients .Fungi tend to invade blood vessels causing mycotic emboli. Entomophthorales are ubiquitous fungi usually causing chronic subcutaneous or nasofascial infections in immunocompetent individuals .The fungi has no tendency to invade blood vessels.[3]

All parts of the alimentary tract are vulnerable to gastrointestinal mucormycosis infection, with stomach (the most common site), ileum, and colon being commonly affected.[4]The route of infection is believed to be secondary to ingestion of the fungi, which then may colonize the gastrointestinal tract. Gastric mycoses have developed after nasogastric intubation or other conditions leading to the development of gastric or colonic ulcers, suggesting that an initial ulceration may facilitate fungal entry .The fungus invades the bowel wall and blood vessels, leading to bowel ischemia, necrosis ,perforation, peritonitis or massive hemorrhage.[5]

The symptoms of gastrointestinal mucormycosis are varied and depend on the site affected. Nonspecific abdominal pain and distention associated with nausea and vomiting are the most common symptoms. Fever and hematochezia may also occur. The patient is often thought to have an intra-abdominal abscess. . In premature neonates , mucormycosis may present as necrotizing enterocolitis. Gastric mucormycosis can be categorized into three forms: colonization, infiltration, and vascular invasion.[2] Sharma and associates reported isolated gastrointestinal mucormycosis in 8 patients, 2 of whom were middle-aged individuals without predisposing factors. The diagnosis may be made by biopsy of the suspected area during surgery or endoscopy.[6]The most frequent presentation is perforation, bleeding, or epigastric distention.

Mucoraceae are moulds in the environment that become hyphal forms in tissues. Once the spores (sporangiospores) begin to grow, fungal hyphae (angioinvasive forms) invade blood vessels, producing tissue infarction, necrosis, and thrombosis.[2] Neutrophils are the key host defense against these fungi, thus individuals with neutropenia or neutrophil dysfunction (diabetes, steroid use) are at highest risk. Two major hallmarks of histopathology are direct penetration and growth through the blood vessel wall, which explains the propensity for thrombosis and tissue necrosis with black eschar and discharge that are pathognomonic of this infection.[4]

Diagnosis of this condition can be elusive and is most often revealed by histopathology. There are no reliable, serologic, polymerase chain reaction (PCR) based or skin tests for zygomycosis. Therefore, the diagnosis is usually made by biopsy of infected tissues.[1] It is not possible to differentiate the various mucormycoses in tissue sections and isolation of Mucorales is difficult; material has to be cultured immediately.[3]

The biopsy demonstrates the characteristic wide, ribbon-like, aseptate hyphal elements that branch at right angles, as seen in the present case. A hallmark of zygomycosis infections is the virtually uniform presence of extensive angioinvasion with resultant vessel thrombosis and tissue necrosis. Tissue diagnosis of mucormycosis is essential to lower mortality, which can be higher than 50% in patients with hematological malignancies.Unfortunately, diagnosis is difficult and requires a biopsy of the organ(s) involved.[5] Aspergillus can sometimes produce a similar tissue reaction with multinucleated giant cells .It is readily distinguished by the presence of narrow hyphae with dichotomous branching at acute angles.

Antifungal therapy alone is typically inadequate to control mucormycosis, and surgery to debulk the fungal infection and /or resect all infected tissues is often required for effective cure.[6] Management of the underlying medical disease if any is also required.[8]

IV. CONCLUSION

Increased awareness of this condition as a possible cause of intestinal ischemia and high index of suspicion is required to make an early diagnosis and management in these patients . It is important to initiate vigorous supportive medical management and antifungal agents after adequate surgical excision with clear margins.

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Standard of Living of the Indian Origin Tamils in the Sri Lankan Estate sector

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Abstract- This paper examines the basic aspects of standard of living of the Indian origin estate sector Tamil society, which is a very unique social group living in the central highlands of Sri Lanka. The Indian origin estate sector Tamils are the people, who were brought by the colonial British from South India with the purpose of satisfying the increasing labour needs in the nineteenth century Sri Lankan plantations. Even after spending nearly two centuries in the island, this group of people still lives in a poor condition with many unchanged socio-economic structures of life. Trying to understand the living condition of this distinct social group, this work has been done by referring to their all socio-economic performances through an in depth analysis.

Index Terms- Standard of living, Indian origin estate sector Tamil in Sri Lanka, Sri Lankan

I. INTRODUCTION

The unique socio-cultural and historical identities and characteristics of the Indian origin Tamils working in the Sri Lankan plantation sector always necessitate socio-anthropological studies on overall aspects of their life. Most of these unchanged socio-cultural and economic identities of these people have been strengthen throughout the historical periods by the limitations for their outer world contacts. Mainly, the provision of basic facilities such as housing, health care and education within the boundaries of estates has been the major reason for the limited social opportunities for them to intermingle with the neighboring communities (Aheeyar: 2006, CEPA: 2005). Among the unique identities of this community, its economic condition which gives also an overall image of the community is identified by many people as an area that can be studied broadly.

When reviewing the economic condition of these people, whereas, the poor economic state of them is mostly criticized by many just as a social vulnerable condition, some people explain this as a condition created by some external influences such as the changing tactics occupied in politics and system of economy at different periods in the country that reflect in adverse conditions such as decreasing job opportunities within estates and political marginalization (CEPA: 2005, Fernando: 2007). Similarly, some people may give completely a different explanation that the cultural barriers of these people are the reason for the poor economic condition of this community. Considering all such different factors, this study aims at understanding the complexity of actual factors underlying socio-economic conditions that decide standard of living of estate sector Indian origin Tamil in Sri Lanka.

II. METHODOLOGY

The study employed qualitative data collection tools to extract the needed primary data. Especially, it engaged number of case studies and in-depth interviews to collect data from various individuals representing both genders in the study area, Sogama Estate, Pussellawa, Sri Lanka. Beside the primary data, the study used enormous amount of secondary data, too, received from many previous studies and national level statistics to support the present arguments.

III. STANDARD OF LIVING

When it comes to the concept 'standard of living', which is the core aspect generating the major thoughts of this study, though it has links with number of socio-cultural and (at sometimes, even) psychological platforms of a society, it is broadly accepted that at most of the times it essentially has an economic dimension (Sen, 1985:1). However, still there are many controversies in finalizing the criteria to assess the standard of living as it involves number of other aspects along with economic improvement. For example, the following quote clarifies the difficulty in giving a precised definition to the concept 'standard of living'.

> *"There are many fundamentally different ways of seeing the quality of living, and a quite a few of them have some immediate plausibility. You could be well off, without being well. You could be well, without being able to lead the life you wanted. You could have got the life you wanted, without being happy. You could be happy, without having much freedom. You could have a good deal of freedom, without achieving much…" (Sen, 1985:1)*

Therefore, it is now clear that measuring a group of people's standard of living should be a deal to ensure the evaluation of all such life aspects, especially of income, happiness, freedom and achievement. Even though this type of an assumption has a great deal of recognition from a sociological point of view, the importance of economic phenomena should not be under-estimated as it is the dominant factor that ensures the above mentioned many qualitative, social prerequisites of standard of living at most of the times.

For instance, to explain the concept 'standard of living', Adam Smith employed a link to the condition where people '*do not feel ashamed to appear in public*' and explained how the fulfillment of economic (and/or commodity) requirements help attaining happiness and life achievements, which are integral aspects in evaluating standard of living (Smith, 1910:351-3).

Therefore, it is possible to say that even though happiness and social recognition are most significant two qualitative social aspects of standard of living that do not maintain any direct relationships with economy or possession of commodities by people, still the achievement of these qualitative social targets are not possible without economic possession and monetary investments. For example, things like nutritious food, good cloths, foot wares, good education are the factors that help people to feel happy about themselves and to be confident to appear in public. However, it should be kept in mind that these things need economic possession and economic investment in quality education at childhood.

IV. LIVING CONDITION OF THE INDIAN ORIGIN TAMILS IN THE SRI LANKAN ESTATE SECTOR

While discussing the living condition of Tamils in the Sri Lankan estate sector, both economic and non-economic factors get importance as they both maintain to play integral roles in determining the living condition of these people. Firstly, in terms of economic factors, the study findings prove that the estate sector households are very vulnerable in terms of increasing cost of living. In this regard, only a very few households are there that succeed in reaching higher standard of living through regular income from the estate employment and external income sources. Anyhow, the generalized facts from the overall study notifies that most people working in the estates, both men and women, are not well-educated and are employed in the estates just to provide their unskilled labour and thereby enabled to get only a poor earning.

Secondly, when it comes to the non-economic aspects that have an effect on their living standard, it is important to state that the structure of plantation system is the key factor that creates number of non-economic forms of poverty, which in turn has impacts on economic aspects of their day-to-day life. For instance, poor investment in good education and health hinder the overall socio-economic wellbeing of these people.

In this manner, the situation of poverty in the Sri Lankan estate sector can be connected not only to economic factors that can be directly linked to income and expenditure levels, but also to the non-economic aspects of daily life of these people. This is because, the poor economic condition of these people often closely linked to their health, education, poor social links and many other personal attributes (Fernando: 2007). Similarly, many of the deep rooted issues related to economic vulnerability and poor condition of standard of living are closely connected to many non-economic factors that are usually set apart from economic aspects, especially such as social and cultural marginalization (Aheeyar, 2006).

As a result, in analyzing the standard of living and addressing related issues of the Indian origin Tamils in the Sri Lankan estate sector, this study attempts to investigate both the economic life and social attributes of these people as it will help getting clear account of all the aspects of standard of living such as income, expenditure, savings, health, education, happiness, higher achievements and social links among these people.

A. Income

In assessing the standard of life of a particular society the concept of level of income plays a very important role as that connects with many other attributes of its social domains. When assessing income levels in order to get an idea about living condition, it is important to pay attention to make sure whether the particular society, as a whole, gets a satisfactory average amount of living wage. Living wage is commonly understood as the means that secures a persons' and his or her family's decent living standard and therefore it is being a major source that secures a household from falling into the 'poor' category in a country. When it comes to the Sri Lankan context, the ever remaining question is that how many of the estate sector workers in this country are paid with a living wage that is enough to carry out a poverty-free life.

This increases the need to study about another related concept 'minimum standard of income' here as to link the living wages with the living standard of these people. Because, minimum standard of real income that is a must in any country, can tell us many stories about people's living condition, as it helps people to maintain at least a normal decent life.

In defining national minimum standard of real income, Pigou highlights the ability for commodity possession by people. He puts this in the following manner:

> *"The minimum includes some defined quantity and quality of house accommodation, of medical care, of education, of food, of leisure, of the apparatus of sanitary convenience and safety where work is carried on, and so on" (1952:759)*

To understand the level of minimum wages of the workers in the Sri Lankan plantation sector it is important to get a comparative analysis with the minimum wages of the other sectors in the country. The following table gives such a comparative view of the minimum wage levels of different sectors in Sri Lanka, for the year 2013.

Table 1: Minimum wage levels of different sectors in Sri Lanka-2013

Industry	Worker Category	Minimum wages (in LKR)
Plantation Sector		380 per day
	plus Attendance Bonus	105 per day
	plus productivity incentive	30 per day
Industrial Sector	Unskilled	6500-7500 per month
	Semi-Skilled	7000-8000 per month
	Skilled	7500-9500 per month
Service Sector	Unskilled	6500-7500 per month
	Semi-Skilled	7500-8000 per month
	Skilled	8400-9500 per month

Source: http://www.salary.lk/home/salary/minimum-wage

NOTE:

1. Overtime is paid at one and half times the normal hourly rate of wage.
2. Holiday pay for work on weekends (Sundays) and public holidays is paid for at a higher rate 1 1/2 times the daily rate or double the rate of remuneration.
3. Bonuses e.g. project, attendance, festival would vary from company to company.

Even though, the above table shows that the amount of minimum wage per day of plantation sector worker exceeds the minimum wage level of other sector workers in an overall manner, the reality is that the plantation sector workers get a very less monthly income comparing to other sectors mainly because of the relatively less number of working days they get in a month. The following table from the report of Department of Census and Statistics (2009/10) also serves to prove the relative income poverty of estate sector Tamils in the country.

Table 2: Mean and median household income (average monthly) by sector

Sector/ Province	Mean Income (LKR)	Median Income (LKR)
Sri Lanka	36, 451	23, 746
Urban	47, 783	31, 000
Rural	35, 228	23, 126
Estate	24, 162	17, 366

Source: Department of Census and Statistics, 2009/10, Household Income and Expenditure Survey

In addition, taking random examples from the study area, Sogama Estate, Pussellawa, it is possible to say that even though some individuals get Rs. 620 (if men) and Rs. 600 (if women) as the per day wage, most of their monthly total income certainly does not exceed Rs. 12000, as a result of less number of working days available to them. The most important fact that should be noted here is that the above mentioned per day salary amount is even reduced in to an amount falls between Rs. 450 – Rs. 550 if the number of working days is less than 22.

In addition, some case studies under this research prove that there are few families from which no member is employed in the estate anymore, manage total monthly expenses of whole family in a way not exceeding Rs. 5000. This fact increases the doubt whether many families in the plantation sector get an enough amount of monthly income, which is not less than the standard amount of minimum wage.

Whereas the minimum wage should be about twice the poverty line, according to the Department of Census and Statistics (2011), in Sri Lanka the official poverty line at national level for June 2011 is Rs. 3239. That means Rs. 6478 or above should be the minimum

wage to maintain a quality life in Sri Lanka. However this is seriously questioned as many of the plantation people run their life only within an amount that is most probably less than the above mentioned amount.

Anyhow, there are few families that have more than one income sources and have a monthly income that is far more than the minimum wage. For these families, whereas working in the estate makes the major contribution in their economic life, they have many other income sources too via which they earn a considerable amount of money to support their daily expenditures. For example, men in the estate sector work as construction workers, three wheeler drivers, small shop keepers and labourers in road construction and so on, females are employed mainly as housemaids in urban areas. In addition, many women engage in animal husbandry, road construction works and few of them work also as attendants in estate crèche where they look after the children of estate workers.

Most of the women whose husbands are working outside the estate are almost abandoned by their husbands. Such men working in cities (mostly in Colombo) are earning more than Rs.25000 monthly, but their contribution to their families in the estates are relatively lower than that of the women. Importantly, girls working in the garment factories in Colombo economically contribute more to their families in the estates, in a constant way.

Whatever the income sources, it is important to note here that the expenses of these people almost always exceed the amount of income, and this never promotes them to save any money for their future. The expenditures for household items, health, education, transport, dress, housing repairs, visiting friends and relatives, contributing the estate level societies and associations, arranging and attending ceremonies are questioning the fulfillment of the basic needs of these people even in an ordinary manner. This situation is common for almost all the estate sector Tamil workers in the island and it leads them to be indebted for generations.

B. Indebtedness and Savings

Recent studies show that comparing to other sectors in Sri Lanka the estate sector has an increasing rate of debt and thereby negative saving. The following table of Central Bank of Sri Lanka gives a comparative view on the saving rates among different sectors in the island and notably it indicates that estate sector people never save any amount of money since their monthly expenditure exceeds monthly household income.

Table 3: Monthly income, expenditures and savings (2003/04)

Sector	Monthly Household Income (LKR)	Monthly Household Expenditure (LKR)	Savings (LKR)
Urban	30,091	27,860	2,231
Rural	15,611	15,382	229
Estate	9,180	10,712	-1533
All sectors	17,109	16,717	392

Source: Central Bank of Sri Lanka, 2005

In the study area, no body among the study sample has saving as a habit and some of them do not have even a savings account in any bank. Another bitter fact is that even the people, who have bank accounts, do not use them for saving purposes, but just for transection purposes. However, one important positive feature of their economic life is that the prevalence of Seetu system, which is being the most common and significant saving mechanism for most of the households coming under the study area.

Speaking about the major reasons behind the poor savings and condition of poverty in the study area, it is important to mention that very poor financial management is the most important factor that does not let these people to save any money. For example, they get salary advances and loans varying amounts from Rs. 3500 to Rs.5000 during the ceremonial periods and this decreases the amount of their salary throughout the upcoming one year of repayment period and decrease the happiness and life satisfaction as there is no enough money to cover daily expenditures. However, provision of very less amount of wages that does not match in anyway the endless, intensified rise in the living costs is also identified in recent studies as a major reason for increasing indebtedness and very poor savings among the plantation sector workers (CEPA, 2005).

Along with these factors, over expenditure on household luxury items, spending on alcohol consumption are also prevailing as the major causes that increases the negative saving rate among these people. This type of a situation is continued as a cycle over and over there in the estate sector and this leads this community to be in a chronic poverty condition throughout the lifetime.

C. Health

When it comes to the health condition, it is a common feature that most people of the study population have some diseases after forties, and their bodies are not cooperative to work in the estates any more. However, such people are also still working in the estates since they have no other income sources to run their life. Also, some of the people in their forties and fifties are unemployed as their health condition is too bad.

Unhealthy living conditions including poor housing, diet and unsafe workplace increase the chances of plantation sector people to be diseased throughout the year and this has adverse influence even in their economic wellbeing in the forms of loss of working days and increased expenditure on medicine.

In addition, most of the estate workers' increased liquor consumption also questions healthy life of the overall family units. This happens in two major ways: firstly, increased alcohol intake severely affects the health of the first persons; secondly, increased spending over alcohol reduces the amount of expenditure on healthy diet and safe household environment, which cause malnutrition and numberless diseases among the family members.

Unavailability and poor access to good healthcare services are other factors to be paid much attention as they are becoming major problems in many of the estates including the study area, Sogama Estate, Pussellawa. Despite the fact that the plantation sector has been assigned with number of hospitals, people in the estates are not well served by these hospitals as they are not well equipped both with quality drugs and qualified personnel.

These conditions tempt the people in the study area to search for better medical services available in the private sector. In this kind of a situation, their expenditures are increased not only by expensive healthcare services and drugs, but also by private transports services they use to go to nearby towns to get private medical services as their line rooms are located far more than a kilometer from the main road. Therefore, just a single trip to the nearest town for getting private medical services altogether cost more than Rs. 1500, which is, for most of the families in the study area, nearly one fourth of the overall monthly earning.

D. Education

In comparison with other sectors within the country, the Sri Lankan estate sector shows poor educational attainments, especially among girls in the estates (Aheeyar, 2006). Although, earlier mentioned poor economic and health conditions play a major role in creating social circumstances that are not favourable for active education, many cultural characteristics of these communities also can be pointed out as the significant factors causing drawback in the educational progresses. For instance, the following quote elaborates how some socio-cultural features of estate communities affect women's education in the sector:

> *"There is more employment for females as pluckers. Yet the household duties fall on them as well. So it is much easier for the mother to go to work and leave the household chores in charge of the daughter. The practice of not sending daughter to school after puberty is prevalent because it eases the burden on the mother. Once the girl is 16 she too can become a plucker and an additional income earner for the family" (Samaraweera, 2001)*

Many children among the now younger generation are educated only up to grade 7, 8, or 9 and most of them drop out in the middle of the school education for many reasons. Even though, such children are interested in getting some vocational training they are not adequately supported economically by the family.

Lack of educational facilities both at pre-school and school levels, lack of secondary schools within estates and increasing cost of education today intensifies the educational vulnerability of these people. For example, even providing everyday bus fare for children to go to schools located in near towns seems to be an economic burden for many families in the study area.

A good many schools in the Sri Lankan estate sector to which estate children predominantly attend are academically not well-supported as enough number of qualified and graduate teachers are not appointed to cater the increasing needs of students. Importantly, these schools do not employ competent English and Math teachers. These conditions have long-lasting adverse impacts on today's young generation and this necessarily work for the reduction of quality of life throughout generations. However, despite all these conditions, there is a raise of an educated new generation noticed in this community, which tries to alter the traditional identities of life of the Indian origin estate sector Tamils in the island.

E. Infrastructure

It is obvious that most of the line rooms, which are usually 10X12 feet in size, of these people are still has the same condition they did many decades before. However, very few line rooms have been constructed or modernized in their own by the estate people

throughout the last few years. Most of the interviewed people's sole complaint was that their political representatives are not concerning anything about their development and they openly blame that even though many of the present politicians' election time promises were to reconstruct their line rooms, nobody of them did so after they were elected.

The most common problems regarding infrastructures are lack of space for a normal social life, hazardous condition of line rooms with leaking roofs and weaken walls and poor sanitation facilities including absence of clean, piped drinking water and proper toilet facilities. According to the statistics of Central Bank of Sri Lanka (2005) more than a half of the plantation sector households (57%) rely on public/street tap for their water needs. Similarly, year 2000 estimates of the Department of Census and Statistics reveal that plantation sector households, especially in the districts of Nuwara Eliya and Badulla are lacking access to safe sanitation. These deficiencies and poor condition of very basic infrastructure facilities in the plantations necessarily leads these people to experience lack of standard in their living condition.

However, progress in the provision of infrastructure facilities also have been observed in the estate sector, initiated or/and supported by number of Non-Governmental Organizations. Especially, in the study area water facilities and sanitary facilities have been provided by some prominent NGOs, where the tanks and pipelines have been provided by Sathyodhaya and toilets have been constructed and handed over by TRUST.

V. DISCUSSIONS AND CONCLUSIONS

Standard of living is not just an aspect that is determined solely by income or income poverty. Beyond that there are good many factors that have an effect on a group of people's standard of living, such as health, education and infrastructure facilities etc. However, we should accept that such different factors are also at most of the times repeatedly determined by economic aspects in almost all the societies.

Discussing about the standard of living of the estate sector Indian origin Tamils in Sri Lanka, this very fact seems to be largely applicable, since these people's number of social aspects that can be linked to the living condition are directly or indirectly determined by their economic condition. This paper through its investigations proves that the standard of living of the Indian origin estate sector people is still in a poor condition in terms of income level, quality of education, savings and infrastructure facilities and thereby happiness and life satisfaction, too. Even though, they might be capable to progress their many of the social aspects of life, the major factor that hinder such developments is the economic poverty promoted by poor management of money and poor wages that never fit to the increasing cost of living. Thus desirable policy level changes to increase the wages and necessary measures to enhance knowledge in management of monthly salary among these people can be expected to help upgrading the standard of living of this community at least in the future

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Sublethal effects of phenolic compounds on biochemical, histological and ionoregulatory parameters in a tropical teleost fish Oreochromis mossambicus (Peters)

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Abstract- Sub lethal toxicity of phenolic compounds in a tropical teleost fish *Oreochromis. mossambicus* was investigated. Experimental animals were exposed to sub lethal (1/10th of 96 hr LC_{50}) concentration of phenol (3.12 mg l-1) and m-cresol (2.2 mg l-1) for a period of 21 days using a semi-static test bioassay system. Significant ($P<0.05$) lack of cortisol response was observed on exposure to both the phenolics. Furthermore total carbohydrate significantly ($P<0.05$) decreased in liver and muscle and blood glucose level was also significantly ($P<0.05$) decreased. The LDH (lactate dehydrogenase) showed significantly ($P<0.05$) elevated activity in the liver and kidney of fishes treated with phenol suggesting anaerobic glycolysis. Elevation in the activity ($P<0.05$) of ALT (alanine amino transferase) can be considered as a response to meet the excess energy demand. Increased serum ACP (acid phosphatase) activity suggests an increase in lysosomal mobilization. Also a significant ($P<0.05$) inhibition of branchial ATPases (Na^+K^+-ATPase, Mg^{2+}-ATPase and Ca^{2+}-ATPase) was observed. Moreover gill histopathological analysis on phenol exposure revealed severe lesions such as architectural loss, necrosis, desquamation of epithelial layer, hyperplasia and telangiectesis. Significant changes observed on m-cresol exposure were lamellar necrosis, lamellar shortening, telangiectesis and lamellar clubbing. Phenolic compounds even at very low concentrations (1/10th of 96 hr LC_{50}) for a short duration of 21 days induce metabolic stress, impair branchial functioning and are likely to induce tissue damage in *O. mossambicus*.

Index Terms- biomarker, branchial ATPases, m-cresol, fish, phenol

I. Introduction

Phenolic compounds are a group of wide spread xenobiotics. They are common constituents of aqueous effluents from the industrial processes such as resin production, oil refining and coking plants [1]. Aquatic biota uptake these pollutants directly from water, sediments, suspended and particulate matter. Phenols are listed among the potent chemical toxicants adversely affecting the aquatic habitats [2]. Among the different phenolic compounds, we were interested to study about phenols and cresols which are widely used as organic solvents. These compounds have also been identified in water- soluble fractions of crude oil since they are potential degradation products of aromatic hydrocarbon metabolism [3]. Also phenol is a toxic metabolite of benzene, a ubiquitous industrial and environmental pollutant [4]. Phenol is among the first compound described as toxic by the Environmental Protection Agency - United States and due to its relevance as an ecotoxin it has been maintained in the priority list. Creosote is classified as a hazardous substance for occupational exposure [5]. Crude cresol (commercial grade) contains appromximately 20% o-cresol, 40% m-cresol, and 30% p-cresol.

Fish can be used as bioindicators to evaluate the environmental contamination levels of hydrocarbons, because these pollutants tend to accumulate more in organisms than in the environment [6]. The aim of this study was to investigate the impact of sub-lethal concentrations (1/10th of LC_{50}/96 h) of phenol and m-cresol in a tropical teleost fish, *Oreochromis mossambicus*. For this biochemical, physiological and histological biomarkers were experimented by the end of the exposure period (21days).

II. Research Elaborations

Animals and Experimental Exposure

Investigations were carried out in a fresh water fish *Oreochromis mossambicus* (15±3g) procured from the culture ponds of Kerala Agricultural University (Puduvypu), India. The water in the aquarium was renewed daily and was aerated mechanically. The average values of water quality parameters were as following: dissolved oxygen content of 7.8 ± 0.03 mg l^{-1}, hardness below detectable amounts, pH 7.0 ± 0.37, temperature 26 ± 30ºC and salinity 0 ppt (parts per thousand) [7]. They were fed on a commercial diet *ad libitum* and were maintained in tanks for a month before the experiment in order to acclimate to the experimental system.

Sub-lethal toxicity studies

The acute LC_{50} value of phenol and *m*-cresol was determined in the laboratory using semi-static method. The LC_{50} levels and 95% confidence limits were calculated using Probit analysis [8]. The acclimated fishes (15±3 g) were divided into three groups (10 fishes each) in control and sub lethal concentrations of phenol and m-cresol. Triplicates were kept for both the treated groups and respective controls. Sub lethal concentration of phenol (3.12 mg l^{-1}) and m-cresol (2.2 mg l^{-1}), corresponding to 10% of the LC_{50}-96h of the respective compound was used. The system water was renewed every 24h (semi-static) with the same concentrations of phenolic compounds so as to maintain the concentration. The exposure period was for 21 days.

Tissue and blood samples

At the end of 21days tissues fishes were killed by pithing (by damaging the brain and severing the spinal cord between the head and trunk region using a sharp needle). Liver, gills, kidney and muscle tissues were dissected out and blood and other body fluids were removed using blotting paper. The tissues were washed in ice cold 0.33 M sucrose and again blotted dry and the desired amounts of tissues were weighed and used.

Blood was drawn from the common cardinal vein using 1 ml syringe and was then kept at room temperature for 30 minutes and then subjected to centrifugation at 3000 rpm for 3 minutes. The serum separated was stored at -20°C until assayed.

Biochemical studies

Blood was drawn from the common cardinal vein using 1 ml syringe and was then kept at room temperature for 30 minutes and then subjected to centrifugation at 3000 rpm for 3 minutes. The serum separated was stored at -20°C until assayed. The level of serum cortisol was estimated by electrochemiluminescence immunoassay (ECLIA) using Elecsys cortisol reagent kit, cat. No.11875116. The results were expressed as µg/dl. Total carbohydrate was estimated by the method of Carroll et al. [9]. The values were expressed as mg of glucose / g wet wt. of tissue. Glucose 6-phosphatase (EC 3.1.3.9) was assayed according to the method of King [10]. The enzyme activity was expressed as µg of inorganic phosphorus liberated / min / mg protein. Blood Glucose was estimated by the method of Sasaki et al. [11]. The values were expressed as mg glucose / dl. LDH (EC 1.1.1.27) was assayed according to the method of King [12] and the activity was expressed as µ moles of pyruvate liberated / h / mg protein. ALT (EC 2.6.1.2) was assayed by the method of Mohun and Cook [13] and expressed as µ moles of pyruvate liberated / h / mg protein. ACP (EC 3.1.3.2) was assayed by the method of King [14] and the activity was expressed as mg of phenol liberated / min / mg protein. Protein was estimated by the method of Lowry et.al. [15]. The values are expressed as mg of protein / g wet wt. of tissue. All the parameters were assayed using a Hitachi UV-visible spectrophotometer

Assay of Branchial ATPases

Estimation of Branchial ATPases was done using 10% gill homogenate prepared in 0.33 M sucrose, centrifuged at 3000×g for 15 minutes and the supernatant so obtained was centrifuged at `135,000×g for 30 minutes. The pellet so obtained corresponded to heavy microsomal fraction [16]. The pellet was then resuspended in cold 0.33 M sucrose and used as the enzyme source. Na^+K^+-ATPase activity was assayed according to the method of Bonting [17]. Ca^{2+}-ATPase activity was assayed according to the method of Hjerton and Pan [18]. Mg^{2+}-ATPase activity was assayed according to the method of Ohnishi et al. [19]. The phosphorus content was estimated by the method of Fiske and Subbaraow [20]. The enzyme activity was expressed as µmoles of Pi liberated/min/mg protein.

Histopathological studies

For histopathological studies fishes from each test groups as well as control group were sacrificed and gills were dissected out and fixed in Bouin's fixative for 48 h. They were then washed with running tap water overnight. The gills were decalcified in decalcifying agent (HNO_3 and 70% alcohol) for another 48 h. After dehydration in graded alcohol series, they were embedded in paraffin and sectioned at 5-6mm. The sections were stained in haematoxylin-eosin. Changes were examined under a Leica DM/LS type microscope with camera attachment and were photographed at both high as well as low power resolutions.

The statistical analysis was carried out using the software SPSS 13.0 package. One-way analysis of variance (ANOVA) was done and if significant differences were revealed by the ANOVA test, Tukey's test was used to further elucidate which treatments were significantly different from their respective control. All the data were presented as mean ± S.D and the differences were regarded as statistically significant at $P<0.05$.

III. RESULTS

Phenolic compounds induced changes in Biochemical parameters

One-way ANOVA followed by Tukey's test showed that there was significant ($P<0.05$) decrease in cortisol in both the phenolic compound treated groups compared to control as depicted in Fig.1.

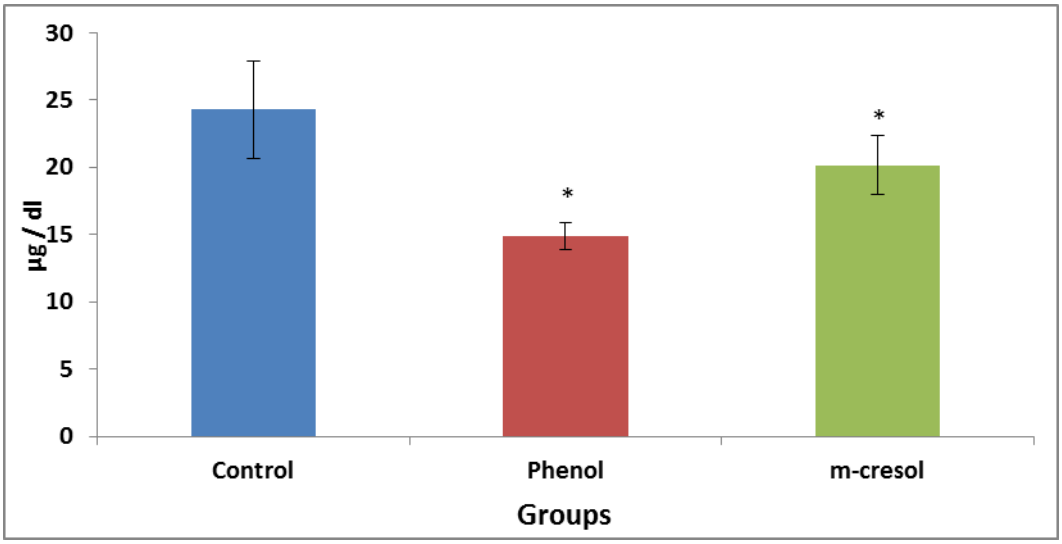

Figure 1. Effect of different phenolic compounds on cortisol in *O. mossambicus.* Values are expressed as µg / dl. Each value represents the mean ± S.D of six separate experiments. * indicates significant (P<0.05) difference from control.

A statistically significant (P<0.05) decrease in total carbohydrate as illustrated in Fig. 2 was observed in liver and muscle of both the treated groups compared to control. Among the tissues, kidney showed significant (P<0.05) elevated carbohydrate level in both the treated groups compared to control. No significant variation was observed in gills of both the treated groups compared to control.

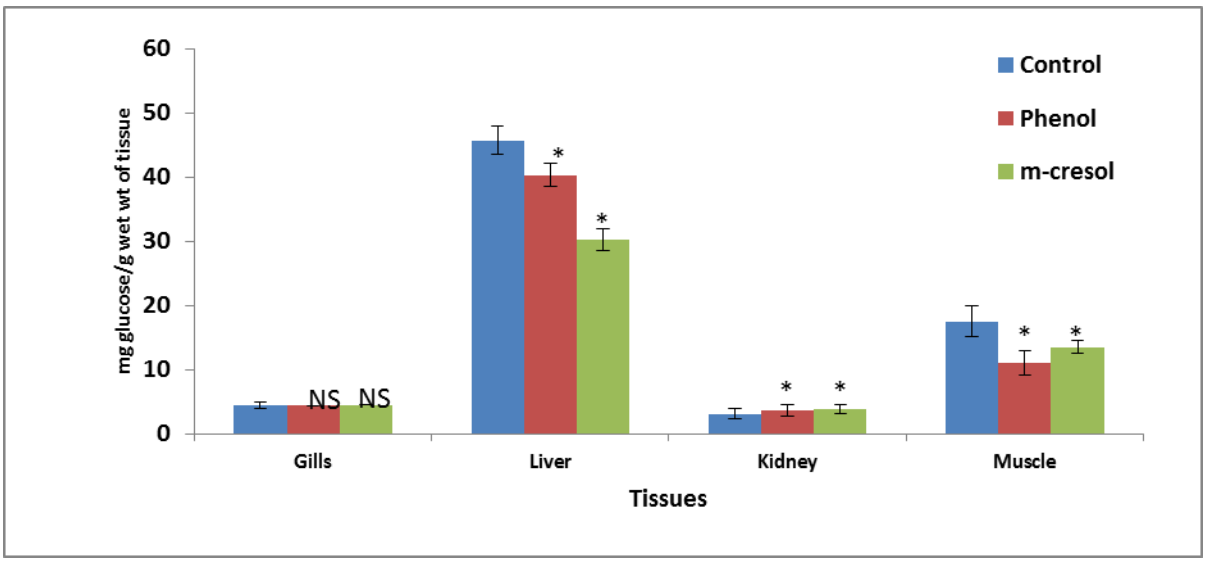

Figure 2: Effect of different phenolic compounds on total carbohydrate in *O. mossambicus.* Each bar diagram represents mean ± S.D for n=6. On each set of bars, significant difference are marked by (*) for P<0.05 compared to the respective control (One-way ANOVA).

One-way ANOVA followed by Tukey's test showed that there was significant (P<0.05) decrease in glucose-6-phosphatase activity in both the treated groups compared to control (Fig.3).

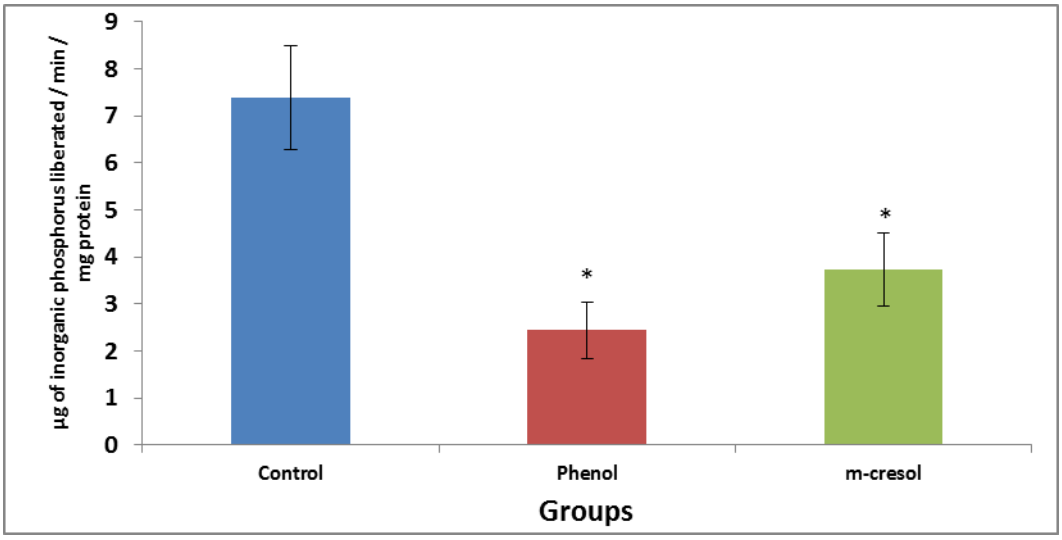

Figure 3. Effect of different phenolic compounds on glucose-6-phosphatase activity (mean ± S.D) in *O. mossambicus.* Values are expressed as µg of inorganic phosphorus liberated/min/mg protein. Each value represents the mean ± S.D of six separate experiments. * indicates significant (P<0.05) difference from control.

One-way ANOVA followed by Tukey's test showed that there was significant (P<0.05) decrease in blood glucose in both the treated groups compared to control (Fig.4).

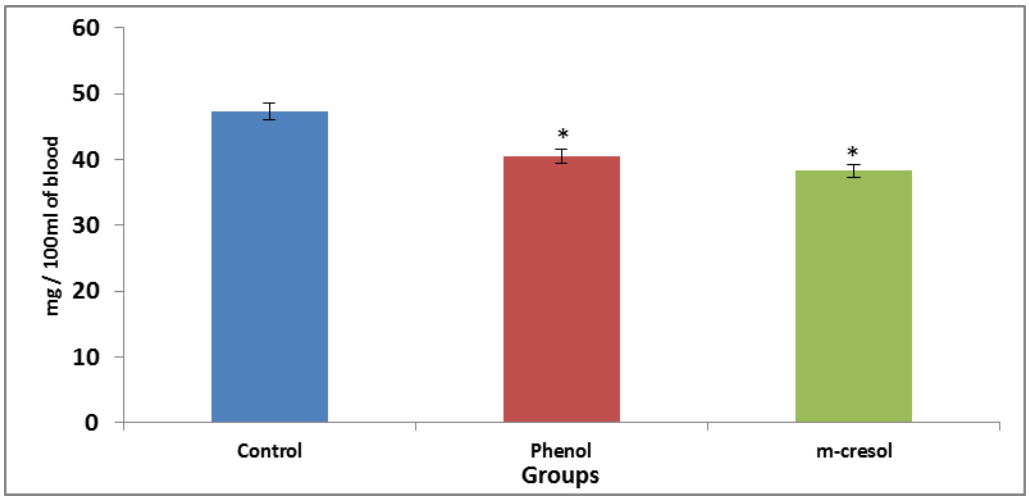

Figure 4. Effect of different phenolic compounds on blood glucose level (mean ± S.D) in *O. mossambicus.* Values are expressed as mg/dl. Each value represents the mean ± S.D of six separate experiments. * indicates significant (P<0.05) difference from control.

As depicted in Fig.5 serum acid phosphates activity, showed a significant (P<0.05) increase in both the treated groups compared to control.

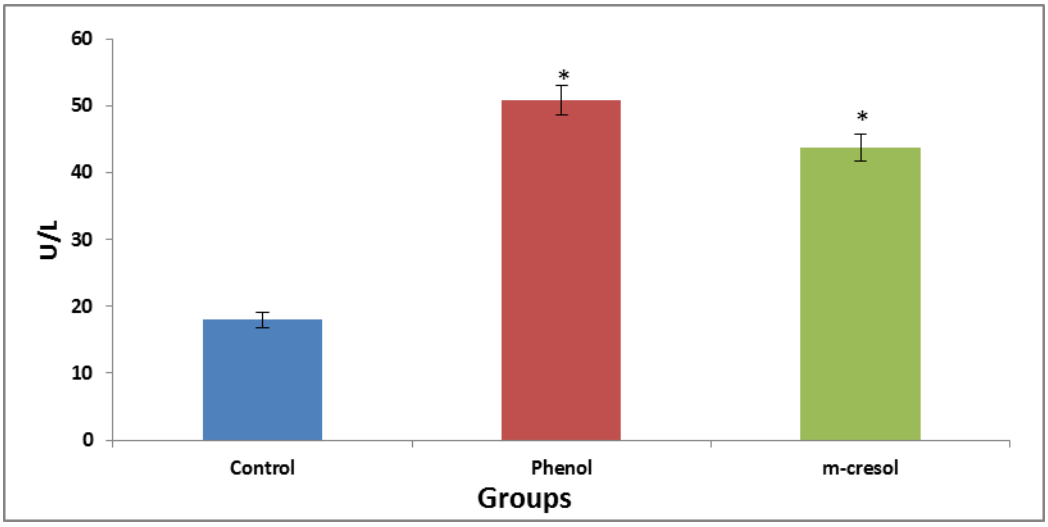

Figure 5. Effect of different phenolic compounds on serum ACP activity in *O. mossambicus.* Values are expressed as U/L. Each value represents the mean ± S.D of six separate experiments. *indicates significant (P<0.05) difference from control.

Significantly (P<0.05) elevated LDH activity was observed in the phenol treated group as illustrated in Fig.6 in tissues such as liver, kidney and muscle compared to control. Among the tissues of m-cresol treated group, the gills and muscle showed significantly (P<0.05) elevated activity and the liver and kidney showed a significantly (P<0.05) decreased activity compared to control.

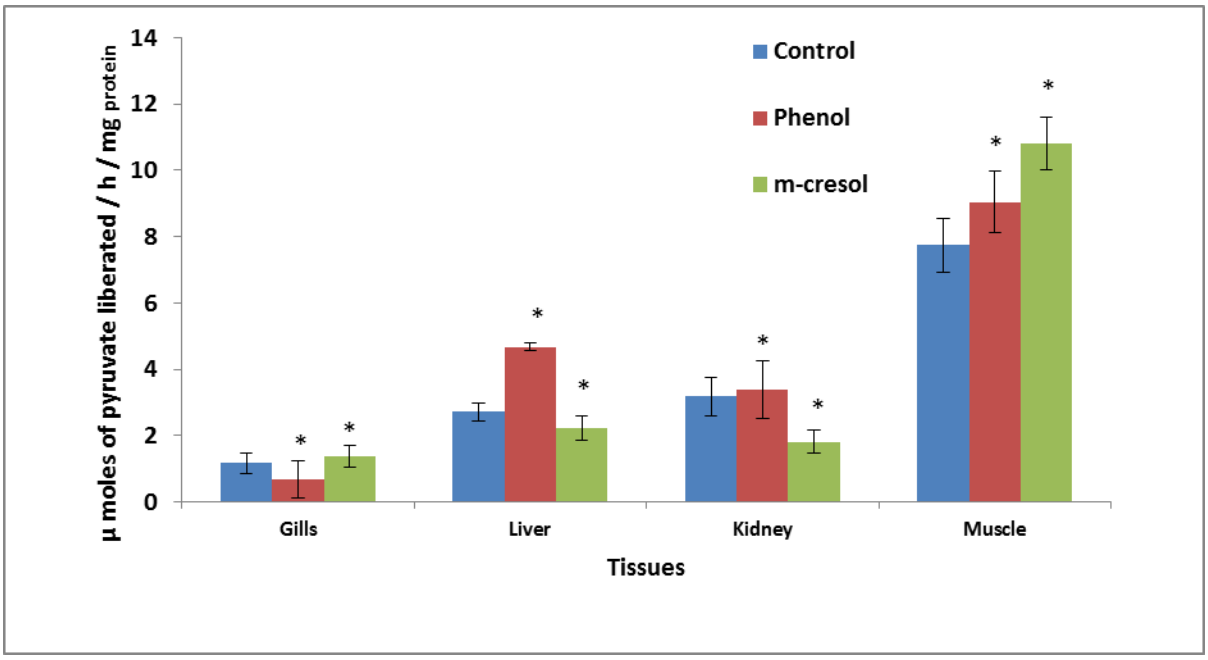

Figure 6: Effect of different phenolic compounds on lactate dehydrogenase activity in *O. mossambicus.* Each bar diagram represents mean ± S.D for n=6. On each set of bars, significant difference are marked by (*) for P<0.05 compared to the respective control (One-way ANOVA).

There was significant (P<0.05) elevation in ALT activity (Fig. 7), in both the treated groups compared to control. Liver and kidney of phenol treated group showed significantly elevated activity (P<0.05) compared to m-cresol treated group. Gills and muscle of m-cresol treated group showed significantly elevated activity compared to phenol treated group.

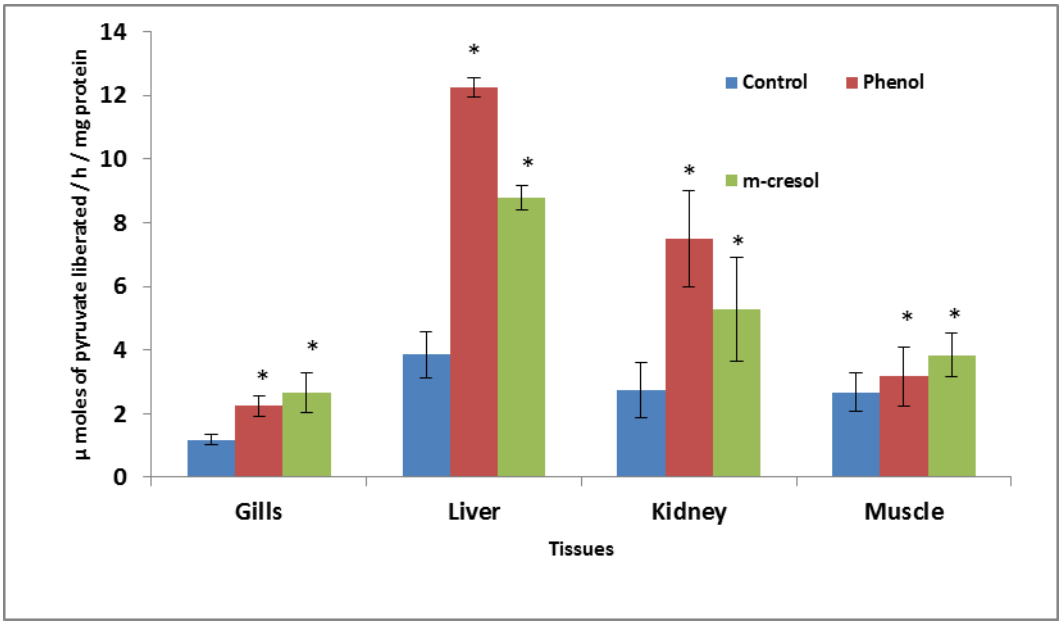

Figure 7: Effect of different phenolic compounds on ALT activity in *O. mossambicus.* Each bar diagram represents mean ± S.D for n=6. On each set of bars, significant difference are marked by (*) for P<0.05 compared to the respective control (One-way ANOVA).

Statistically significant (P<0.05) decreased protein level as shown in Fig. 8, was observed in liver and muscle of both the treated groups compared to control. Gills and kidney of both the treated groups showed a significantly (P<0.05) elevated protein level compared to control.

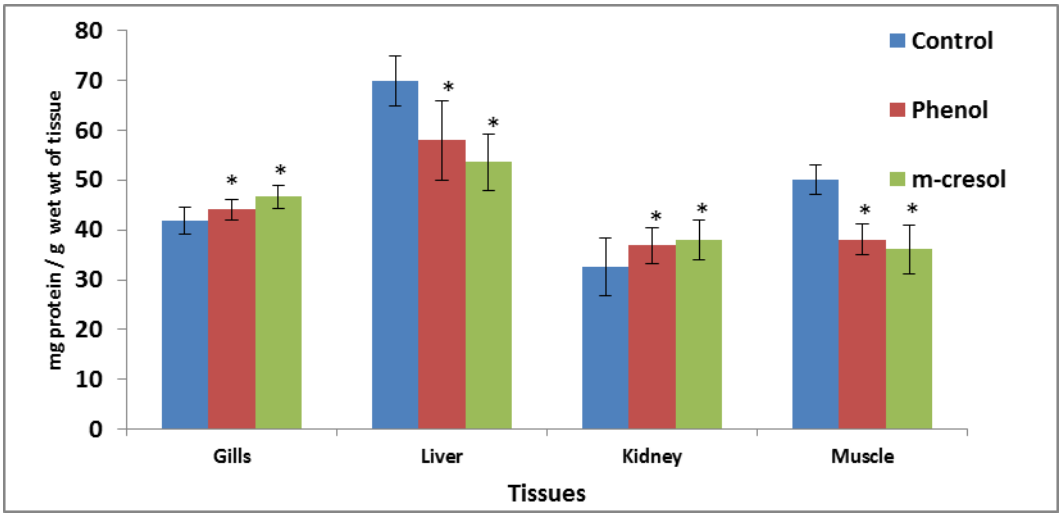

Figure 8: Effect of different phenolic compounds on total protein level (mean ± S.D) in *O. mossambicus.* Each bar diagram represents mean ± S.D for n=6. On each set of bars, significant difference are marked by (*) for P<0.05 compared to the respective control (One-way ANOVA).

Effect of Phenolic compounds on Branchial ATPases

Comparison between different treatments as illustrated in Table 1. revealed that there was significant (P<0.05) decrease in $Na^{+}K^{+}$-ATPase, Ca^{2+}-ATPase and Mg^{2+}-ATPase activities in both phenol and m-cresol treated groups compared to control. Statistical analysis also showed that phenol treated group showed the least activity compared to m-cresol treated group.

Table 1. Effect of different phenolic compounds on branchial ATPases activity in *O. mossambicus*. Values in the same row with different lower case letters vary significantly (P<0.05) between treatment groups (One-way ANOVA). Each value represents the mean ± S.D of six separate experiments. Values are expressed as µmoles of inorganic phosphorus liberated/min/mg protein.

Branchial ATPases	Control	Phenol	m-cresol
$Na^{+}K^{+}$-ATPase	12.38 ± 0.27^{c}	4.53 ± 0.24^{a}	8.89 ± 0.34^{b}
Ca^{2+}-ATPase	14.49 ± 0.54^{c}	9.66 ± 0.50^{a}	12.51 ± 0.78^{b}
Mg^{2+}-ATPase	11.35 ± 1.37^{c}	7.42 ± 0.13^{a}	9.85 ± 1.86^{b}

Histopathological changes in gill tissue on exposure to phenolic compounds

Gills of fish in control group showed no histopathological abnormalities. The structural details of the gills of control group *O. mossambicus* are shown in Fig. 9 (a). As shown in Figure 9 (a), gills are made up of double rows of filaments from which arise perpendicularly the lamellae. The lamellae are lined by squamous epithelium composed of pavement and non differentiated cells. Below that epithelium are lamellar blood sinuses separated by pillar cells. Between the lamellae, the filament is lined by a thick stratified epithelium constituted by several cellular types, such as chloride, mucus and pavement cells. In the phenol treated group, the histopathological changes in gills observed were architectural loss, necrosis, desquamation of epithelial layer, hyperplasia and telangiectesis, Fig. 9 (b, c, and d). On exposure to m-cresol, the most significant histopathological changes observed in gills were lamellar necrosis, lamellar shortening, telangiectesis and lamellar clubbing as illustrated in Fig. 9 (e and f).

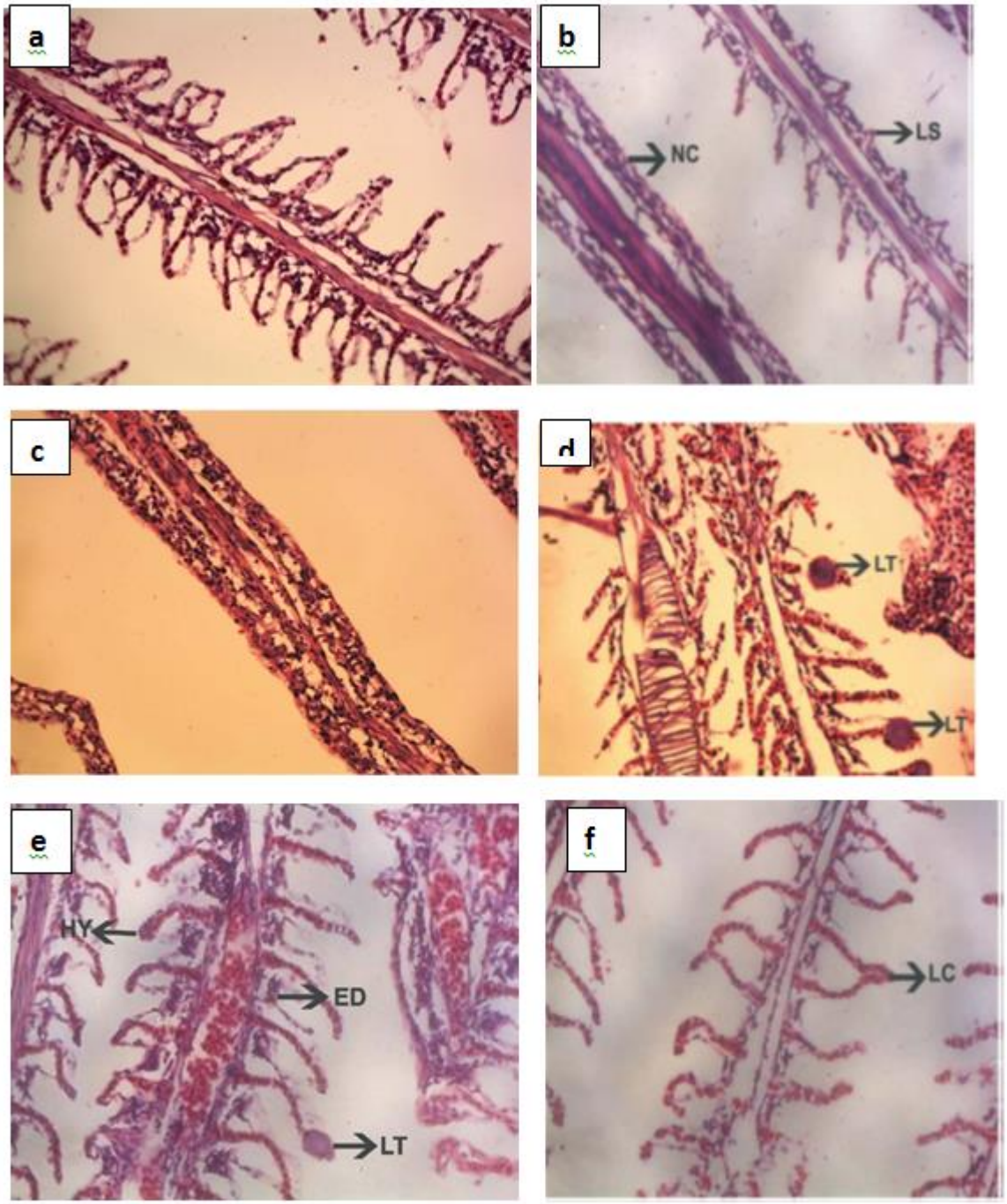

Figure 9. Histopathological changes observed in the gill tissue of *O. mossambicus on* exposure to different phenolic compounds a) control gill architecture with primary lamellae and secondary lamellae (40X) b) phenol treated showing complete necrosis of secondary lamellae (40X) c) phenol treated group showing hyperplasia (HY), epithelial desquamation (ED) and lamellar telangiectesis (LT) (40X) d) m-cresol treated group showing lamellar necrosis (LN) and lamellar shortening (LS) (40X) e) lamellar telangiectesis (LT) (40X) f) m-cresol treated group showing lamellar clubbing (LC) (40X).

IV. DISCUSSION

The overall results observed points to the adverse effects of very low concentrations (1/10th of LC_{50} value) of the tested phenolic compounds that altered normal metabolism of *O.mossambicus*. The lack of cortisol response suggests that, similar to other xenobiotics phenol and m-cresol can act as endocrine disruptors and as such impair steroidogenesis. There are some experimental observations with possible explanations for this, first; it might be possible that one of the primary steps in the steroid hormone synthesis pathway was compromised.

Cholesterol is the substrate for steroid synthesis [21], particularly the non-esterified cholesterol. It has been demonstrated in carp (*Cyprinus carpio*) that chronic exposure to water-borne phenol (8 mg l^{-1}) caused significant accumulation of non-esterified cholesterol in both tissues and serum by days 15 and 30 of exposure, respectively [22]. This accumulation was due to the inability of the steroidogenic tissues to synthesize steroids. It has also been shown that xenobiotics can inhibit the transport of cholesterol to the mitochondria [23-24]. There are several studies which provided evidence that the capacity to raise plasma cortisol is impaired in fish exposed to organic pollutants [25] and metals [26, 27, 28] which is in agreement with our decreased cortisol response. Studies [29] on the impact of three pharmaceuticals (acetaminophen, ibuprofen and salicylic acid) in rainbow trout supported the hypothesis that these pharmaceuticals disrupt steroidogenesis in fish interrenal tissue. Similar results were also reported [30] in the neotropical fish *Prochilodus lineatus* exposed to water-soluble fraction of diesel oil for 15 days. Therefore many pollutants halt cortisol secretion and hence even if the fish is under stress this will probably not be reflected as an increased cortisol response. Fish exhibiting an impaired cortisol stress response may be at a disadvantage in coping with environmental stressors thereby attenuating the chances of coping with subsequent natural or anthropogenic stressors. Perhaps a future research targeted at endocrine study at the hypothalamo pituitary interrenal axis is also under consideration. We observed a decrease in total carbohydrate content in liver and muscle of both the treated groups. There are studies reported which show that chemical stress causes rapid depletion of stored carbohydrates primarily in liver and other tissues [31]. Hence detoxification mechanisms become active and the hepatic synthesis of detoxifying enzymes requires high energy levels that might be derived from carbohydrate metabolism, for driving the various enzyme-mediated reactions. UDP-glucuronic acid is an important carbohydrate derivative. Phenolics are often excreted as glucuronyl derivatives by conjugating with UDP-glucuronic acid. UDPglucuronyltransferases (UGTs) are one of the phase II enzymes that catalyse this conjugation. UGTs are induced by a variety of natural and synthetic compounds and play a key role in catalyzing the conjugation and potential excretion of different xenobiotics in fish [32]. Inhibition of glucose-6-phosphatase activity in the liver may be a reflection of damage to the microsomal membrane as the enzyme is localized exclusively in the membranes of the endoplasmic reticulum. Also a decreased blood glucose level was observed in both the treated groups. Varying levels of blood glucose were also noticed [33] as indicative of abnormal carbohydrate metabolism and possibly the result of impaired hormonal control. Experimental groups of monosex tilapia exposed to deltamethrin also exhibited decreased blood glucose [34] which was due to either decrease in the synthesis of blood glucose regulating hormones or enhanced energy demand that stimulates utilization and exhaustion of glucose. These results points to the fact that blood glucose homeostasis was not maintained on exposure to phenolics.

LDH, an anaerobic enzyme showed elevated activity in liver and kidney of fishes treated with phenol. The increase in LDH activity also suggests a significant increase in the conversion of pyruvate to lactic acid, thereby leading to the accumulation of lactic acid. Similar increase in LDH activity in juvenile Australian Bass and *Macquaria novemaculeata* in response to two different crude oil spills have also been reported [35]. Decreased LDH activity in liver and kidney of m-cresol treated group and in gills of fishes treated with phenol may be due to increased tissue damage. Similar results were obtained when *O. mossambicus* were exposed to sub-lethal concentrations of organophosphorus insecticide [36]. Stimulation of LDH in muscle of *O. mossambicus* on exposure to phenolic compounds suggests that the final product of glycolysis - pyruvate was preferentially used to produce lactate. Lactate formed is an important gluconeogenic substrate which can be used to cope with the high and rapid demand of energy due to stress. LDH is an important glycolytic enzyme in biological systems and is inducible by oxygen stress. The activity of lactate dehydrogenase sustains the continued process of glycolysis under anaerobic conditions [37]. The level of LDH was found to be increased in the gills and decreased in the liver, kidney and muscles in the monocrotophos exposed fish [38].

ALT an enzyme frequently used in the diagnosis of damage caused by pollutants in various tissues [39, 40] was highly elevated in all the tissues of fishes treated with phenol and m-cresol. Thus elevation in activity of ALT in different tissues of *O. mossambicus* can be considered as a response to the stress induced by phenolic compounds to generate keto acids for contributing to gluconeogenesis and/or energy production necessary to meet the excess energy demand. An elevation in ACP activity suggests an increase in lysosomal mobilization and cell necrosis due to the toxicity of phenolics. This increase also suggests the supply of phosphate group for energy metabolism. This shows an adverse impact on metabolism, which may lead to negative impact on growth, health and reproduction. Degeneration and necrosis induced in hepatic parenchymatous cells by these toxicants may have caused release of acid phosphatase in the serum. Alterations in ACP activities in tissues and serum have been reported in pesticide treated fish [41].

The reduction in protein content in liver and muscle of both the treated groups indicates that under stress conditions the tissue protein may undergo proteolysis, which may have resulted in the production of free amino acids which can be used in the tricarboxylic acid cycle for energy production. The tissue protein is metabolized to produce glucose by the process of gluconeogenesis and it is utilized for energy production under stress conditions [42]. The decrease in protein content in gills and kidneys may be attributed to stress induced by phenolic compounds for the utilization of amino acids in various catabolic reactions. Yadav et al. [43] has reported that the animals exposed to chemicals obtain extra energy requirement from the tissue protein. The depletion of protein content may thus be due to the rapid utilization of tissue protein as the food utilization decreases when the animals are under stress conditions.

Na^+K^+-ATPase, an important membrane bound enzyme in gills showed a decreased activity in both the phenolic compound dosed groups. Thus, any toxicant that interferes with ionic homeostasis may be reflected as altered Na^+K^+-ATPase activity which was found to be decreased in the present investigation. This could be due to the effect of phenolic compounds on cell membrane because of their strong affinity for interaction with membrane lipids causing inhibition of membrane-bound

ATPases activity by affecting enzyme complex [44]. Xenobiotics can also alter Na^+K^+-ATPase activity by disrupting energy-producing metabolic pathways or interacting directly with the enzyme [45.] As the primary link between environmental change and physiological response, the neuroendocrine system is a critical part of osmoregulatory adaptations [46]. Cortisol can increase the cellular differentiation of chloride cells and stimulate branchial Na^+K^+-ATPase activity [47]. But on exposure to phenolics we observed a decreased cortisol response which may have resulted in decreased ATPase activity. Decreased Ca^{2+}-ATPase and Mg^{2+}-ATPase activities were also observed in both the treated groups. A reduction in the activity of Ca^{2+}-ATPases indicated the interaction of phenolic compounds with the microsomal and basolateral Ca^{2+} transporting ATPases [48]. Parvez et al. [49] observed decreased gill ATPase activities in the freshwater fish *Channa punctata* (Bloch) exposed to a diluted paper mill effluent. Chromium compounds were reported to inhibit ATPases, bringing about a failure of osmoregulatory mechanisms [50]. However, it is not clear how the organism compensate for ionic regulation in the face of exposures to environmental pollutants.

Pathological abnormalities in gills such as lamellar necrosis and complete desquamation of the gill epithelium provide evidence for the decreased branchial ATPase activity. Another important histopathological change observed was hyperplasia. Hyperplasia observed maybe the fish's response (1) to ward off or block something that irritates its tissues, whether externally or internally, or (2) to quickly heal an injured or irritated site. Hyperplasia, however, may play a role in the early stages of neoplasia. Increased mucus production and fusion of lamellae were obvious on exposure to both the phenolic compounds. Mucus cells contain mucins, polyanions composed of glycoproteins that can be effective in trapping toxicants and aid in the prevention of toxicant entry into the gill epithelium [51]. Extensive epithelial desquamation was also observed on phenol exposure. After acute exposure to hexavalent chromium, *Channa punctatus* also exhibited marked degenerative changes in the histology of gills, kidney and liver tissues [52]. Lamellar telangiectesis (localised dilation of blood vessel) observed results from the collapse of the pillar cell system and breakdown of vascular integrity with a release of large quantities of blood that push the lamellar epithelium outward [53]. Shortening and clubbing of ends of the secondary gill lamellae and clubbing of adjacent lamellae were well marked in the m-cresol treated group. Complete lamellar fusion may have reduced the total surface area for gas exchange. As fish gills are critical organs for their respiratory and osmoregulatory functions, the injuries in gill tissues observed as a result of exposure to phenolic compounds may have reduced the oxygen consumption and resulted in the disruption of the osmoregulatory functions of the fish. Any change in gill morphology may result in perturbed osmotic and ionic status which was observed as decreased branchial ATPases activity. The defense responses will take place at the expense of the respiratory efficiency of the gills and eventually results in the respiratory impairment.

To conclude, intoxication due to phenolic compounds lead to significant changes in the metabolic profile of *O. mossambicus* and the cause for these alterations appear to be the result of high energy demands. The foregoing results also showed that the branchial ATPases are very sensitive to chemical interaction and can be used as reliable biomarker for toxicity studies in phenolic compounds. The present histological investigations demonstrate a direct correlation between metabolic changes and histopathological disorders observed. From the results obtained, it is possible to consider that phenolic compounds can cause potential risk to the health of aquatic organisms even at very low concentrations (1/10th of LC_{50} value) for a short duration of 21 days, which can in turn affect the growth and vital functions.

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Land Suitability Analysis for Sustainable Agricultural Land Use Planning in Bulandshahr District of Uttar Pradesh

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Abstract- Bulandshahr district is characterised by six soil series depending upon their physio-chemical properties. These soil series are Ganga Khadar Soil Series, Manpur Soil Series, Senta Soil Series, Kota Soil Series, Aulera Soil Series and Ajeetpur Soil Series. In Bulandshahr district an attempt has been made to find out the suitability of major crops based on existing climatic and soil-site database. Land suitability is a function of crop requirement and land/soil characteristics. It is a prerequisite for sustainable agricultural practices. It involves evaluation of the factors like climate, terrain, soil etc. Matching the land characteristics with the crop requirements provides suitability index in the form of ranks. It involves the evaluation and grouping of specific areas of land in terms of their suitability for defined agricultural use. The quality of land categories are rated as S1 (highly suitable), S2 (moderately suitable), S3 (marginally suitable) and N1 (not suitable, but potentially suitable; uneconomical for use) that refers to the effects of the individual land qualities on production of the crop (Sehgal, 2000). The crop land-use requirements are matched with the land qualities for each of the soil series in Bulandshahr district and the final land-suitability maps for the major selected crops are made.

Index Terms- land suitability, Bulandshahr, soil series, land use.

I. Introduction

Land is one of the most important natural resources, and maintaining it in good health, is very much needed for meeting out the increasing demand for food, fibre, fodder and fuel. It assumes greater significance in present situation wherein the scope for further extension of cultivation is very limited. It is necessary to select the judicious crops for cultivation according to the soil suitability, so that maximum profit may be achieved while maintaining the ecological sustainability.

The crop land use planning involves making knowledgeable decisions about land use and the environment. Soil information is a vital component in the planning process, reflecting directly upon land-use suitability (Coleman & Galbraith 2000). The Land suitability is the process of assessing the suitability or ability of a given type of land. Land suitability classification process is the evaluation and grouping of specific areas of land in terms of their suitability for defined agricultural use.

Land suitability analysis is a prerequisite for sustainable agricultural practices. It involves evaluation of the factors like climate, terrain, soil etc. Land suitability is a function of crop requirements and soil/land characteristics. Matching the land characteristics with the crop requirements provides suitability. So, "suitability is a measure of how well the qualities of a land unit match the requirements of a particular form of land use" (FAO, 1976). Land suitability classification aims at evaluating and classifying land units on the basis of specific land and soil features and their limitations.

Soil-site suitability studies provide information on the choice of crops to be grown on best suited soil units for maximizing the crop production per unit of land, labour and inputs. The land suitability for a defined use and the impact of that use on the environment is determined by land conditions and land qualities. The sustainable land use depends on soil resilience that is the balance between soil restorative and soil degradation processes. Ecologically every factor of environment exerts directly or indirectly a specific affect on growth and development of the plants. However, it varies from habitat to habitat and determines the suitability of a plant to any particular environment. For planning and effective utilization of soil resources, the information relating to the soil-site characteristics for cultivation of crops is necessary (Naidu, 2006). In order to follow the principles of sustainable agriculture one has to grow the crops where they suit best and for which first and the foremost requirement is to carry out land suitability analysis (Ahamed et al. 2000).

The natural resources like soil and water and associated climatic features deeply influence the cropping pattern and crop productivity in specified areas. Each plant species requires definite soil and site conditions for its optimum growth. Since the availability of both water and plant nutrients is largely controlled by the physico-chemical properties and micro environment of the soils, therefore, the success and failure of cropping any plant species, in a particular area, is largely determined by these factors (Sehgal, 2000).

Objectives

The main objective of this study is to carry out the land suitability analysis for major crops in Bulandshahr district and to map out the results as well as to find out the deviations in agricultural practices from the optimum suitability of soils at block level in Bulandshahr district.

Study area

Bulandshahr District is a part of the Ganga Yamuna *Doab* lying in western Uttar Pradesh. Its geographical coordinates vary

between 28º 04' N and 28º45' N latitudes and 77º 35' E and 78º 30' E longitudes. It is bounded by the districts of Hapur and Ghaziabad in the north, Aligarh in the south, Amroha and Badaun in the east, and Gautam Budh Nagar in the west. River Ganga forms a natural boundary between Bulandshahr as well as Badaun and Amroha districts. It covers a total area of 3,719 km^2 (Fig. 1.1).

The district is a level plain with variations of some uneven lands on the banks of rivers. The whole of the district being formed of the Gangetic plain. However, the area is covered by alluvium of Quaternary age. The only mineral of any importance in the district is *kankar*. It experiences the sub-humid monsoon climate (Singh, 1971), that is why the district is rich in agricultural land, and produces many crops; fruits and vegetables, generally there are three harvests, the *kharif*, the *rabi* and the *zaid*. The *zaid* is relatively of little significance.

Bulandshahr district is characterised by six soil series depending upon their physio-chemical properties. These soil series are Ganga Khadar Soil Series, Manpur Soil Series, Senta Soil Series, Kota Soil Series, Aulera Soil Series and Ajeetpur Soil Series. A soil series name generally is derived from a town or a landmark in or near the area where the soil series was first recognized (Simonson, 1952). Soil series is a group of soils with similar profiles developed from similar parent materials under comparable climatic and vegetational conditions. The Figure 1.2 shows the soil series map of Bulandshahr district.

Location of Bulandshahr District

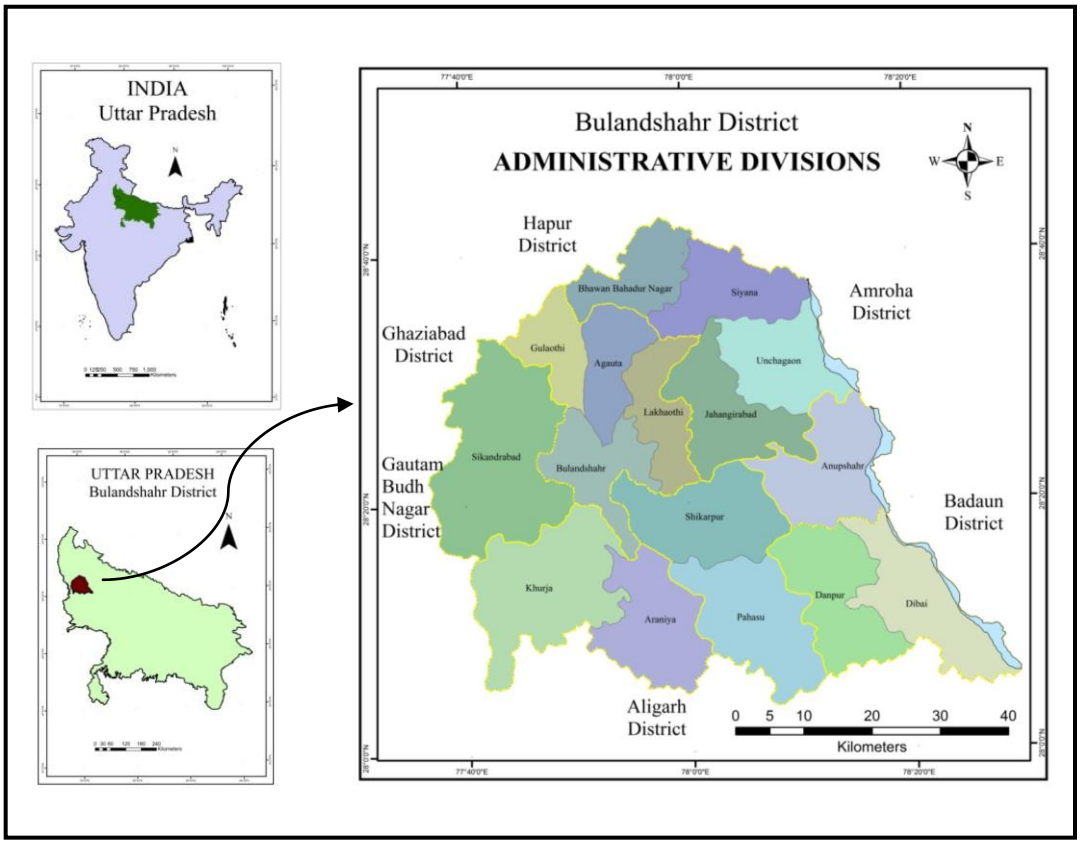

Fig. 1.1

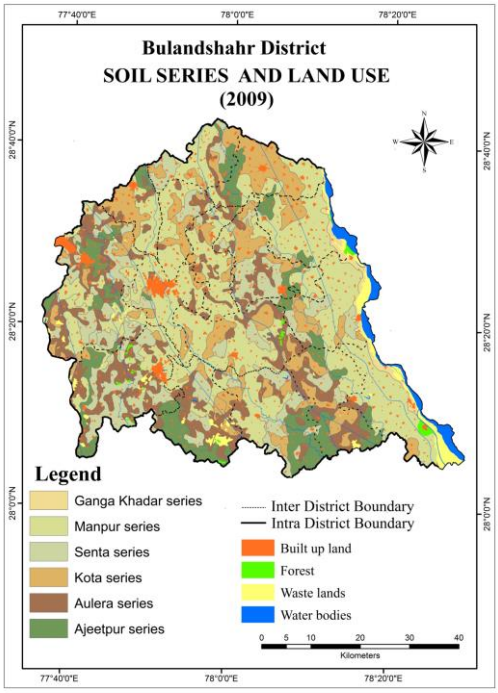

Fig. 1.2

II. Database and Methodology

To carry out the land suitability analysis, the data about the production and acreage of selected crops is taken for the year 2007-08 from district Sankhiyiki Patrika of Bulandshahr district. The soil series data taken from the soil report of National Informatic Centre (NIC). The requirements for each crop were obtained from National Beureou of Soil Survey and Land Use planning (NBSS & LUP) and Indian Council of Agricultural Research (ICAR) publications (Naidu 2006), (Ramesh 2002), Sehgal (1996); the land characteristics were obtained from soil survey reports. The land use land cover map was prepared from the Landsat TM data 2009. The overlay analysis of land use land cover map 2009 and soil series map of all the sixteen blocks of the district Bulandshahr was carried out in GIS environment using Arc GIS 9.3 and finally the soil suitability map of agricultural land was generated. Field survey was done for cross verification for the existing land use pattern in diffrent soil series. Land suitability classification method proposed by FAO (1976) is applied to delineate soil suitability classes. Physical and chemical properties of the land as well as climatic factors are the major determinants for crop suitability of a given land. The physical land properties of the study area are evaluated, including the soil texture, drainage, and soil depth. The slope of the land is also considered. Climate (Temperature and Rainfall) of the study area is also used for crop suitability analysis. The chemical properties of soil like pH (negative log of hydrogen ion concentration), CEC (cation exchange capacity), EC (electrical conductivity) and ESP (exchangeable sodium percentage) are also taken for soil site suitability analysis.

Land suitability index in the form of ranks as a function of crop requirement and land characteristics involving the evaluation and grouping of specific areas of land in terms of their suitability for defined agricultural use are worked out. The flow chart given below (Fig. 1.3) exhibits the land categories of ‘S1’ highly suitable (with slight limitations), ‘S2’ moderately suitable (with moderate limitations), ‘S3’ marginally suitable (with severe limitations), ‘N1’ almost unsuitable (not suitable currently) (FAO 1976).

Soil Suitability Criteria

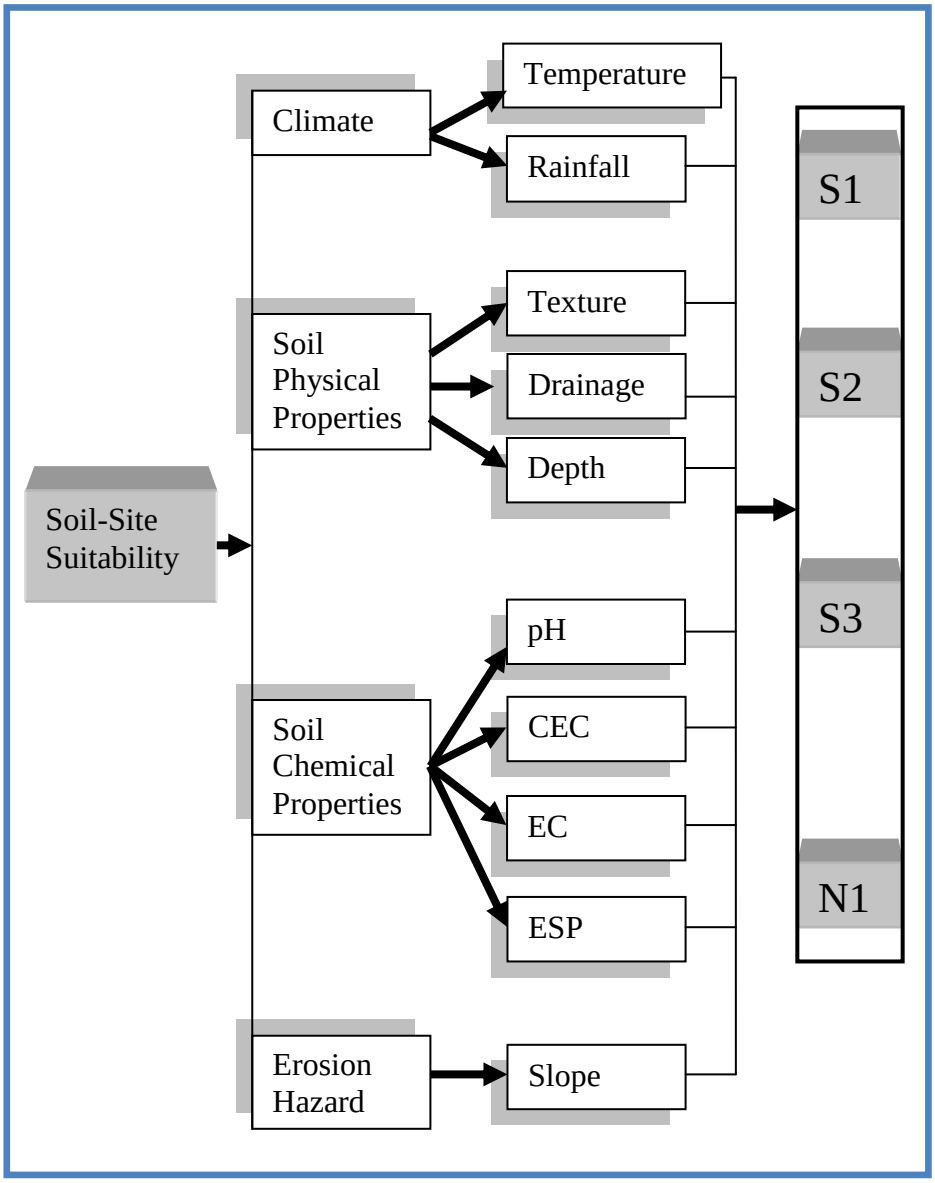

Fig. 1.3

III. Results and Discussions

For the purpose of analysing soil-site suitability, nine major crops viz. Rice, wheat, maize, barley, pearl millet, pulses, mustard, sugarcane and potato were selected. These crops in individual capacity occupy 1% and above and collectively occupy about 82.29 % of net area sown of the district. For the purpose of finding out the suitable crop land use the requirements for each major crop grown were matched with the existing land characteristics.

The quality of each land category was assessed by the ratings S1 (highly suitable), S2 (moderately suitable), S3 (marginally suitable) and N1 (not suitable, but potentially suitable; uneconomical for use) that refer to the effects of the individual land qualities on production of the crop (Sehgal, 2000). The crop land-use requirements and land qualities were matched for each of the soil series and the final land-suitability maps for each selected crop were made.

Rice (*oryza sativa*)

In Bulandshahr district soil suitability classes for rice crop are shown in Figure 1.4. It was found that soil suitability class S2 is spread over an area of about 2700.60 sq.km around 82.89% area of the district and soil suitability class S3 is spread over an area of about 557.63 sq.km around 17.11% area of the district (Table 1.1). The blocks which cover more than the district

average of soil suitability class S2 are the blocks of Siyana, Pahasu, Lakhaothi, Jahangirabad, Gulaothi, Dibai, Bulandshahr, Bhawan Bahadur Nagar, Anupshahr, Agauta and Unchagaon. While the blocks which have the maximum area more than the district average under the soil suitability class S3 are the blocks of Sikandrabad, Shikarpur, Lakhaothi, Khurja, Danpur, and Araniya.

The existing cropping pattern shows that out of 82.40% gross cropped area under the major nine crops, rice covers 12.15% area in the district, though no where in the district the soil are highly suitable (i.e. S1) for rice cultivation. It yields 22.77 quintals/hectares in the district. It also has some variations at block level, the blocks in which rice is cultivated more than the district average are the blocks of Sikandrabad 17.51%, Lakhaothi 15.44%, Bulandshahr 12.71%, Jahangirabad 12.19%, Khurja 14.49%, Araniya 18.15% and Pahasu 15.24%.

Wheat (Triticum Aestivum)

The distribution of soil suitability classes for wheat in Bulandshahr district are shown in Figure 1.5. It shows block wise distribution of soil suitability classes for wheat. It was found that soil suitability class S1 spreads over an area of about 2700.60 sq.kms around 82.89% area of the district and soil suitability class S2 spreads over an area of 38.63 sq.kms around 1.19% area of the district while the soil suitability class S3 spread over an area of about 518.99 sq.kms around 15.93% (Table 1.1). The blocks which cover more than the district average of soil suitability class S1 are Siyana, Pahasu, Lakhaothi, Jahangirabad, Gulaothi, Bulandshahr, Bhawan Bahadur Nagar, Dibai, Anupshahr, Agauta and Unchagaon. The blocks which have the maximum area more than the district average under the soil suitability class S2 are Dibai, Anupshahr and Unchagaon. While the soil suitability class S3 which covers the area more than the district average is found in the blocks of Sikandrabad, Shikarpur, Lakhaothi, Khurja, Danpur and Araniya.

The present cropping pattern of the district reveals that out of 82.40% gross cropped area under the major nine crops wheat is produced on 38.10% area. The average yield of wheat in the district is 37.68 quintal/hectares. Though, area under wheat varies at block level. It covers area more than the district average in the blocks of Sikandrabad 38.51%, Gulaothi 38.24%, Khurja 41.83%, Araniya 41.07%, Pahasu 41.77, Unchagaon 39.02%, Danpur 42.53% and Dibai 39.19%.

Maize (*Zea mays*)

The distribution of soil suitability classes for maize in Bulandshahr district are shown in Figure 1.6. It shows the cultivation of maize in Bulandshahr district. The soil suitability class S1 spreads over an area of about 1068.40 sq.kms which is about 32.79% of the study area. The soil suitability class S2 covers an area of about 1632.20 sq.kms (50.09%) in the district, while soil suitability class S3 covers only 38.63 sq.kms around 1.19% of the study area. Maize also has the soil suitability class N1 and spreads over the area of 518.99 sq.km i.e. about 15.93% area of the district (Table 1.1).

The blocks which have the highest area about 45% suitable for maize production under the soil suitability class S1 are Jahangirabad, Siyana and Bhawan Bahadur Nagar. The soil suitability class S2 has maximum area in the blocks of Bulandshahr, Dibai, Unchagaon and Lakhaothi which has more than 60% area of the blocks. The soil suitability class S3 is found in only four blocks of the district. The soil suitability class N1 more than the district average is found in the blocks of Khurja, Araniya, Danpur, Sikandrabad, Shikarpur and Lakhaothi.

The present cropping pattern of the Bulandshahr district reveals that maize spreads over 11.06% area out of the 82.40% area occupied by the major nine crops of the district. It yields 19.94 quintal/hectares in the district. The area under maize more than the district average is found in the blocks of Shikarpur 14.25%, Jahangirabad 12.81%, Pahasu 14.77%, Unchagaon 12.94%, Danpur 20.02%, Dibai 19.25%, Anupshahr 14.56% (Table 1.2).

Barley (*Hordeum vulgare*)

Soil suitability classes for barley are shown in Figure 1.7. It illustrates the block wise distribution of soil suitability classes for barley. It was found that soil suitability class S1 spreads over an area of about 2700.60 sq.kms (82.89%) of the district. The blocks which cover more than the district average of soil suitability class S1 are Siyana, Pahasu, Lakhaothi, Jahangirabad, Gulaothi, Bulandshahr, Bhawan Bahadur Nagar, Dibai, Anupshahr, Agauta and Unchagaon. The soil suitability class S2 spreads over an area of about 38.63 sq.kms (around 1.19%) of the district. Its spread is only in four blocks of the district namely Dibai, Anupshahr, Unchagaon and Siyana. The S3 spreads over an area of about 518.99 sq.kms (15.93%). The soil suitability class S3 covering area more than the district average is found in the blocks of Sikandrabad, Shikarpur, Lakhaothi, Khurja, Danpur and Araniya. The existing cropping pattern of the district shows that barley covers only 1.62% area, out of the 82.40% area under major nine crops cultivated in the district. It yields 34.38 quintals/hectares in the district. The blocks which cover area more than the district average under barley are Lakhaothi 1.67%, Shikarpur 1.98%, Khurja 1.96%, Araniya 2.15%, Pahasu 1.76%, Danpur 2.26% and Dibai 1.97% (Table 1.2).

Pearl Millet or Bajra (*Pennisetum typhoides*)

The soil suitability classes for pearl millet are shown in Figure 1.8. It is found that for the cultivation of pearl millet in Bulandshahr district, soil suitability class S1 covers 82.89% area of the district which spreads over about 2700.60 sq. kms. The blocks which cover more than the district average of soil suitability class S1 are the blocks of Siyana, Pahasu, Lakhaothi, Jahangirabad, Gulaothi, Dibai, Anupshahr, Bulandshahr, Bhawan Bahadur Nagar, Agauta and Unchagaon. While soil suitability class S3 covers about 17.11% area of the district and spread over about 557.63 sq.kms. The spread of S3 above the district average is found in the blocks of Sikandrabad, Khurja, Lakhaothi, Danpur, and Araniya.

The existing cropping pattern of the district shows that out of 82.40% cropped area under the selected major nine crops pearl millet covers only 1.53% area. Its yield is 16.30 quintal/hectares. The blocks which cover area more than the district average are Sikandrabad 2.27%, Khurja 3.32%, Araniya 3.96%, Pahasu 4.23% and Dibai 2.18% (Table 1.2).

Pulses

The soil suitability for all pulses like *urad, moong, masur, pea* and *arhar* is more or less same. Their existing area under individual pulses in the district is very low i.e. below 1%, that's why all of them are clubbed under the category of pulses. However, in the study area maximum acreage is occupied by *Arhar* or pigeon pea. In Bulandshahr district soil suitability classes for pulses are shown in Figure 1.9. It was found that soil suitability class S1 covers 72.18% area of the district which spreads over about 2351.68 sq.kms covering all the blocks of the district. It covers more than 80% area in the blocks of Siyana, Shikarpur, Lakhaothi, Gulaothi, Dibai, Anupshahr, Unchagaon Bulandshahr, Bhawan Bahadur Nagar and Agauta. The soil suitability class S2 covers 10.71% area of the district covering about 348.92 sq.kms spreading over all the blocks of the district except the Agauta block. The soil suitability class S3 covers only 1.19% area of the district and spreads over four blocks of the district covering about 38.63 sq.kms. While the soil suitability class N1 covers 15.93% area of the district that spreads over all the blocks of the district except Unchagaon block covering about 518.99 sq.kms.

The existing cropping pattern under pulses reveals that out of 82.40% cropped area of the district under major nine crops pulses covers only 3.58% of the area. The blocks which cover area more than the district average are Sikandrabad 3.63%, Gulaothi 3.62%, Shikarpur 4.33%, Khurja 5.96%, Araniya 4.95%, Pahasu 4.49% and Danpur 3.75% (Table 1.2).

Mustard (*Brassica juncea*)

The distribution of soil suitability classes for Mustard in Bulandshahr district are shown in Figure 1.10. It is found that Soil suitability class S1 covers 82.89% area of the district which spreads over about 2700.60 sq.kms found in almost all the blocks of the district. The soil suitability class S2 is found only in four blocks of the district namely Siyana, Unchagaon, Anupshahr and Dibai covering 1.19% area of the district (38.63sq.kms). The soil suitability class N1 covers 15.93% area of the district (518.99sq.kms). It is found in all the blocks of the district except the Unchagaon.

The existing cropping pattern shows that out of 82.40% cropped area under the major nine crops mustard occupy only 1.58% area. Its yield is 11.10 quintals/hectares. Its acerage more than the district average is found in the blocks of Khurja 1.81%, Araniya 3.24%, Pahasu 2.29%, Danpur 2.04% and Dibai 2.50% (Table-1.2).

Sugarcane (Saccharum officinarum)

The soil suitability class for Sugarcane in Bulandshahr district are shown in Figure 1.11. The Table 1.1 and Figure 1.11 reveal the distribution of soil suitability class for sugarcane. It was found that soil suitability class S1 covers only about 32.79% area of the district occupying 1068.40 sq.kms spreading over all the blocks of the district. The soil suitability class S2 covers 51.28% area of the district spreading over 1670.83 sq.kms over all the blocks of the district. While the soil suitability class S3 covers 15.93% area of the district covering 518.99 sq.kms and is found in all the blocks except Unchagaon.

The existing sugarcane cropping shows that it is spread over 11.36% area out of the total 82.40% area under the nine major crops. It yields 587.55 quintal/hectares. The presence of sugarcane more than the district average is found in the blocks of Bhawan Bahadur Nagar 30.50%, Siyana 21.44%, Agauta 21.35%, Gulaothi 19.96%, Anupshahr 19.16%, Unchagaon 15.35%, Jahangirabad 12.79% and Lakhaothi 12.02%.

Potato (Solanum tuberosum)

The distribution of soil suitability class for potato in shown by Table 1.1 and Figure 1.12. It is found that Soil suitability class S1 covers 82.89% area of the district which spreads over 2700.60 sq.kms and is found in almost all the blocks of the district. The soil suitability class S3 is found only in four blocks of the district covering only 1.19% area of the district which spreads over 38.63 sq.kms, these blocks are Siyana, Dibai, Anupshahr and Unchagaon. The soil suitability class N1 covers 15.93% area of the district that spreads over 518.99 sq.kms. Except the Unchagaon it found in all the blocks of the district (Table 1.1).

The existing cropping pattern of the district reveals that potato covers only 1.43% area out of the total cropped area of the district under the major nine crops. It yields 173.57 quintals/hectares. Its presence more than the district average is found in the blocks of Jahangirabad 4.14%, Unchagaon 2.02%, Agauta 1.80%, Shikarpur 1.74% and Bulandshahr 1.46% (Table 1.2).

IV. Conclusion and Suggestions

The soil-site suitability for major crops in Bulandshahr district represents that soil suitability class S1 (highly suitable) covers 82.89% area for wheat, millet, barley, mustard and potato. However the existing cropping pattern (Table 1.2) shows that Bulandshahr district covers only 44.26% area for the cultivation of wheat (38.10%), barley (1.62%), millet (1.53%), mustard (1.58%), and potato (1.43%). Similarly for the cultivation of pulses 72.18% of the area of the district exhibits the same soil category 'S1' while pulses presently are cultivated only on 3.58% area. For maize and sugarcane cultivation 'S1' category of soil is found over 32.79% area of the district while presently they are cultivated only on 22.42% area with a break up for Maize (11.06%) and sugarcane (11.36%). The rice crop is moderately suitable and is cultivated over 12.15% area of the district.

Hence, in the study area more land should be devoted to highly suitable crops like pulse, mustard, barley, millet and potato. The share of these crops in the district is very low.

The block wise study reveals that in almost all the blocks of the district Bulandshahr rice is moderately suitable and comes under S2 soil suitability class should be replaced by other more suitable crops like pulses, mustard, barley, potato and millet, presently the presence of these crops in the block is very less. This change in the cropping pattern would help enhancing not only the sustainable carrying capacity of the land but would also help in the conservation of rural land resources as well as their development.

Beside this in the blocks of Unchagaon, Dibai, Lakhaothi and Bulandshahr the actual area under maize and sugarcane cultivation is higher than the area for their suitability. Thus, the additional area under maize and sugarcane cultivation in the blocks of Unchagaon (13.64%), Dibai (22.72%), Lakhaothi (1.62%) and Bulandshahr (1.92%) should be devoted to highly suitable crops like pulses, mustard, barley, potato and millets presently their share in these blocks is very low.

Bulandshahr District
Soil Suitability

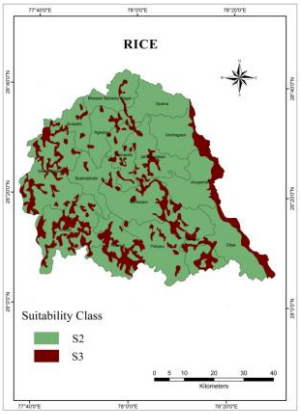

Fig. 1.4

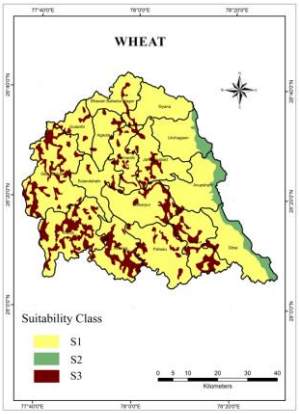

Fig. 1.5

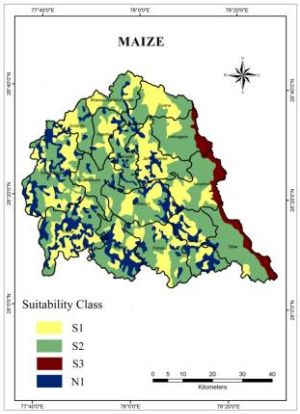

Fig. 1.6

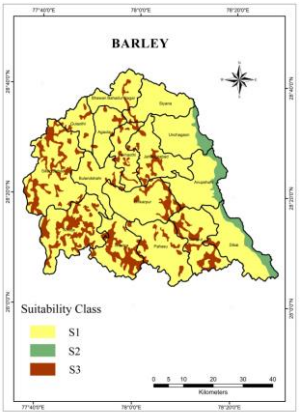

Fig. 1.7

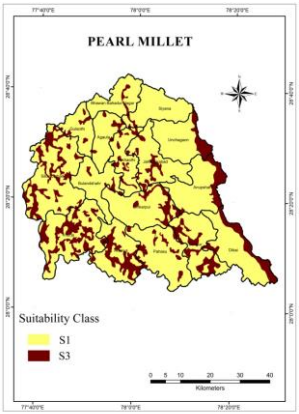

Fig. 1.8

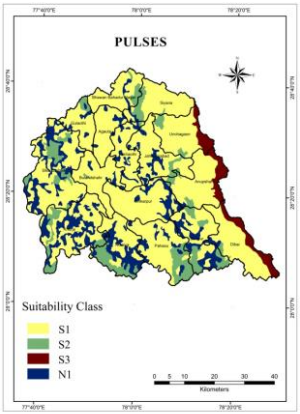

Fig. 1.9

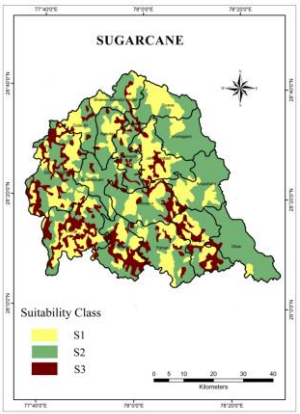

Fig. 1.10

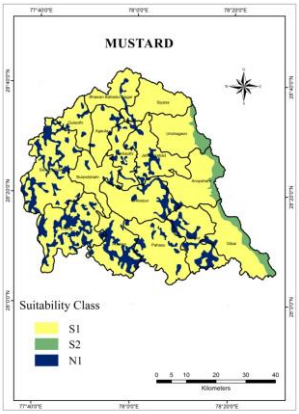

Fig. 1.11

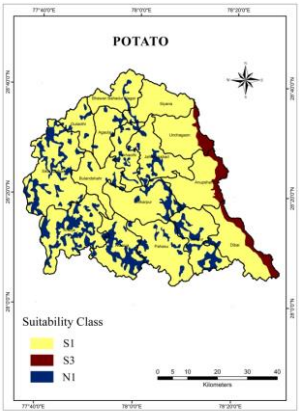

Fig. 1.12

Table – 1.1
Bulandshahr District
Soil Suitability classes for selected crops

		RICE		WHEAT, BARLEY,			MAIZE				PEARL MILLET	
		S2	S3	S1	S2	S3	S1	S2	S3	N1	S1	S3
S.No.	Blocks	%	%	%	%	%	%	%	%	%	%	%
1	Siyana	96.80	3.20	96.80	0.93	2.27	47.42	49.38	0.93	2.27	96.80	3.20
2	Sikandrabad	73.54	26.46	73.54	0.00	26.46	36.26	37.28	0.00	26.46	73.54	26.46
3	Shikarpur	82.66	17.34	82.66	0.00	17.34	33.07	49.59	0.00	17.34	82.66	17.34
4	Pahasu	87.19	12.81	87.19	0.00	12.81	36.21	50.98	0.00	12.81	87.19	12.81
5	Lakhaoti	82.89	17.11	82.89	0.00	17.11	20.77	62.12	0.00	17.11	82.89	17.11
6	Khurja	67.49	32.51	67.49	0.00	32.51	36.22	31.27	0.00	32.51	67.49	32.51
7	Jahangirabad	84.68	15.32	84.68	0.00	15.32	53.86	30.82	0.00	15.32	84.68	15.32
8	Gulaothi	88.90	11.10	88.90	0.00	11.10	37.88	51.02	0.00	11.10	88.90	11.10
9	Dibai	89.86	10.14	89.86	6.69	3.46	5.65	84.20	6.69	3.46	89.86	10.14
10	Danpur	73.13	26.87	73.13	0.00	26.87	30.82	42.31	0.00	26.87	73.13	26.87
11	Bulandshahr	93.52	6.48	93.52	0.00	6.48	17.77	75.75	0.00	6.48	93.52	6.48
12	Bhawan Bahadur Nagar	94.06	5.94	94.06	0.00	5.94	45.87	48.19	0.00	5.94	94.06	5.94
13	Araniya	69.84	30.16	69.84	0.00	30.16	27.75	42.09	0.00	30.16	69.84	30.16
14	Anupshahr	92.45	7.55	92.45	6.09	1.46	34.05	58.40	6.09	1.46	92.45	7.55
15	Agauta	90.84	9.16	90.84	0.00	9.16	36.08	54.76	0.00	9.16	90.84	9.16
16	Unchagaon	93.03	6.97	93.03	6.97	0.00	14.65	78.38	6.97	0.00	93.03	6.97
	Bulandshahr District	**82.89**	**17.11**	**82.89**	**1.19**	**15.93**	**32.79**	**50.09**	**1.19**	**15.93**	**82.89**	**17.11**

Contd……

Table – 1.1
Bulandshahr District
Soil Suitability classes for selected crops

		PULSES				MUSTARD			SUGARCANE			POTATO		
		S1	**S2**	**S3**	**N1**	**S1**	**S2**	**N1**	**S1**	**S2**	**S3**	S1	S3	N1
S. No.	**Blocks**	%	%	%	%	%	%	%	%	%	%	%	%	%
1	Siyana	83.22	13.57	0.93	2.27	96.8	0.93	2.27	47.42	50.31	2.27	96.8	0.93	2.27
2	Sikandrabad	61.38	12.16	0	26.46	73.54	0	26.46	36.26	37.28	26.46	73.54	0	26.46
3	Shikarpur	82.09	0.57	0	17.34	82.66	0	17.34	33.07	49.59	17.34	82.66	0	17.34
4	Pahasu	66.12	21.07	0	12.81	87.19	0	12.81	36.21	50.98	12.81	87.19	0	12.81
5	Lakhaoti	81.84	1.06	0	17.11	82.89	0	17.11	20.77	62.12	17.11	82.89	0	17.11
6	Khurja	54.52	12.97	0	32.51	67.49	0	32.51	36.22	31.27	32.51	67.49	0	32.51
7	Jahangirabad	78.73	5.96	0	15.32	84.68	0	15.32	53.86	30.82	15.32	84.68	0	15.32
8	Gulaothi	80.23	8.67	0	11.1	88.9	0	11.1	37.88	51.02	11.1	88.9	0	11.1
9	Dibai	87.23	2.63	6.69	3.46	89.86	6.69	3.46	5.65	90.89	3.46	89.86	6.69	3.46
10	Danpur	49.01	24.12	0	26.87	73.13	0	26.87	30.82	42.31	26.87	73.13	0	26.87
11	Bulandshahr	92.94	0.58	0	6.48	93.52	0	6.48	17.77	75.75	6.48	93.52	0	6.48
12	Bhawan Bahadur Nagar	82.84	11.22	0	5.94	94.06	0	5.94	45.87	48.19	5.94	94.06	0	5.94
13	Araniya	46.19	23.65	0	30.16	69.84	0	30.16	27.75	42.09	30.16	69.84	0	30.16
14	Anupshahr	85.55	6.9	6.09	1.46	92.45	6.09	1.46	34.05	64.5	1.46	92.45	6.09	1.46
15	Agauta	90.84	0	0	9.16	90.84	0	9.16	36.08	54.76	9.16	90.84	0	9.16
16	Unchagaon	84.25	8.78	6.97	0	93.03	6.97	0	14.65	85.35	0	93.03	6.97	0
	Bulandshahr District	**72.18**	**10.71**	**1.19**	**15.93**	**82.89**	**1.19**	**15.93**	**32.79**	**51.28**	**15.93**	**82.89**	**1.19**	**15.93**

Table 1.2
Bulandshahr District
Acreage under major crops 2007-08 (%)

Blocks	**Rice**	**Wheat**	**Barley**	**Millet**	**Maize**	**Pulses**	**Mustard**	**Sugarcane**	**Potato**	**Total**
Sikandrabad	17.51	38.51	1.50	2.27	5.37	3.63	1.08	6.59	1.35	**77.81**
Gulaothi	9.67	38.24	1.02	0.05	4.91	3.62	1.16	19.96	1.31	**79.93**
Lakhaothi	15.44	37.23	1.67	0.14	10.59	2.90	1.11	12.02	1.05	**82.16**
Bulandshahr	12.71	35.63	1.46	0.05	10.50	2.99	1.25	9.19	1.46	**75.23**
Shikarpur	11.13	37.79	1.98	0.27	14.25	4.33	1.55	9.54	1.74	**82.59**
Bhawan Bahadur Nagar	6.10	31.09	1.06	0.06	4.94	2.89	0.98	30.50	1.00	**78.62**
Siyana	5.90	34.31	1.10	0.13	8.18	2.67	1.27	21.44	0.89	**75.88**
Jahangirabad	12.19	34.20	1.16	0.05	12.81	2.19	0.82	12.79	4.14	**80.33**
Khurja	14.49	41.83	1.96	3.32	7.47	5.96	1.81	4.74	1.26	**82.85**
Araniya	18.15	41.07	2.15	3.96	7.71	4.95	3.24	5.76	1.03	**88.00**
Pahasu	15.24	41.77	1.76	4.23	14.77	4.49	2.29	5.05	1.07	**90.67**
Unchagaon	4.36	39.02	1.07	0.05	12.94	2.79	0.83	15.35	2.02	**78.43**
Danpur	10.22	42.53	2.26	1.37	20.02	3.75	2.04	6.63	0.85	**89.66**
Dibai	10.40	39.19	1.97	2.18	19.25	2.43	2.50	9.12	0.63	**87.68**
Anupshahr	8.33	35.15	1.55	0.60	14.56	1.89	1.22	19.16	1.01	**83.48**
Agauta	9.15	32.17	1.03	0.02	5.90	2.57	0.95	21.35	1.80	**74.95**
Bulandshahr District	**12.15**	**38.10**	**1.62**	**1.53**	**11.06**	**3.58**	**1.58**	**11.36**	**1.43**	**82.41**

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Cold Agglutinins associated with Plasmodium falciparum malaria: A case report

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Abstract- The combination of anemia in malarial infestations ranges from nutritional deficiency to marrow suppression. An immune hemolytic anemia in Plasmodium falciparum malaria is also a part of this wide-ranging spectrum. But the co-existence of cold agglutinins in a Plasmodium falciparum malaria has only sporadically been reported in literature. We present a case of a patient with falciparum malaria who developed severe anemia and jaundice at the time of presentation. The Coombs' test and cold agglutinin test were negative. This case underlines a rare association of cold agglutinins in Plasmodium falciparum malaria.

Index Terms- Plasmodium falciparum; cold agglutinins; hemolytic anemia; jaundice.

I. Introduction

Malaria continues to be a premier disease in India; with an increasing prevalence and geographical diversity. *Plasmodium falciparum* malaria in particular has been associated with a multitude of complications. Moreover, the varied presentations of the disease and its diversity in terms of hematological manifestations have been well endowed in literature. Anemia, by far, is the most important manifestation. The aetiology of anemia seen in falciparum malaria is multifactorial. This anemia ranges from nutritional deficiency to hemolytic anemia due to an accelerated red blood cell removal by the spleen. Also, an ineffective erythropoiesis is also incriminated in few cases. Drug-induced hemolytic anemia is the other dimension to this aspect. However, an immune-mediated hemolysis in malaria has gathered the attention of researchers in recent years. As literature keeps expanding with varied immune-mediated complications, the role of cold agglutinins is seldom mentioned. We report a case of *Plasmodium falciparum* malaria where clinical and laboratory evidence of hemolysis due to cold agglutinins were evidenced.

II. Case report

A 27-year old male patient with a two-day history of high grade, intermittent fever with chills and rigors presented to the medicine outpatient department of our hospital. Clinical examination showed pallor and icterus. A mild to moderately enlarged spleen was palpated on general examination. The laboratory investigations revealed anemia (hemoglobin: 7.3g/dl) and thrombocytopenia (platelet count: 23,000/mm^3). Both the peripheral smear and quantitative buffy coat (QBC) test showed abundant gametocytes and ring forms of *Plasmodium falciparum* malarial parasite (figure 1). But the autoanalyzer had given a suspect flag for 'H &H' check fail. The RBC count and hematocrit were disproportionately low for the degree of anemia (1.34 x 10^6 / cu.mm and 15.2% respectively). Additionally, the peripheral smear showed clumping of erythrocytes with occasional spherocytes and mild polychromasia; suggesting a hemolytic anemia due to cold agglutinins (figure 1). The sample was warmed to 37 degree Celsius for 30 minutes and run on the analyzer. The cell counts improved marginally. As such, a Coombs' test and cold agglutinin test were advised along with a follow up count for thrombocytopenia.

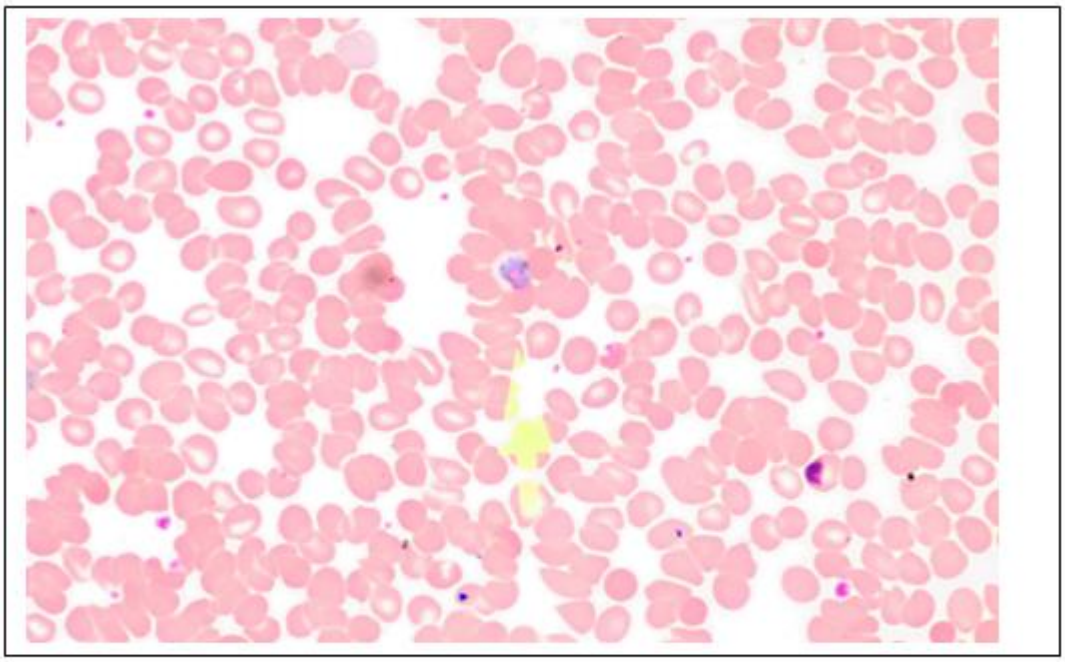

Figure 1: Peripheral blood smear showing erythrocyte clumping and trophozoites and ring forms of *Plasmodium falciparum* (arrow) (Leishman ; x200)

The direct Coombs' test (DAT) was negative. The biochemical tests showed a raised serum bilirubin; with an appreciably high fraction of unconjugated bilirubin (2.1mg/dl); confirming the pre-hepatic hemolytic anemia. Other investigations showed a reticulocyte count of 5.6%; which was not significantly high for the degree of anemia. No hemoglobin was detected in the urine examination. The cold agglutinin test performed on the same sample showed a negligibly positive titre of 1:128. Thus, based on the clinical parameters and laboratory evidence, a diagnosis of cold agglutinin disease associated with *Plasmodium falciparum* malaria was rendered.

The patient was placed on anti-malarial therapy and improved clinically within four days. Laboratory investigations-wise, the counts appreciated in these days as well. The peripheral smear on day four of admission did not show clumping of erythrocytes.

III. Discussion

Anemia in malaria is not an uncommon association. The prevalence of anemia depends on many variables such as age and nutritional status of the patient and endemicity. Besides these, the other causes of anemia includes an accelerated RBC removal by the spleen, obligatory RBC destruction at parasite schizogony (due to reduced red cell deformation of parasitized and non-parasitized erythrocytes) and ineffective erythropoiesis.[1] The recent advancements have showed that a variety of cytokine dysregulations are indeed vital participants in inducing and accelerating the pathogenesis of hemolysis in malaria. They include a significant increase in interferon (IFN) gamma, interleukin (IL)-6, tumour necrosis factor (TNF)-alpha, IL-1, hypoxia inducing factor (HIF)-1 and decrease in IL-10 and IL-12 levels.[1,2] Compounding this problem is the anecdotal evidence that hemolysis in malaria is much greater than that seen in other parasite- induced diseases. Thus, an underlying immune-mediated pathology has been suggested.[3]

Hemolytic anaemias are manifested due to an excessive destruction of red blood cells. Cold agglutinin disease of the secondary type is associated with infections far more than neoplastic processes; with malaria being one of the uncommon aetiologies.[4] Immune hemolytic anemias caused by cold-active antibodies are associated with IgM antibodies, directed at the 'I' or 'i' antigens on the surface of RBCs.[5] A vast majority of these antibodies rarely cause symptomatic anemia with the level of hemoglobin infrequently dropping below 7gm/dl.[6] In this case, the clumping of erythrocytes on the peripheral smear and RBC indices on the autoanalyzer hinted towards the role of an IgM antibody. Additionally, the degree of hemolysis was not severe. Although the patient's condition improved with treatment, the pertinent question is whether the transient hemolysis which was observed at presentation significant?

A raised titre of IgM antibodies in in malaria is practically unheard of. If one considers the prototype example of *Mycoplasma pneumoniae* infection and development of secondary cold agglutinin disease, some hypothesis can be speculated.[7,8] The generation of IgM antibodies in this particular falciparum malaria case may be due to the changes (sialylation) of I or i antigens on erythrocyte membrane surface of the

parasitized erythrocytes. This minor modification in the antigen could have incited a transient IgM response. Other possibility is that of a by-stander effect. The fact that the RBC clumping disappeared in the next three days can also be attributed to the clearance of the parasitized RBCs; thus reducing the antigenicity.

IV. Conclusion

Anemia in falciparum malaria has been assigned to a number of aetiologies. Immune hemolytic anemia is probably the least mentioned one. Still rarer is the combination of cold agglutinins and malaria. The definitive answer as to whether this hemolytic reaction is transient or clinically significant can only be answered by more research in the future

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Acute Erythroid Leukemia – A Hematological review of 5 cases in a tertiary care centre

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Abstract- Acute Erythroid Leukemia (AML M6) is a rare form of acute leukemia. **Aims and Objectives**: To retrospectively evaluate 5 cases of acute erythroid leukemia reported in the department of Pathology, Kasturba Medical College and Hospital, Manipal and analyze their clinico-hematological features with the available literature. **Materials and Methods**: Case records of the 5 patients with acute erythroid leukemia, diagnosed between January 2009 and December 2012 were reviewed. Clinical details were noted and slides were reviewed. **Results**: The mean age was 43.8years (range: 12-72). Male: female ratio of 3:2. Mean duration of symptoms in the present series was 6.4 weeks. Cytogenetics available in 2 cases, were normal. Pancytopenia was seen in 4 of the 5 cases. 4 cases were typed as AML –M6a or erythroleukemia (erythroid/myeloid) while one solitary case was of pure erythroid leukemia. **Conclusion**: The features of AML M6 are different from those reported in similar studies thus far.

Index Terms- Acute Erythroid Leukemia, AML M6, clinico-hematological feature.

I. Introduction

Acute Erythroid Leukemia (AML M6) is a rare form of acute leukemia; characterized by an uncontrolled proliferation of erythroid precursors (proerythroblasts and basophilic erythroblasts) and myeloblasts. Ever since its description almost a century ago it remains an elusive diagnosis, comprising < 5 % of all Acute Myeloid Leukemia (AML) cases.[1] After Giovanni Di Guglielmo stumbled onto this rare disease in 1928, the neoplasm has borne the eponym "Di Guglielmo syndrome".[2] The disease continues to evolve with time, hence providing a better understanding of the biology, clinical course and survival outcomes. To date, only few case reports of AML M6 have been reported from the Indian subcontinent. [3-6] We here report a retrospective analysis, in which we evaluated the clinico-hematological features of Acute Erythroid Leukemia.

II. Objectives

To review the 5 cases of acute erythroid leukemia reported in our hospital and analyze their clinico-hematological features with the available literature.

III. Materials and Methods

5 cases reported as acute erythroid leukemia in the Dept. of Pathology, Kasturba Medical College and Hospital, Manipal over a period of three years between January 2009 to December 2012, were reviewed. Clinical information was obtained from the Medical Records Department. The clinical details as available in the hospital records were noted. Age, sex, symptoms with duration, examination findings and any other relevant data were reviewed. Hematological review of all 5 cases (reported by an individual pathologist) was done on the bone marrow aspirate smears; including the cytochemical stains (MPO, SBB and PAS).

IV. Definition of AML M6

The current WHO classification subtypes it into two categories based on the presence or absence of significant myeloid component.[1] Erythroleukemia or Erythroid/Myeloid (FAB subtype A – M6a) comprises of more than 50% erythroid precursors among all nucleated cell population of bone marrow and more than 20% myeloblasts among non erythroid cells. Pure erythroid leukemia (FAB subtype B – M6b) comprises of more than 80% immature cells of erythroid lineage with no evidence of a significant myeloid component.

V. Results

The 5 cases typed morphologically as Acute Erythroid Leukemia had distinct profiles. The clinical parameters are presented in Table 1.

Table 1: Clinical characteristics of all 5 AML M6 patients

Case no	Age	Sex	Fever	Asthenia	Jaundice	Bleeding	Lymphadenopathy	Organomegaly	Pallor
1.	72	M	+	+	-	+	+	+	+
2.	39	F	+	+	-	-	-	+	+
3.	43	M	-	+	+	+	-	-	+
4.	11	M	-	+	+	+	-	+	+
5.	51	F	+	+	-	+	-	+	+

+ present.
- absent.

The hematological parameters are presented in Table 2.

Table 2: Hematological parameters in all 5 AML M6 patients

Case no.	Hemoglobin (gm %)	Total WBC count ($x10^{6}$/ dL)	Platelets ($x10^{6}$/ dL)	No. of cell lineages with dyspoiesis	Bone marrow megakaryocyte number	WHO 2008 classification	Cytogenetics
1.	5.5	2300	55000	3(E+My+Me)	Reduced	M6a	Not done
2.	6.3	4000	71000	3(E+My+Me)	Reduced	M6a	Not done
3.	2.3	2600	30000	2(E+My)	Reduced	M6a	46,XY
4.	9.3	7300	140000	1 (E)	Adequate	M6b	46,XY
5.	5.2	4200	26000	3(E+My+Me)	Reduced	M6a	Not done

E- Erythroid, My-Myeloid, Me-Megakaryocyte
M6b- Pure erythroleukemia
M6a- Erythroid/ myeloid

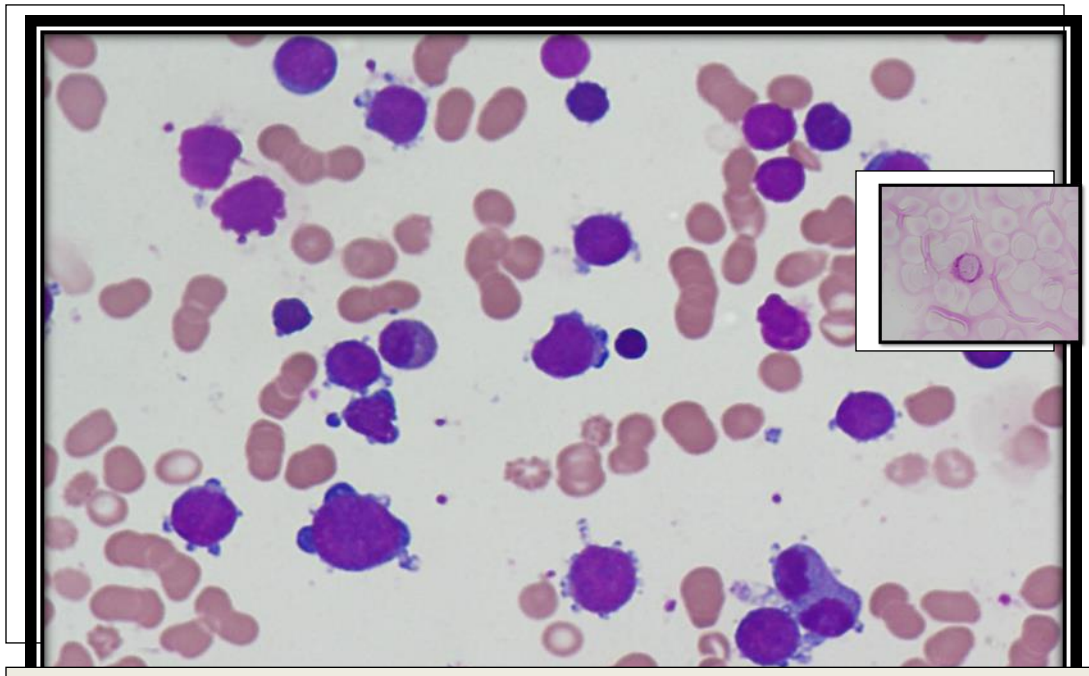

Figure 1 – Bone marrow aspirate showing erythroid hyperplasia with PAS positive erythroblast (Inset). (Leishman x200)

VI. Discussion

Acute Erythroid Leukemia (AML M6) is a rare form of acute leukemia. It is a distinctive bone marrow disorder characterized by the neoplastic proliferation of the dysplastic erythroid elements mixed with blasts of myeloid origin. The cases reported from India are sparse. Recent past have had few reports including a single case in 10 years of follow up of the Tata Memorial Hospital data and 20 cases in the series from AIIMS, Delhi. [7, 8] More recently, a case series from a south indian tertiary care hospital was also reported.[6] AML M6 is relatively uncommon and is known to account for 3-5% of all de novo AMLs and 20-30% of secondary leukemias.[6]

Clinical parameters: The malignancy usually presents in the fifth and sixth decades, but a bimodal peak has been described in conjunction with AML M6.[9] The smaller peak has been noted below 20 years, and a broader peak in seventh decade. [10] Few pediatric cases have also been elucidated.[11] In the present series, the age group ranged from 11 to 72 years with a mean of 43.8 years. One pediatric case was seen in the present series as well and is an addition to this rare demographic. The reason for this could be that all the cases in the present series were de novo. In most of the series, due to unknown reasons, males have been predominant. This was the case in the present series, with a male: female ratio of 3:2.

The signs and symptoms of AML M6 are nonspecific and are attributed to the replacement of bone marrow elements by neoplastic cells. Patients rarely present with symptoms lasting longer than six months, and they are usually diagnosed within1-3 months after the onset of symptoms.[6] Mean duration of symptoms in the present series was 6.4 weeks, which is marginally lesser than the ones reported in literature.[5,12-14] In many series, approximately half the cases of AML M6 are therapy-related while secondary leukemias are less frequent (10-15%).[15] No history of any therapy was seen in the present series, hence they could be de novo.

Asthenia (100%), bleeding (80%) and fever (60%) were the most dominant presenting features in this study; which is fairly consistent with the other recent series.[4,6] None of the 5 patients had significant bone pains, which have been reported in 33% of all cases.[4,12,13,14,16] Interestingly, the other features associated with AML M6 patients presenting with bone pains include hypergammaglobulinemia, positivity for rheumatoid factor, Coombs test and anti-nuclear antibody.[17]

Examination findings included hepatomegaly, splenomegaly and lymphadenopathy. Pallor was consistently noted in all the 5 cases. A comparison of the examination findings in the present study is compared with other studies and the data are shown in Table 3

Table 3: Comparison of clinical findings in the earlier series and the present study

[9] **Series**	[10] **No. of patients**	[11] **Hepatosplenomegaly**	[12] **Lymphadenopathy**	[13] **Pallor**
[14] **Tsuji ,et al 1995 (18)**	[23] **20**	[32] **2**	[41] **0**	[50] **18**
[15]	[24]	[33]	[42]	[51]
[16] **Oloapade O. et al. 1992 (13)**	[25] **26**	[34] **10**	[43] **0**	[52] **26**
[17]	[26]	[35]	[44]	[53]
[18] **Mazella, et al. 1998 (9)**	[27] **21**	[36] **15**	[45] **0**	[54] **18**
[19]	[28]	[37]	[46]	[55]
[20] **Attili, et al .2006 (6)**	[29] **14**	[38] **6**	[47] **2**	[56] **14**
[21]	[30]	[39]	[48]	[57]
[22] **Present**	[31] **5**	[40] **4**	[49] **1**	[58] **5**

Hematological profile: Pancytopenia was noted in all the cases in our study (table 2). Anemia was significant (median Hb – 6.3 gm%) Thrombocytopenia was the most consistent finding (median – 41 x 10^3 /ul). The leucocyte number ranged from low normal to mildly reduced. Interestingly, the lone pediatric case had a milder cytopenia in contrast to the others. Morphological diagnosis of AML M6 was based on bone marrow aspirate and peripheral smear findings. The aspirates studied showed hyper cellularity with an increased erythroid cells showing varying degrees of dysplastic features such as megaloblastoid change, multinuclearity, inter-nuclear bridges and nuclear budding were observed (figure 1). Dyspoiesis was noted most consistently with erythroid series (100%), followed by myeloid (60%). All but one case had reduced megakaryocytes (Table 2).

But the most consistent and important is the morphological pattern based on the percentage of the erythroblasts and myeloblasts. Erythroblasts can be differentiated from other lineages by being positive for Periodic Acid Schiff (PAS), showing globular positivity and negative for Myeloperoxidase (MPO) & Sudan Black B (SBB). In flow cytometry analysis, the erythroblasts are positive for CD36 and glycophorin A, but not specific.[19]

The cytogenetic abnormality pattern in AML M6 is quite varied. Complex karyotypes with multiple structural abnormalities are common with del 5q and del 7q.[1,13] The involvement of chromosomes 11 and 19 in de novo patients have recently surfaced.[20] In the present series, 2 of the 5 cases had a normal karyotype. The cytogenetics could not be done in the remaining 3 patients.

The differential diagnoses for AML M6 could be varied and pose diagnostic challenges.[1] With regard to erythroleukemia (erythroid/myeloid); MDS (refractory anemia with excess blasts): is a possibility but the blasts account for less than 20%. In AML with MDS related changes, >20 % blasts with multi-lineage dysplasia in >50% cases of the cells in more than 2 lineages supports the diagnosis. AML with increased erythroid precursors (lesser proerythroblasts and basophilic erythroblasts) also comes in this realm. In cases of pure erythroid leukemia, megaloblastic anemia, acute lymphoblastic leukemia (especially in pediatric age group) and lymphomas are often considered as close diagnostic parallels.[21]

Both subtypes of AML M6 are associated with an aggressive and rapid clinical course.[1] Due to poor follow-up and non-uniformity in treatment received, the survival of the 5 patients were not charted. The study was not supported by ancillary technique such as immunophenotyping by flow- cytometry due to varied reasons (ranging from heavy cost involved to lack of consent on the part of patients/clinicians). The number of cases was a handful, but this could be debated by the sheer rarity of this entity.

VII. Conclusions

Many neoplasms continue to evolve and perplex the researchers. Acute Erythroid Leukemia (AML M6) is a rare form of acute leukemia which seems to follow that trend. The features of this entity are different from those reported in similar studies thus far.

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Web Forum Crawling

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Abstract- The supervised web-scale forum crawler is to crawl relevant forum content from the web with minimum overhead. Forum threads contain information content that is the target of forum crawlers. each forums have different layouts or styles and have different forum software packages, they always have similar constant navigation paths connected by specific URL types to direct users from entry pages to thread page. we reduce the web forum crawling problem to a URL-type recognition problem. And shows how to learn accurate and effective regular expression patterns of constant navigation paths from automatically created training sets using aggregated results from weak page type classifiers. Robust page type classifiers can be experienced from as few as five annotated forums and applied to a large set of unseen forums.

Index Terms- EIT path, forum crawling, ITF regex, page classification(PC), page type, URL pattern learning, URL type, present Forum Crawler Under Supervision (FoCUS).

I. INTRODUCTION

The World-Wide-Web (WWW) is growing exponentially and has become increasingly difficult to retrieve relevant information on the web. The rapid growth of the WWW poses unprecedented scaling challenges for general purpose crawlers and search engines. In this paper, we present Forum Crawler Under Supervision (FoCUS), a supervised web-scale forum crawler. The goal of FoCUS is to crawl relevant forum content from the web with minimal overhead, this crawler is to selectively seek out pages that are relevant to a predefined set of topics, rather than collecting and indexing all accessible web documents to be able to answer all possible ad-hoc queries. FoCUS continuously keeps on crawling the web and finds any new web pages that have been added to the web, pages that have been removed from the web. Due to growing and dynamic nature of the web; it has become a challenge to traverse all URLs in the web documents and to handle these URLs. We will take one seed URL as input and search with a keyword, the searching result is based on keyword and it will fetch the web pages where it will find that keyword.

All the major search engines have highly optimized crawling system, although working and details of documentation of this system are usually with their owner. It is easy to build a crawler that would work slowly and download few pages per second for a short period of time. In contrast, it's a big challenge to build the same system design, I/O, network efficiency, robustness and manageability. Every search engine is divided into different modules among those modules crawler module is the module on which search engine relies the most because it helps to provide the best possible results.

II. LITERATURE SURVEY

A.WEB CRAWLING**:**

Automated traversal of web to collect all the useful informative pages, effectively and efficiently Gather information about link structure interconnecting the informative pages. Web application designed to manage user created content. Online discussion area where anyone can discuss their favorite topics.

1.How it works**:**

Pre-samples few pages to discover the repetitive regions. Group pre-sampled pages into clusters based on their repetitive regions where each cluster can be considered a vertex in the sitemap.

B.Irobot

Tool to crawl through Web Forums Intelligent enough to understand structure of forums before selecting traversal path. It work towards two issues are Important page and Important links.

3.Read URL

We are concentrating on focus ontology which search for the relevant web pages based on the keyword we give. Actually it forms a hierarchy of links. The web information on the particular web page for a particular keyword, which we give as, input. It will search for the link on that seed URL and after that switch to that link and find another link on that web page but it should match with the keyword, it will do like that until it reach the limit that we set. But it may be possible that it will not found the number of links that we set before. Then it shows that the web page is not having any further link for that particular keyword. While fetching the links the user profiles also make sure that it should fetch only the unique links, mean s that it should not revisit the same link again and again. Finally , when we finished with the links, we will give one txt file as input and run the three pattern matching algorithm.

III. STUDIES AND FINDINGS

a. READ URL:

We are concentrating on focus ontology which search for the relevant web pages based on the keyword we give. Actually it forms a hierarchy of links. The web information on the particular web page for a particular keyword, which we give as, input. It will search for the link on that seed URL and after that switch to that link and find another link on that web page but it ,should match with the keyword, it will do like that until it reach the limit that we set. But it may be possible that it will not found the number of links that we set before. Then it shows that the web

page is not having any further link for that particular keyword. While fetching the links the user profiles also make sure that it should fetch only the unique links, mean s that it should not revisit the same link again and again. Finally , when we finished with the links, we will give one txt file as input and run the three pattern matching algorithm.

b. PATTERN RECOGNITION:

Here with pattern we mean only text. Pattern matching is used for syntax analysis. When we compare pattern matching with regular expressions then we will find that patterns are more powerful, but slower in matching. A pattern is a character string. All keywords can be written in both the upper and lower cases. A pattern expression consists of atoms bound by unary and binary operators. Spaces and tabs can be used to separate keywords. Text mining is an important step of knowledge discovery process. It is used to extract hidden information from not-structured or semi-structured data. This aspect is fundamental because much of the web information is semi-structured due to the nested structure of HTML code, much of the web information is linked, and much of the web information is redundant. Web text mining helps whole knowledge mining process of mining, extraction and integration of useful data, information and knowledge from the web page content. Pattern recognition is applied on the web information like this , When we start the retrieval it will give me the links related to the keyword. It will then read the web pages that are extracted from the links and while it will read the web page it will extract only the content. Here content means only the text that is available on the web page. It should not include images, tags, and buttons. The extracted content should be stored in some file. But it should not include any HTML tags.

c. IDENTIFICATION PROCESS:

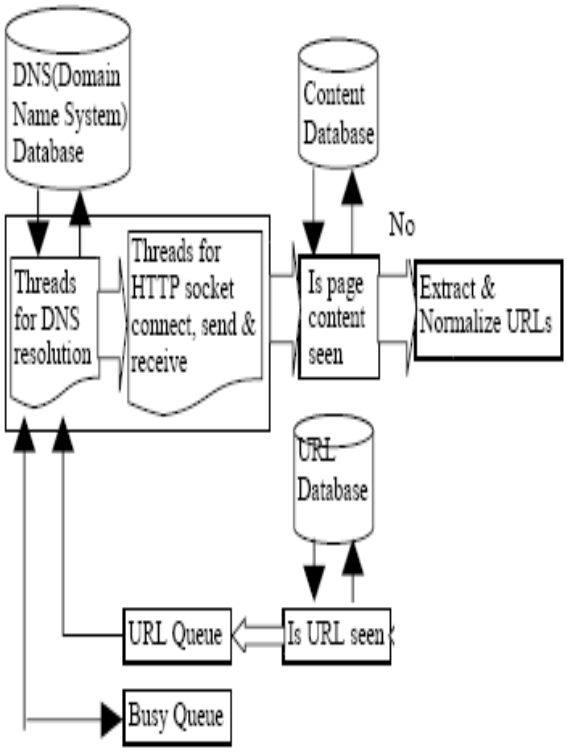
This process will identify the required urn is whether right kind of link or wrong kind link. It will identify the url, protocol link also for retrieve the relevant web page for user requesting. It's used to omit bad urls while user requesting web pages. Bad urls are identified by pattern of protocol occur on the relevant web pages on the server side.

d. DOWNLOADING PROCESS:

After completion of all process the downloading will started. It will start to downloading requesting url link of users need. After three checking process only it will downloaded the relevant link for users request. It will working efficiently to users, the requested link will retrieve.

e. INDEX URL AND THREAD URL TRAINING SETS:

Recall that an index URL is a URL that is on an entry or index page; its destination page is another index page; its anchor text is the board title of its destination page. A thread URL is a URL that is on an index page; its destination page is a thread page; its anchor text is the thread title of its destination page. We also note that the only way to distinguish index URLs from thread URLs is the type of their destination pages. Therefore, we need a method to decide the page type of a destination page.The index pages and thread pages each have their own typical layouts. Usually, an index page has many narrow records, relatively long anchor text, and short plain text; while a thread page has a few large records Each post has a very long text block and relatively short anchor text. An index page or a thread page always has a timestamp field in each record, but the timestamp order in the two types of pages are reversed: the timestamps are typically in descending order in an index page while they are in ascending order in a thread page.



IV. RELATED WORK

A.Evaluations of FoCUS Modules

Evaluation of Index/Thread URL Detection

To build page classifiers, we manual selected five index pages, five thread pages, and five other pages from each of the 40 forums and extracted the features. Results of Entry URL Discovery manually selected 10 index pages, 10 thread pages, and 10 other pages from each of the 160 forums. This is called 10-Page/160 test set. We then ran Index/Thread URL Detection module described "Index URL and Thread URL Training Sets" in Section 4.3.1 on the 10-Page/160 test set and manually checked the detected URLs. Note that we computed the results at page level not at individual URL level since we applied a majority voting procedure.

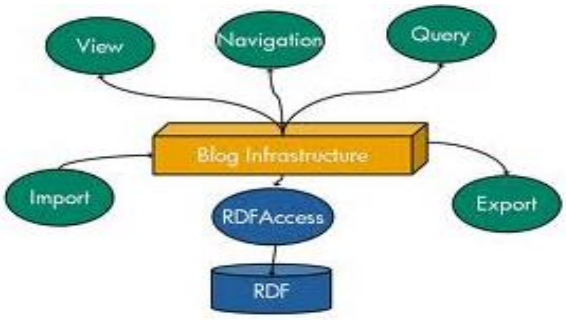


Fig.3.rdf

B.Evaluation of Page-Flipping URL Detection

To test page-flipping URL detection, we applied the module described "Page-Flipping URL Training Set"and manually checked whether it found the correct URLs. The method achieved 99 percent precision and 95 percent recall. It is not successfuls mainly due to JavaScript-based page-flipping URLs or HTML DOM tree alignment error.

C.Evaluation of Entry URL Discovery

As far as we know, all prior works in forum crawling assume that an entry URL is given. But finding forum entry URL is not trivial. For each forum in the test set, we randomly sampled a page and fed it to this module. Then, we manually checked if the output was indeed its entry page. In order to see whether FoCUS and the baseline were robust, we repeated this procedure 10 times with different sample pages. The baseline had 76 percent precision and recall. On the contrary, FoCUS achieved 99 percent precision and 99 percent recall. The low standard deviation also indicates that it is not sensitive to sample pages. There are two main failure cases: 1) forums are no longer in operation and 2) JavaScript generated URLs which we do not handle currently.

D.Evaluation of Online Crawling

We have shown in the previous sections that FoCUS is efficient in learning ITF regexes and is effective in detection of index URL, thread URL, page-flipping URL, and forum entry URL. In this section, we compare FoCUS with other existing methods in terms of effectiveness and coverage .

V. CONCLUSION

We are concentrating on focus crawler which search for the relevant web pages based on the keyword we give. Actually it forms a hierarchy of links. The crawler on the particular web page for a particular keyword, which we give as, input. It will search for the link on that seed URL and after that switch to that link and find another link on that web page but it should match with the keyword, it will do like that until it reach the limit that we set.Knutt-Morris-Pratt method takes advantage of the partial-match, Identify the bad URL in a website. No. of character present in a web page. Identify type of protocol used for the web page.Retrieve the web pages.we apply pattern recognition over text.Pattern symbolizes check text only.Check how much text is available on web page.

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Biochemical Changes (Reducing Sugar) in Different Mango and Papaya Fruits Varieties Due to Post Harvest Fungi. (M.S) India

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Abstract- In the present investigation emphasis has been given on to study the changes in reducing sugar content of mango and papaya pulp due to post harvest fungi. It was found that maximum decrease in reducing sugar in local (Kesar, Beed, Jalna) varieties of mango due to post harvest fungi. Reducing sugar content in local (Jalna, Nanded, Hingoli) varieties of papaya was hampered due to post harvest fungi.

Index Terms- Changes in reducing sugar, post harvest fungi, mango and papaya fruit.

I. INTRODUCTION

In India fruit have been found to be infected with several disease in the field as well as very significantly in the transport and storage. Most of the disease have been studied in detail in relation to epidemiology and management strategies. A post harvest fruit and food loss constitutes a vast complex of physical and biological changes due to micro-organism like fungi and bacteria.

1) Tanden (1970) 2) Pandey et.al, (1974), 3) Fush et.al., (1980), 4) Reddy and laxminarayana (1984) reported the changes in reducing sugar content in mango infected by Aspergillus niger. They found that there is decreases in reducing sugar content of mango fruit due to infection of a niger. 5)Chaudhar et.al., (1980) reported that pestalotia anonicola, stachybotrys SP. And Trichderma viride were decrease the total sugar and increase the reducing sugar. Similarly Cladosporium oxysporum and drechslera rostraata loquat and capegoose- berry, respectively utilized their total sugar contents within ten days, 6) singh, 1980. 7) Singh and Sinha (1982) found that Aspergilus flavus and A parastiticus cause depletion in total, reducing and non reducing sugar of citrus sinesis fruit similar result were observed by 8) Singh and Sinha (1983) in guava fruit. They found that decrease in total, reducing and non reducing sugar of guava fruit was observed due to a spergillus falvus and A. parasiticus. 9) Bilgrami et.al., (1983) revealed that there was sharp decline in the level of total reducing and non reducing sugars of dry fruit during Aspergillus flavus infestation.

Studies on bio-deterioration of fruit were carried out. To study the bio-deterioration of the mango and papaya fruit, they were artificially inoculated with equal amount of sporelation of A. alternatea a, Aspergillus favus, Aspergillus niger, Botryodiplodia theobromae, Colletotrichum gleosporiodes, Fusarium onysporum, phoma cariecare, penicillium chrysogenum, phytophthora nicotina and rhizopus stolonifer. After incubation period biochemical changes in mango and papaya pulp were estimated by standard biochemical method.
It was observed that reducing sugar content of mango and papaya were found to be decrease due to some post harvest fungi.

II. OBJECTIVE

In the present paper changes in reducing sugar content in mango and papaya due to post harvest fungi were discussed.

III. METHODOLOGY

Changes in reducing sugar content:

The reducing sugar content in plant material was estimated by the procedure recommended by Oser (1979) as follows:

500 mg of pulp was taken in 50ml distilled water and boiled, then filtered further filtrate was diluted up to 100 ml. There folin - wu tubes were taken and to it following content were added.

1) Blank Tube - Distilled water 2 ml
2) 2 ml glucose ‘C’ solution
3) 2 ml filtrate in each tube 3 ml alkaline solution of copper was added.

Then tube was boiled in boiling water bath for 8 minutes. The tube were cooled under tap water and 2 ml of phospho molybdic acid solution was added which gave blue colour. Then this solution was diluted up to 25 ml distilled water and optical density was determined at 420 nm and the amount of reducing sugar present in pulp was calculated. Percent total sugar was calculated by following farmula:

$$\text{M g sugar /100 mg sample} : \frac{\text{O.D of unknown} \times 100 \times 0.4}{\text{Conc. from graph} \times 2 \times W}$$

Where V= Volume of the filtrate
W= Weight of the sample taken

IV. RESULT AND DISCUSSION

Changes in reducing sugar (gm/100 gm pulp) content of mango pulp due to post harvest fungi

In order to study the bio-chemical changes in mango fruit due to post harvest fungi, five varieties viz kesar, local (Beed, Jalna, Nanded and Aurangabad) varieties of mango were

selected. Spore suspension of test fungi was inoculated into healthy mango varieties. After seven days pulp of these deteriorated varieties was collected in separate containers. This pulp was used to estimate reducing sugar content and result are given in table 1.

It s clear from the table that Batryodeplodia theobramae showed maximum decrease in reducing sugar in kesar, local (Beed, Jalna) varieties while, it was due to Aspergillus niger in local (Nanded, Aurangabad) varieties of mango.

Aspergillus flavus was responsible for maximum depletion of reducing sugar contents kesar and local Aurangabad. As compaired to other post- harvest fungi, collectotrichum gloeosporiales showed minimum decrease in reducing sugar contents in all varieties.

Changes in reducing sugar (gm/100 gm pulp) content of papaya pulp due to post harvest fungi. In order to study the biochemical changes in papaya fruit due to post harvest fungi, five healthy varieties local (Jalna, Aurangabad, Beed, Nanded and Hingoli) varieties of papaya were selected. Spore suspension of test fungi was inoculated into these healthy varieties. After seven days pulp of these deteriorated varieties was collected in separate containers. This pulp was used to estimate reducing sugar content and results are summarized in table 2.

From the table it is observed that reducing sugar content in local (Jalna, Nanded and Hingoli) papaya varieties was hampered due to Aspergillus niger Fusarium oxysporum in local Beed and Phoma caricar in local Aurangabad were responsible for maximum depletion of sugar content Alternaria alternata and colletotrichum gloeosoporioides caused depletion in the reducing sugar content of local Beed and local Jalna respectively.

Table. 1
Changes in reducing sugar (gm/100gm pulp) content of mango pulp due to post harvest fungi.

Fungi	**Varieties of Mango**				
	Kesar	**Local Beed**	**Local Jalna**	**Local Nanded**	**Local A'bad**
Aspergillus flavus	5.9	6.1	6.9	7.9	4.1
Aspergillus niger	6.8	6.2	4.1	5.9	3.4
Collectotrichum gloeosporioides	6.7	6.6	6.0	7.0	5.3
Botryodiplodia theobromae	5.8	4.1	4.0	6.2	3.9
Penicilliu chrysogenum	6.8	5.1	5.8	6.1	5.1
Control	9.9	9.0	9.2	9.4	8.1

Table. 2
Changes in reducing sugar (gm/100gm pulp) content of papaya pulp due to post harvest fungi:

Fungi	**Varieties of Papaya**				
	Local Jalna	**Local A'bad**	**Local Beed**	**Local Nanded**	**Local Hingoli**
Alternaria alternata	2.80	3.10	3.00	2.60	3.00
Aspergillus niger	2.09	2.70	2.00	1.20	1.00
Coletotrichum gloeosporiodes	2.10	2.50	2.60	2.30	2.80
Fusarium oxysporum	3.51	2.40	2.40	2.80	2.30
Phoma caricae	3.50	2.30	3.20	2.40	2.50
Phytophthora nicotina	3.60	3.80	3.70	3.80	2.90
Control	4.70	4.30	4.20	4.50	3.40

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Efficacy of some selected botanical extracts against the Cotton mealybug *Phenacoccus solenopsis* (Tinsley) (Hemiptera: Pseudococcidae)

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Abstract- Laboratory studies were carried out to evaluate the efficacy of some locally available botanicals against cotton mealy bug *Phenacoccus solenopsis* on shoe flower plants *Hibiscus rosa-sinensis.* Plants extracts obtained from *Azadirachta indica, Ocimum sanctum, Calotropis gigantea, Nicotina tabacum* and *Alium sativum* using standard methods. Among all these botanicals, extracts were prepared and dilutions were obtained at 0.2, 0.4, 0.6, 0.8, 1.0,1.2,1.5, 2.0 percentage concentrations with the addition of soap solution. Among the treated botanicals, *O.sanctum* was effective significantly ($p<0.05$) at lower concentrations and has the 0.6% concentration as LC_{50}. *O.sanctum* solution of this particular strength was applied in a field trial and was resulted lower adult mortality (39%) and a higher nymphal mortality (72%). Neem, Tobacco, Calotropis and Garlic solutions have LC_{50} values as 0.82, 0.89, 0.95 and 1.15 percentages respectively.

Index Terms- Botanicals, Efficacy, Extracts, *Phenacoccus solenopsis*

I. Introduction

The mealybug species are widespread throughout the world. The cotton mealybug *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) has been described as a serious and invasive polyphagous pest with a vast host range by several authors. It has a wide geographical distribution with its origin in Central America (Fuchs et al, 1991) followed by reports of the Caribbean and Ecuador (Ben-Dov, 1994), Chile (Larrain, 2002), Argentina (Granara de Willink, 2003), Brazil (Mark and Gullan 2005). *P. solenopsis* has been described as a serious and invasive pest of shoe flower in Pakistan and India (Hodgson et al. 2008) on *Hibiscus rosa-sinensis* in Nigeria (Akintola and Ande, 2008) Latest report by the authors on the invasiveness of *P. solenopsis* has been from the Eastern region of Sri Lanka (Prishanthini and Vinobaba, 2009) on ornamentals, vegetable crops, and weeds, and in China (Wang *et al*. 2009; Wu and Zhang, 2009) on shoe flower. *P.solenopsis* is identified as one of the major damage causing and fastly spreading invasive mealybugs of Sri Lanka next to Papaya mealybug *Paracoccus marginatus*. Being a polyphagous pest, the *P. solenopsis* has been recorded to feed on a number of cultivated crops including weeds (Patel *et al*. 2009). According to the recent information provided by the authors (Prishanthini and Vinobaba, 2011) *P.solenopsis* has been reported from 28 host plant species comprising 10 families in Sri Lanka. This includes the major field crops of family Malavaceae, Solanaceae and Amaranthaceae. Farmers are currently using some toxic chemical insecticides against cotton mealy on large and small scale cultivations of Okra, Brinjal, Tomato and Amaranthus.

Reliance on synthetic chemicals to control pests has also given rise to a number of problems such as destruction of beneficial non-target organisms (parasitoids and predators) thereby affecting the food chain and impacting on biological diversity. The injudicious use of synthetic pesticides can lead to secondary outbreaks of pests that are normally under natural control resulting in their rapid proliferation. There have also been cases of pests becoming tolerant to insecticides, resulting in the use of double and triple application rates (Stoll, 2000). In addition, due to other problems such as health hazards, undesirable side effects and environmental pollution caused by the continuous use of synthetic chemical pesticides (Nas, 2004), there is renewed interest in the application of botanical pesticides for crop protection. Botanical pesticides are biodegradable (Devlin and Zettel, 1999) and their use in crop protection is a practical sustainable alternative. It maintains biological diversity of predators (Grange and Ahmed, 1988), and reduces environmental contamination and human health hazards. Botanicals are safe for homegardens and green houses. Therefore the present study attempts to evaluate the efficacies of some native botanicals against cotton mealybugs.

II. MATERIALS AND METHODS

The study was conducted under laboratory conditions of Department of Zoology, Eastern University, Sri Lanka during the period from June 2012 to May 2013.

Culture of mealybugs

The laboratory culture of *P.solenopsis* was established from individuals collected from shoe flower plants in home gardens those do not have any previous exposure to pesticides. *P.solenopsis* were reared in on potato sprouts and on potted shoe flower plants under laboratory conditions.

Collection of botanicals

The botanicals used in this experiment were, *Ocimum sanctum* L. (Lamiaceae), *Azadirachta indica* A. Juss. (Meliaceae),*Calotropis gigantea* R. Br. (Asclepidaceae), *Nicotina tabacum* Linn. (Solanaceae) and *Alium sativum* Linn. (Amaryllidaceae). Leaves of *Ocimum sanctum* (Tulasi) and *Azadiracta indica* (Neem) and *Calotropis sp.* were collected from the home gardens of Batticaloa. The dried leaves of Tobacco (*Nicotina tabacum*) and Garlic cloves were bought from local market.

The leaves collected were washed with sterile distilled water until the dirt was completely removed and allowed to shade dry for one week. Then the dried materials were finely ground using motor and pestle until the powdered form was obtained. The powders were stored separately in dark bottles for extraction.

Preparation of extracts

A. Extracts of Neem, Tulsi, Calotropis and Tobacco leaves

50 g of powdered botanicals from each was weighed and transferred to a cellulose extraction thimble (Whatman, UK). These materials were extracted using 250 ml ethanol (78 ^{o}c) for 5 hours in a Soxhlet apparatus (250 ml) and the extracts were decanted from the flask separately. Then the volume of each abstract was measured and each was made to a final volume of 200 ml and transferred separately into round bottom flasks. The flasks were fitted with the Rotatory evaporator (Buchi; R-114; Switzerland) individually and evaporated to dryness at a temperature not exceeding 85 ^{o}c. Then the flasks with dried materials were removed and weighed. The weight of the dried extract was calculated by subtracting the weight of the empty flask. Thereafter few milliliters of ethanol were added to each flask to aid the dissolution of the extract with water. Finally 50 ml of distilled water was added to the extract to get 1gml^{-1} (100% w/v) concentration. Further dilutions were made for further experiments.

B. Extract of Garlic

50 g Garlic cloves were taken and ground well using mortar and pestle to obtain a paste form. Then 25 ml of distilled water is added to the paste and shaken well. The mixture was kept for three days; strained using a clean muslin cloth and the volume was made to 50ml by adding further 25 ml of water, shaken well and stored in a dark bottle.

10 ml solution from each of the initially prepared botanical extracts (1gml^{-1}) was transferred into 500ml volumetric flask using a pipette and the final volume was made to 500ml to obtain a solution with a concentration 20 mg/ml (2% w/v). From these solutions different dilutions were obtained by adding certain volume of botanical solution, certain volume of distilled water and 1ml of 1% (w/v) soap solution.

Evaluation of efficacy of different botanicals against *P.solenopsis*

Laboratory studies

Approximately 10-12 cm length terminal portions of the Shoe flower stems (*Hibiscus rosa-sinensis*) infected with the *P.solenopsis* were cut off using a sharp knife. The cut end of each was wrapped with wet paper towel and collected in polythene bags. Then they were brought to the laboratory by keeping them inside a regiform container to prevent from heat and mechanical damages during transport. Then yoghurt cups were taken and filled with tap water. A hole was made on each lid to tightly fix the stem portion. The

number of leaves on each plant terminal was reduced to 4 (only the upper terminal leaves were allowed to remain) and all the nymphal stages including crawlers, and egg masses except twenty adult females were removed from the stem by using a hand lens and a camel hair brush. Then the stem portions were fixed with the lid by allowing the cut end to contact with the water inside the yoghurt cup to keep the stem cutting fresh throughout the study. The stem portion fitted with the cup was placed inside a rectangular cubic glass container measuring 10cm x 10cm x 20 cm. Then prepared solution of a particular concentration from each botanical was sprayed over the mealy bugs using a syringe and needle (3 ml of solution) and the container was covered with a muslin cloth. Mealy bug mortality was counted at 24, 48 and 72 hours following initial application. The mortality records for all treatments were obtained in percentage values.

Field studies

The most effective botanical solution which has the lowest LC_{50} (concentration which cause lethality of 50% of the mealybug population) was used for the field trial. 20 Shoe flower plants of 50- 60 cm height were infected adult female mealybugs. Plant to plant and row to row distances were maintained at 30cm and 75cm respectively. Number of irrigations and all other practices were performed uniformly to all plants. The plants were maintained in this manner for 35 days until the development of sufficient population of mealybugs. Five plants were kept as control without any application of botanical solution. Other plants were sprayed solution was prepared and applied over the mealybug colonies. Number of mealybugs was counted 24 hours before spray and the mealy bug mortality following spray was counted at 24, 48 and 72 hours after initial application. The data was recorded from three randomly selected twigs of 10 cm long in each replication.

Percent corrected mortality was calculated by following formula described by Schneider-Orelli's (1947) and Puntener (1981)

$$\text{Corrected \% mortality} = \frac{\%\ mortality\ in\ treatment - \%\ mortality\ in\ control}{100 - \%\ mortality\ in\ control} X\ 100$$

Statistical analysis

For all the data obtained the differences among the mortality of mealybugs at all treatments were subjected to analysis of variance (one way ANOVA) and differences among means were considered significant at a probability level of five percent ($p \leq 0.05$). Probit analysis was carried out to determine the LC_{50} values of each botanical. Statistical package Minitab 14.0 was used for all these statistical analyses.

III. RESULTS AND DISCUSSION

Efficacy of botanicals under laboratory conditions

The efficacy of few selected botanical pesticides at different concentrations was evaluated against cotton mealybug. The results revealed that the treatments are significantly differing among themselves in causing mortality of *P.solenopsis*. ($p<0.05$) except at 0.2% concentration (p=0.230). After an exposure of 24 hours the maximum mortality (100%) was observed in ocimum extract beyond 1.2%, in Neem and tobacco extracts beyond 1.5% and Calotrophis at 2.0%. The mortality caused by each treatment increased gradually with an increase in the exposure interval.Figure 1 shows the comparison of percentage mean mortalities to different botanicals at different concentrations at 24 hrs after initial applications. Mortality rates increased with increasing concentrations for all botanicals.

Table 1: Mean percentage mortalities of *Phenacoccus solenopsis* to different botanical solutions at various concentrations at 24hours after initial application. Values express (Mean ± S.E)

Treatment	*O.sanctum*	*A.indica*	*N.tabacum*	*C.gigantea*	*A.sativum*
Control	0.00	0.00	0.00	0.00	0.00
0.2%	5.00±2.24	3.33±2.11	3.33±2.11	1.67±1.67	0.00
0.4%	16.67±2.11	10.00±2.58	6.67±2.11	5.00±2.24	3.33±2.11
0.6%	50.00±2.58	20.00±2.58	16.67±2.11	13.33±3.33	10.00±2.58
0.8%	76.67±2.11	43.33±2.11	31.67±1.67	25.00±2.24	16.67±2.11
1.0%	91.67±1.67	75.00±2.24	65.00±2.24	60.00±2.58	28.33±1.67
1.2%	100.00	86.67±2.11	83.33±3.33	78.33±1.67	51.67±3.07
1.5%	100.00	100.00	100.00	88.33±3.07	75.00±2.24

2.0%	100.00	100.00	100.00	100.00	95.00±2.24

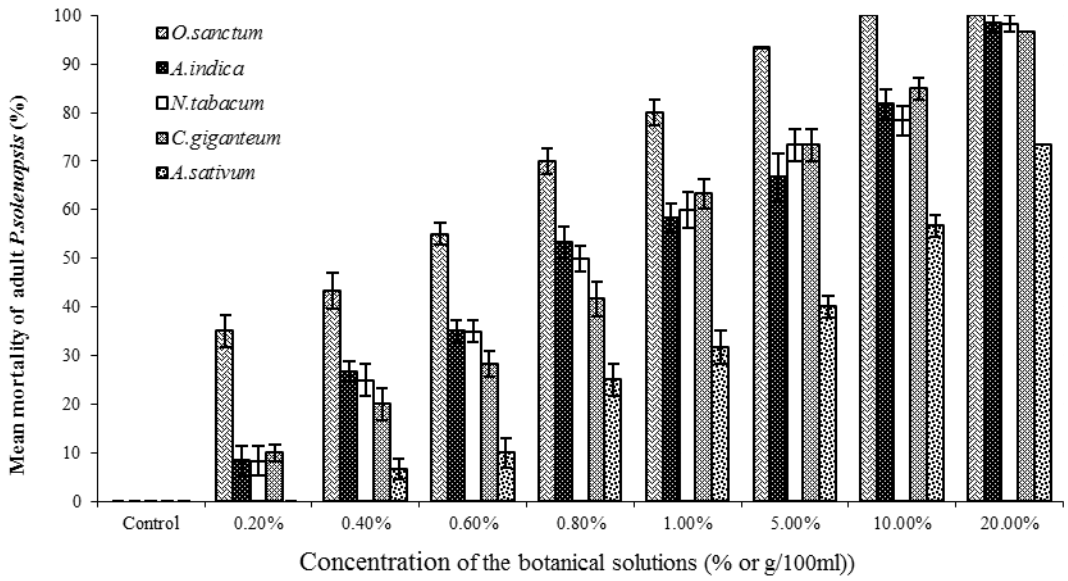

Figure 1: Comparison of percentage mean mortalities of *Phenacoccus solenopsis* to different botanical solutions of various concentrations at 24 hours after initial applications.

LC_{50} values obtained from probit analysis for mortality values after 24 hours of each botanical applied are given in the table 1. According to the results of probit analysis the botanical *O.sanctum* has the lowest value i.e.0.60 % solution. Among all, the *Ocimum sanctum* and soap mixed solution was found to be more effective against P. *solenopsis* with the lowest LC_{50} value. Next to Osmium, Neem Tobacco and Calotropis extracts were efficient with 0.82 0.89 and 0.95 percentages as LC_{50} values. Garlic has the highest LC50 value that refers it is the least effective among all against cotton mealybug.

Table 2: LC_{50} values (after 24 hrs) for the botanicals obtained from Probit Analysis

Name of Botanical	LC_{50}
O.sanctum	0.60
N.tabacum	0.89
C.gigantea	0.95
A.sativum	1.15
A.indica	0.82

The above results indicated that mortality of mealy bug *P.solenopsis* on shoe flower treated with different botanical at different concentrations increased with an increased concentration and with increased exposure.

Field studies

In the field experiment the 0.6% solution of *Ocimum sanctum* which is the LC_{50} value obtained from the laboratory experiments was field applied on healthy shoe flower plants of same age and height. In this trial the 0.6% Tulasi, *Ocimum sanctum* solution caused 39.42% adult morality and 72.21% nymphal mortality to *P.solenopsis* after 24 hours of application.. Adult mortality under field conditions was lower than that of under laboratory conditions. Use of Tulasi for pest control has long history and has both repellent and herbicidal properties. The essential oils from the species of this genus contain linalool, linalol, linoleic acid, *p*-cymene, estragosol, eucalyptol, eugenol, citral, thujone, ocimene, camphor, methyl chavicol, oleic acid, and many other terpenes as active ingredients, all of which are effective repellents (Moore and Lenglet, 2004). Generally contact pesticides are less effective against mealybugs because of their cryptic habitats in plants and the water proof waxy layer over the body (Tanwar *et al*, 2007).The soap solution added at low

concentration increases the effectiveness of the botanical solution. Soap facilitates the solubility of the active ingredient and acts as a sticking agent (Nhachi and Kasilo, 1996), breaks down the protective wax cover and also acts as a surfactant.

Based on these results development of new formulations with the combinations of these botanicals which can be produced and applied using simple methods applicable to local public will be very useful. Moreover, analyzing new botanicals from different plant origins and least toxic chemicals for their efficacy against the mealybugs are also necessary to reduce use of the toxic chemical insecticides. More research on the active ingredients, pesticide preparations, application rates and environmental impact of botanical pesticides are a prerequisite for sustainable agriculture.

IV. CONCLUSION

In conclusion it can be stated that *O.sanctum* was effective significantly at lower concentrations and 0.6% concentration of the *O.sanctum* solution was resulted a significant nymphal mortality in the field conditions. The botanicals used in this study such as *A.indica, O.sanctum, C.gigantea, N.tabacum* and *A.sativum* were showed different levels of insecticidal activities. These findings of the present study suggest that Osmium extract can be used as a botanical spray to get better and safe control of cotton mealybug *P.solenopsis*.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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Data mining plays a key role in soil data analysis of Warangal region

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Abstract- The advancement in computers provided large amount of data.The task is to analyse the input data and obtain the required data which can be done by various data mining techniques. Present work focusses on analysis of soil profile data from various locations of Warangal Region. Naive Bayes, J48(C4.5) and JRip Algorithms were used to analyse the data JRip reported to be simple, efficient classifier of soil data. The selected soil attributes were Nitrogen, Phosphorus, Calcium, Magnesium, Sulphur, Iron, Zinc, Potassium, PH and Humus. The attributes were predicted by linear regression, least median square and simple regression. Even though all regressions provided almost equal results least median Square depicts better results. The attributes nitrogen, phosphorus and sulphur were determined in less time by linear regression and showed accurate results. As large data of a long period for different locations were analysed by data mining, it reduces the time consuming process in soil analysis by traditional methods. Thus the results can be used by the researchers to suggest suitable crop to a particular region, season and also can recommend required fertiliser based on deficit elements.

Index Terms- Soil data, Warangal, Attributes, Naïve Bayes, J48(C4.5), JRip, Datamining.

I. INTRODUCTION

Data mining is the process of analysing data from different perspectives and summarizing it into useful information - information that can be used for industrial, commercial and scientific purposes. As such the process of data mining involves sorting through large amounts of data and discovering patterns in the data (Witten and Eibe, 2005).Agricultural and biological research studies have used various techniques of data analysis including, natural trees, statistical machine learning and other analysis methods (Cunningham and Holmes, 1999).The recent advances in data mining technologies are successfully applied to the management of natural resources also. Armstrong *et al*., (2007) have reported that data mining empowers farmers in selection of site specific crop varieties by studying soil fertility. The principle objective of classification of soil is for predicting the engineering properties and behaviour of soil finally dictating the choices for use. Laboratory and various statistical techniques are time consuming and highly expensive, efficient techniques can be developed for solving complex soil data sets using data mining to improve the effectiveness and accuracy of the classification of large soil data sets [Kumar and Kannathasan,2011). Verheyen *et al*., (2001) have studied the soil characteristics by k-means approach and GPS based data mining techniques. Tripati *et al.,* (2006) have reported the weather changes by using SVMs. K-means method and K-nearest neighbour method are useful to study pollution in atmosphere, weather variables and precipitation levels(Jorquera *et al.,* 2001; Rajagopalan and Lall, 1999). Soil tests are generally performed to study the nutrient content, contamination and deficiencies in soil that to be remedied (Wikipedia,2013). Soil testing laboratories either government or private sector provides various protocols for soil analysis and literature regarding the soil characteristics. Based on the data describes the soil composition and also recommends suitable fertilisers based on the data. It also helps farmers to supply the suitable fertiliser for suitable crop for a particular season.

The present work has taken up to analyse the soil data of Warangal district by various data mining techniques and the outcome obtained has been used by researchers and also farmers for selection of suitable crop and fertiliser to that soil.

II. METHODOLOGY

Data collection

The present research has been done by collecting soil data from three agriculture areas of Warangal district, Andhra Pradesh, India. The research has utilised commonly occurring available seven soil type data for correlation and comparison. The data has provided by Agriculture department, ANGRAU, Warangal. The data contains ten attributes and 1500 instances. Soil characteristic classification is important as it gives detail study of soil qualitatively and quantitatively. Traditional classification involves tables, flowcharts etc., as it is manual approach it takes lot of time. Hence quick, reliable, automated rule based proposed method is selected to study and classify soils based on fertility. Rules like facts, concepts and theories were collected from soil testing lab. Soil testing labs classify soils as very high fertile, high fertile, median fertile, low fertile and very low fertile. The collected data had analysed by selected automated method and observed the fertility level. The results used by the experts to suggest suitable crops and also fertiliser to compensate the deficit elements of that soil. The following algorithms were used to study the collected soil data.

Naïve Bayes

Naive Bayes classifier assumes that the presence or absence of a particular feature is unrelated to the presence or absence of any other feature, given the class variable. It can be trained very efficiently in a supervised learning. In many practical applications, parameter estimation for naive Bayes models uses the method of maximum likelihood. An advantage of naive

Bayes is that it only requires a small amount of training data to estimate the parameters (means and variances of the variables) (Wikipedia, 2013).

J48 (C4.5)

It is an open source algorithm in Weka data mining tool. A decision tree can be generated from the input data by C4.5 proramme. It is an algorithm used to generate a decision tree and is an extension of Quinlan's earlier ID3 Algorithm. The decision trees generated by this can be used for classification and so referred to as statistical classifier (Wikipedia, 2013).

JRip

This class implements a propositional rule learner, Repeated Incremental Pruning to Produce Error Reduction (RIPPER), which was proposed by William Cohen (1995) as an optimized version of IREP. It is based in association rules with reduced error pruning (REP), a very common and effective technique found in decision tree algorithms (Wikipedia, 2013).

Attribute prediction

The attributes were predicted by Linear regression, Least Median square and Simple regression. Linear regression is the first type of regression analysis, considers numerical prediction. If data has any nonlinearity it cannot be applied and in such cases median square techniques are used. As the median regression techniques have high computational costs they are not used for simple practical problems (Witten and Eibe, 2005).

III. STATISTICAL ANALYSIS

Each analysis was replicated thrice by the above said three classifiers which were used to compare and evaluate the soil data based on false positive rate, true positive rate, accuracy and time.

IV. RESULTS AND DISCUSSION

Results and discussion: Table I gives details about various attributes selected for soil data analysis. Results show that JRip model is the best classifier for soil sample data analysis in comparison with other models (Table II).Table III shows that the relative absolute error is almost equal in both linear and least median regression analysis. There is no much variation in the correlation coefficient obtained in both the predicted algorithms but the time taken to build linear regression model is 61.7% less than the least median regression. This shows that the computational cost used by linear regression is much lower than the least median square. Median regression techniques have high computational costs (Witten and Eibe 2005). Though least median square model produces better results the accuracy of linear regression and least median regression are almost equal. The attributes Nitrogen, Phosphorus and sulphur were determined by linear regression technique in lesser time and gave accurate results. These predictions helps to find the attributes without carrying traditional chemical tests and thus time could be saved and reliable information obtained (Table IV).

V. CONCLUSION

Thus in conclusion the given soil data analysis was done by different algorithms. It can also be concluded that better results were obtained by least median square than linear regression analysis and classification of soil by JRip proved to be simple classifier and gave best result by constructing decision tree.

VI. ACKNOWLEDGEMENT

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Table I: Attributes selected for soil data analysis

Attribute	Expanded form
N	Nitrogen
S	Sulphur
Ca	Calcium
Mg	Magnesium
Zn	Zinc
Fe	Iron
P	Phosphorus
K	Potassium
pH	Acidity or Basicity of a component
Hs	Humus

Table II: Comparison of different classifiers

Classifier	Naive Bayes	J48	JRip
Correctly Classified Instances	932	2108	2225
Incorrectly Classified Instances	1468	292	175
Accuracy	38.74	87.06	92.53
Mean Absolute error	0.426	0.0412	0.0316

Table III: Comparison of Regression analysis

Algorithm	Linear Regression	Least median Regression
Time for model building (Seconds)	2.85	12.86
Relative absolute error (%)	12.18	12.73
Correlation coefficient	0.9528	0.9746

Table IV: Comparison of actual and predicted values

Actual value by soil testing	Predicted values by linear regression	Error
11.4	11.81	0.41
5.6	5.34	-0.26
8.5	7.62	-0.88
8.1	7.79	-0.31
4.6	4.662	0.062
6.2	6.62	0.42
6.6	6.45	-0.15
2.5	3.2	0.7
7	7.5	0.5
16.8	17.4	0.6

Supply Chain Analysis of Cardamom in Kerala

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Abstract- This study analyses the key players in the supply chain of cardamom. The present study undertaken in Kerala. Interview of key chain players help to identify the supply chain participants and their role in marketing of the product. Analysis of cost of production of cardamom, showed the price margin enjoyed by each participants in supplu chain. SWOT analysis also help to identify the strength, weaknesses, oppurtunities and threats of cardamom cultivation in Kerala. Cardamom cultivation has greater influence in the development of the people, as it provides employmeny oppurtunities. Plantations are also attracted by the tourists and it gives earning to the growers. Kumily is a plantation town closely associated with the Thekkady. The spice and tea plantations and bustling spice trading activities have made Kumily one of the important tourist and commercial centre in Kerala.

Index Terms- Supply chain analysis, Cardamom, pricing, Spices plantations, Value chain model

I. Introduction

Agriculture in Kerala is dominated in commercial crops. Coconut, tea, cashew, rubber, aracanut and spices including pepper, cardamom, vanilla, cinnamon, and nutmeg comprises of agriculture sector. Main agriculture staple is rice. Coconut trees are essential to the traditional life style of the people of Kerala. Kerala is also known for its spice plantations. Major spices in Kerala are black pepper, cardamom, ginger, turmeric, nutmeg, cinnamon, clove, garcinia, vanilla, paprika, etc. Kerala spices have a wide frame across the universe for its aroma and flavour. Cardamom has unique flavour and it has great demand in Middle East, Russia and Japan. Major portion of cardamom production in Kerala, comes from Palakkad and Wayanad are other districts which have cardamom production in Kerala.

Cardamom is considered as 'the Queen of Spices' with its aroma and commercial supply. More over Indian cardamom enjoys a preference in foreign countries. Cardamom cultivation needs continuous care and attention and it is a labour intensive cultivation. Thus growers have to spend more on labour. They got only low price for their produce. At the same time consumers have to give higher price in the open market to purchase cardamom. This situation necessitates a study on the supply chain of Cardamom. This study could help to identify the key players in the supply chin, performance of the supply chain, problems or constraints which affect the performance of the supply chain etc.

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II. Objectives and Methodology of this Study

The key objectives are:-

1. To understand the functioning and dynamics of the supply chain of cardamom.
2. To identify the key players in the supply chain of the cardamom.
3. To identify the cost of production of cardamom.

The present study is to carry out the product chain study of cardamom in Kerala. It also try to identify the chain actors from input suppliers to retailers, factors affecting the performance of the supply chain, availability of service providers and their linkage/relationship, key constraints and opportunities of the supply chain. The methodology adopted in this study has three main parts. Identification and mapping of the commodity supply chain is the first part. In second part, the constraints and bottlenecks of the supply chain of the cardamom is identified. It is necessary to achieve the competitive advantage of the products. In third part, all the constraints identified were assessed in order to improve the performance of the supply chain. The cost and margin of main players at different levels of supply chain also identified. The methodology adapted for this study are:-

- Sources of data: - Both primary and secondary data are used for the study. Primary data were collected from the participants in the supply chain of the cardamom, through interview schedule and questionnaires. Key participants in the supply chain are farmers, input suppliers, traders, service providers etc. Secondary data are collected from available literatures in government sectors.
- Interview of key chain players:- An in-depth interview was also held with supply chain agents including local traders/collectors, input suppliers, transporters, wholesalers, processors, representatives from co-operatives, farmers associations, NGOs, etc. The interview was mainly focussed on the performance of the supply chain, such as constraints and opportunities, cost and margins, prices in different markets, trends and perspectives, growth potentials etc. Interaction with the government organisations and NGO's also helped in secondary data collection.
- Focus Group Discussion was held with the major players of the supply chain. Issues covered are supply chain performance, constraints and opportunities, efficiency of the supply chain, profitability, prices, trends and perspectives etc.
- SWOT Analysis: - In depth discussion with the key players of the supply chain was made on strengths, weaknesses, opportunities and treats of cardamom supply chain. Then major strengths, weaknesses, opportunities and treats among the supply chain of cardamom are identified.

Sampling of chain actors: - The growers, traders, service providers formed the focus of this study. People engaged in the marketing of the product are also interviewed. Officials and participants in NGO's are also form part of the population. Period of study: Data for analysis are taken from the months of April to September, 2013.**Product and market:** - cardamom is the commodity taken for the present study. Supply chain analysis of cardamom, which is the major crop of Kerala. Primary data were collected from farmers and players in Udumbanchola Taluk, Kerala.

Area and Production of Cardamom in Kerala

Cardamom is a perennial, herbaceous, rhizomatous plant. Three varieties of cardamom are recognised based on the nature of panicles. Those are Malabar variety with prostrate panicle, Mysore variety with erect panicle, Vazhukka with semi erect panicles. Cultivation of cardamom is mostly concentrated in the ever green forests of Western Ghats in south India. In international markets, Indian cardamom is offered in different grades. Alleppey Green Extra Bold (AGEB), Alleppey Green Bold (AGB), Alleppey Green Superior (AGS) are the names of different grades. Cardamom oil is an important ingredient in food preparations, perfumery, health foods, medicines and beverages.

Cardamom is used as a flavouring material in food items, backed goods and confectionaries. Arabs used it in the making of 'gahwa'-a strong cardamom coffee- which is an unavoidable habit of their life style. In Europe and North America, it is used as an ingredient in curry powder/sausages products.

For the year 2011- 2012, total area of cardamom cultivation in Kerala is 41600 Ha. Major areas of cultivation of cardamom in Kerala occupies 79% of total area. Wayand district has second position with 10% area to the total. On analysing the area of cultivation of last 4 years, it is maximum during the agricultural year 2011-12 and the area is 41600 ha.

Table-1
Area, Production, Productivity and growth rate of Cardamom
(2008-09 to 2011-12)

	Area (Ha)				Production (Mt)				Productivity (Kg/Ha)			
Year	Kerala	GR	India	GR	Kerala	GR	India	GR	Kerala	GR	India	GR
2008-09	41588	1.00	71170	1.00	8550	1.00	9900	1.00	206	1.00	139	1.00
2009-10	41593	1.01	71170	0	7800	0.12	10075	1.02	188	0.91	142	1.02
2010-11	41242	0.16	71170	0	7935	1.02	10380	1.03	192	1.02	146	1.03
2011-12	41600	1.87	71110	0.92	10222	1.29	12975	1.25	246	1.28	182	1.25

Source: Planter's Chronicle GR- Growth Rate

Table.1, shows the area, production and productivity of cardamom in Kerala and India. Cardamom production and productivity in India showed a steady growth from 2008-12. For the year 2011-12, there is a slight decrease in the area of production. But production and productivity increased by 0.2% in 2011-12. For the year 2011-12, area of cultivation of cardamom in Kerala increased by 0.8%. It results in an increase of production and productivity by 0.22% compared to 2010-11.

Kerala accounted for a major share (78.8%) in the total cardamom production in the country. Karnataka and Tamil Nadu contributed 14.7 percent and 6.5 percent share respectively. In Kerala, the area under cardamom is 0.42 lakh ha comprising 59.2 percent of total area of crop in the country during 2011-12. The

production has increased from 0.08 lakh MT to 0.10 lakh MT in the respective year.

During 2011-12, India produced 12.98 thousand tonnes of Cardamom with an increase of 2.60 thousand tonnes compared to 10.38 thousand tonnes in the last year. Area under cardamom in the country is 0.71 lakh ha during this period. The price of cardamom in domestic market was ₹ 1013 per kg. in 2010-11, which further declined ₹ 614 per kg. in 2011-12 and slightly increased to ₹ 677.59 per kg in February 2013. Remunerative prices are required for the development of crop in the state.

III. Production Management

- **Input Supply Situation**

The quality of produce depends on the input used and the methods adopted in its cultivation, processing, packing, storing, transportation etc. Therefore great care is to be given for the production of agricultural products from seed till harvesting. Cardamom is generally reproduced by vegetative propagation using suckers. This method gives out the production relatively earlier than by seed/seedlings. Thus the cardamom cultivation begins with the management of seed materials and other inputs associated with it. Most of the cardamom growers use suckers produced in the neighbouring plantation. Most of the farmers in the area prefer to use suckers, because they produce normal yield in 3-4 years while seedlings take 5-6 years to come to full bearing.

- **Credit Demand Supply Situation**

If the land is available as owned or leased then cultivation does not involve huge investment. Major portion of the cost of cultivation is for labour and cost of suckers at the beginning. This cultivation does not need fertilizers and plant protection material at the beginning. Hence, credit demand for cardamom cultivation is very low.

- **Plantation and Maintenance (Garden)**

Cardamom is a tropical herb which requires a good amount of sun shine and appropriate rainfall. Loamy soil is appropriate for cultivation. Moderate shade also necessitates for high yield. Plantation can be done with the commencement of monsoon, before heavy rains. For new plantation, overgrown plants are removed and destroyed first and land is cleared of all weeds. Usually the pits are taken at a size of 60cm x 60cm x 35cm each. The pits are dug at a distance of 1.5 m x 1.5m to 2m x 2m on either side, in the case of Malabar variety and that distance may be 2m x2m to 3m x 2m for Mysore/vazhukka. Undergrowth and weeds collected are put along the inter rows. It will help to improve the soil fertility and prevent soil erosion. Pits are filled with top soil or add some compost.

Regular schedules of cultural operations are needed for the plantation. Cultural practices involve weeding, mulching, trashing, shade regulation, fertilizer application, irrigation, etc. The removal of old and dried shoots, leaves and dried panicles should be taken up once in a year during June-July.

- **Nutrient Management**

Application of organic manures such as cow dung, FYM or compost @ 5 kg/ plant or neem cake @ 1-2 kg/plant may be done during June/July. Recommendation of nutrient is N: P205: K20@ 75:75:150 kg/ha. Recommendation of fertilizers can be applied in two split doses, before and after monsoon.

- **Harvesting and Post Harvesting**

Cardamom plants starts bearing capsules from the third year of planting. Picking of capsule is done at an interval of 30-45 days. Harvested capsules should be processed within 24-36 hours after picking. Harvesting season in Kerala is October-February and September-November is the peak period of harvest.

- **Post-harvest Curing**

Capsules are dried through curing houses after washing in water. Then capsules are spread on wire net trays in curing chamber. Burning fire wood in curing house produces heat for drying. The process of drying takes 18-24 hours. After drying, capsules are rubbed on wire mesh to remove the stalk and portion of flower from the capsules.

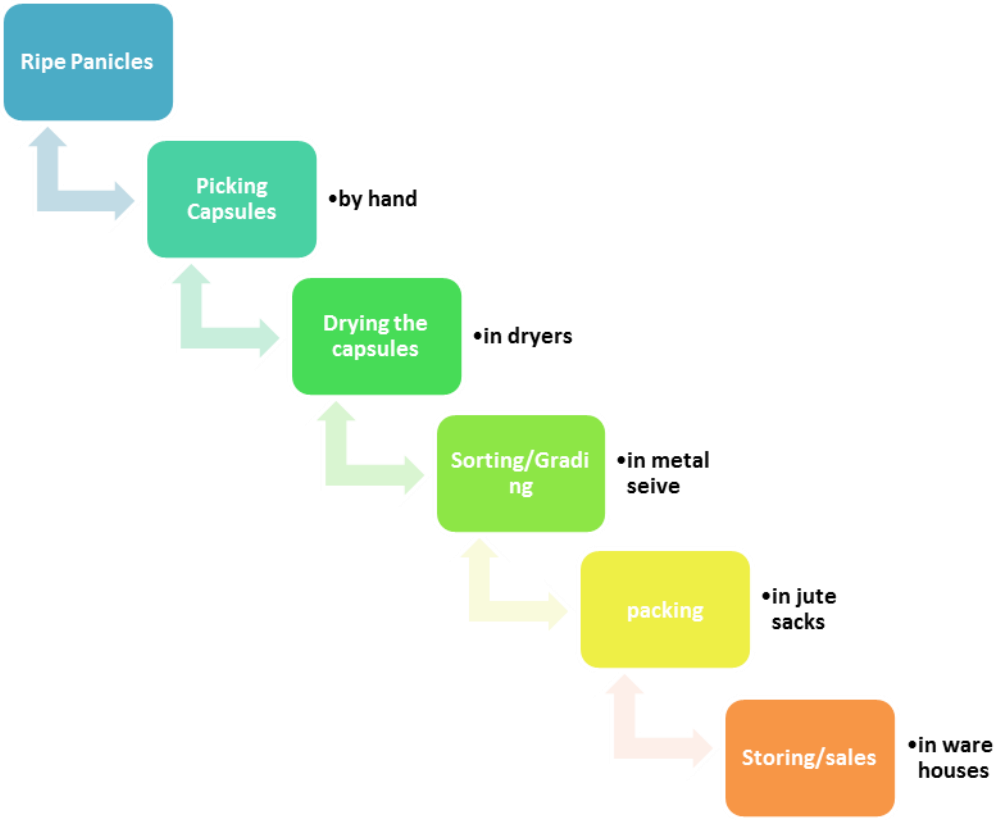
- **Grading and Packing**

Dried capsules are to be graded according to the sizes of 6, 6.5, 7mm etc. Higher graded commodity can fetch high price in market. Quality of cardamom is determined on the basis of size and green colour. Processed commodity is stored in polythene lined gunny bags. This packing helps to retain green colour and to avoid exposure to moisture

- **Transporting**

Transportation of cardamom from producers to customers is not a big problem. Good road networks available in Kerala help the movement of commodity. Farmers bring their produce in private or hired vehicles to the local traders. They transport goods in trucks or vans to the merchants or wholesalers. Merchants may be exporters or wholesalers, they transfer goods using trucks, or through air ways in foreign countries.

Production flow of cardamom
Fig-1



Marketing

Farmers are not aware about the new methods in marketing of cardamom. Marginal farmers and farmers sell their produces immediately after drying, without sorting or grading. But some producers, however, store for some period to wait for high price. Some of them now ready to sorting and grading their products. Many of farmers are resorted to the local traders who give relatively high price, after seeing the sample. Marketing channels of the cardamom is flow from farmers/growers, local traders, wholesalers, and exporters. Everyone have their own role in the smooth flow of product. Now farmers are familiar with commodity future market, and some of them engaged in future market. Farmers associations also trying to make more profit through assembling their produce together and operate in large scale.

Pricing

Many of the marginal and farmers sell their produce without grading or sorting. So normally they get lower price than market supply. They approached local dealers with a sample of their produce, then traders offer prices and farmers sell to those who offer highest price. Farmers do not have access to market information. But the medium or large farmers get reasonably fair price, as they offer their produce in auction. Thus they can ensure market supply.

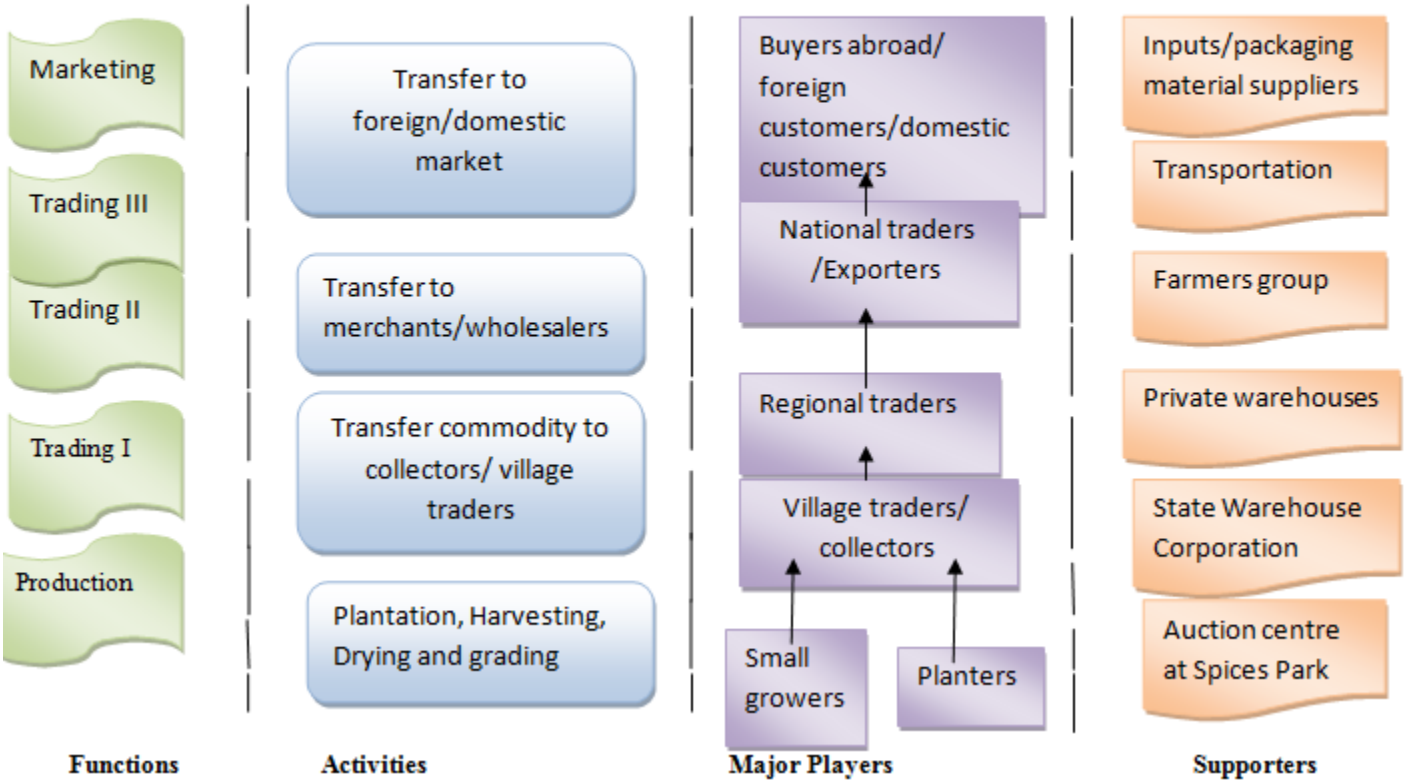
IV. Supply Chain Analysis

- **Supply Chain Map**

As shown in fig-2 the cardamom supply chain in Kerala provides a graphic preview of the movement of commodity from producers to consumers. It depicts the channels or stages thorough which the commodity passes to the customers all over the world. The left hand blocks indicate the major functions of the chain such as production, collection, trading and marketing of cardamom. Second blocks indicate the key players and their various activities in the supply chain. The support service providers have greater importance in the supply chain. They assist or facilitate key players in performing their functions. They are represented in the right hand block and include government institution, non-government organisations, credit suppliers, etc...

Supply Chain Map of Cardamom

Figure-2



Analysis of Supply Chain and Price Margins

The analysis of price margin has been done by using a standard format showing major costs, losses, margins and prices along the supply chain. The flow of supply chain of the commodity moves from farmers to local traders, wholesale market and finally up to the exporters. Information for the analysis is obtained from the key players at Udmpanchola Taluk in Kerala. The terminal market is Vandenmedu. The following table shows the price margin analysis of cardamom in Vandenmedu, Kerala. The table contains the analysis of per unit margins retained by the major players along the supply chain.

Table-2

Supply Chain of Cardamom (1 kg of Dried Cardamom)							
Farmers/Growers		Local Traders		Wholesaler		Exporter	
	cost		cost		cost		cost
Production cost		*Assembling cost*		*Assembling cost*		*Assembling cost*	
seed material	30	grading	4	sorting	4	sorting	4
labour	234.78	sorting	4	grading	4	grading	4
Processing cost	55	Packing	0.25	Over head	2	Over head	1
other inputs	45.87						
Total Production cost	365.65	Acquisition cost	700	Acquisition cost	710	Acquisition cost	725
Post production cost		Transfer cost	1.75	Trucking cost	3.75	Trucking cost	1.75
Miscellaneous	1						
Total cost	366.65	Total cost	701.75	Total assembling cost	713.75	Total cost	735.75
				Total whole sale level*	713.75	Total export level*	735.75
Losses	30	Losses	5.75	Losses	3.37	Losses	2.5
Margin	336.65	Margin	14	Margin	19.62	Margin	26.75
Average price	685	Assembler level price	710	whole sale level price	730	Whole sale level price	760

Source- Calculation based on field study * Tax is ignored for this calculation.

- **Farmers/Growers**

From the table 2, it can be seen that farmers/growers share the largest portion of margin, compared to other participants in the supply chain. Total production cost at full maturity of the plantation is Rs.366.65 per 1kg of dried cardamom (see annex 1 for the detail calculation of cost of production of cardamom). Labour constitutes the major portion of cost of production (86.21%) in the fifth year of production. Rest of 13.79% represents the input used for production. Total farm level cost with post production cost is around Rs.366.65 per 1kg of dried cardamom.

- **Local Traders**

Local traders have important role in the supply chain; they are the intermediary between the farmers and wholesalers. The major items of costs incurred by them are acquisition, cleaning, sorting, grading, packaging and transferring. The margin enjoyed by local traders is comparatively low (Rs.14 per kg).

- **Wholesalers**

Wholesalers also have immense role in the supply chain by linking the farmers/traders with exporters. Sometimes the wholesalers act as exporters also. Major costs are sorting, grading, packaging and transferring. The amount tax payable is ignored for the calculation. The margin acquired by them may be Rs.19.62 per kg.

- **Exporters**

Exporters are the last component and backbones of the supply chain. They also have cost of acquisition, sorting, grading, packaging, and transferring etc. Exporters collect the products from the farmers/traders. The margin calculated for them is Rs.26.75 per kg.

V. SWOT Analysis of Cardamom

SWOT, involves Strength, Weakness, Opportunities and Threat. SWOT analysis is a tool used in developing strategies for intervention. This provides a framework for interventions and it should address the entire supply chain. The major issues of the SWOT are classified into the following categories:- **S** - Commodities Internal strength, **W** - Commodities Internal weaknesses , **O** – External Opportunities might move the commodity forward, **T** – Threats might hold the commodity back

VI. Support Services

Nationalised banks and co-operative societies are ready to provide credit facilities to the farmers. Ware house receipt can also be used as security to get loans. Government and non government organisations also worked for the promotion of the cardamom cultivation.

VII. Findings and Conclusion

Cardamom is the major crop cultivated in Kerala. Kerala constitute more than 90% of the cardamom production in Kerala state. Area of production and productivity also become high.

Around 20000 hectares of yielding are consist of around 14000 holdings are there in Udumbanchola Taluk. It is the major area of cardamom production in Kerala. Major viral diseases affected in this area are Katte or mosaic diseases and azhukal disease. There exist potentials for expansion of cardamom in the area. This cultivation is highly labour intensive and it provides people with employment and regular income. Spices Park in Puttadi have greater role in the marketing of cardamom.

Spices Park consisting of a set of institutions such auction centre, ware houses, banks, grading centre, etc which enhance the marketing process. Electronic auction centre is useful for farmers as well as traders to get reasonable price. But the farmers' participation in E- auction is very low. Specialised warehouses (air conditioned) for cardamom also available in Spices park to keep the quality of product for a long period. Farmers are not conscious about the quality of the product. Marginal and farmers always sell their produce, without sorting or drying. They sell their produce to the local traders who give reasonable price. Absence of grading system at producers' level is the main problem of cardamom cultivation in Kerala. Marginal farmers and traders do not have access to market information. Body Naykanur in Tamil Nadu is the main area, where majority of our production assembled.

Cardamom cultivation has greater influence in the development of the people, as it provides employment opportunities. Plantations are also attracted by the tourists and it gives earning to the growers. Kumily is a plantation town closely associated with the Thekkady. The spice and tea plantations and bustling spice trading activities have made Kumily one of the important tourist and commercial centre in Kerala.

VIII. Recommendation and Suggestions

- Problems of cultivation are related to a general lack of knowledge. Farmers should provide practical knowledge in plant protection and pest management.
- Government and non-governmental organisations should encourage replacement of diseased plants with some compensation.
- Financial support should be provided to the farmers during lean periods.
- and marginal farmers need financial support for installing dryers individually.
- Feasibility of storehouse in collaboration with different government and non-government institutions to be carried out.
- Need for using bio-fertilisers and bio-pesticides should be informed to the farmers.
- Farmers should provide knowledge for sorting and grading commodities.

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A Highly Secure Skin Tone Based Optimal Parity Assignment Steganographic Scheme Using Double Density Discrete Wavelet Transform

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Abstract- Steganography is the art of hiding the existence of data in another transmission medium i.e. image, audio, video files to achieve secret communication. It does not replace cryptography but rather boosts the security using its obscurity features. The proposed method uses both Cryptography and Steganography to enhance the security of the message. The secret message is first encrypted using RSA algorithm and then randomized using OAEP. This encoded message is then embedded in the bitmap cover image using frequency domain approach. For embedding the encrypted message, initially skin tone regions of the cover image are detected using HSV (Hue, Saturation, Value) model. Thereafter, a region from skin detected area is selected, which is known as the cropped region. In this cropped region secret message is embedded using DD-DWT (Double Density Discrete Wavelet Transform). DD-DWT overcomes the intertwined shortcomings of DWT (like poor directional selectivity, Shift invariance, oscillations and aliasing). Hence the image obtained after embedding secret message (i.e. Stego image) is far more secure and has an acceptable range of PSNR. The terms of PSNR and robustness against various noises (like Poisson, Gaussian, salt and pepper, rotation, translation etc.).

Index Terms- Cropping, IWT, Gaussian, HSV, OAEP, Poisson, PSNR, RSA, Skin tone detection, Stego Image

I. INTRODUCTION

In this highly digitalized world, the Internet serves as an important role for data transmission and sharing. However, since it is a worldwide and publicized medium, some confidential data might be stolen, copied, modified, or destroyed by an unintended observer. Therefore, security problems become an essential issue.

Encryption is a well-known procedure for secured data transmission. Frequently used encryption methods include RSA, DES (Data encryption standard). Although encryption achieves certain security effects, they make the secret messages unreadable and unnatural or meaningless. These unnatural messages usually attract some unintended observers' attention. This is the reason a new security approach called "steganography" arises. As an example, the cover text. "I'm feeling really stuffy. Emily's medicine wasn't strong enough without another febrifuge." Hides the sentence "Meet me at nine," if the reader retains the second letter of each word in sequence. In steganography secret message is the data that the sender wishes to remain confidential and can be text, images, audio, video, or any other data that can be represented by a stream of bits. The cover or host is the medium in which the message is embedded and serves to hide the presence of the message. The message embedding technique is strongly dependent on the structure of the cover, and in this paper covers and secret messages are restricted to being digital images. The cover-image with the secret data embedded is called the "Stego-Image". The Stego-Image should resemble the cover image under casual inspection and analysis. In addition, for higher security requirements, we can encrypt the message data before embedding them in the cover-image to provide further protection. For this the encoder usually employs a stego-key which ensures that only recipients who know the corresponding decoding key will be able to extract the message from a stego-image. For proposed method cover image is cropped interactively and that cropped region works as a key at decoding side yielding improved security. There are two things that need to be considered while designing the Steganographic system. (a) Invisibility: Human eyes cannot distinguish the difference between original and stego image. (b) Capacity: The more data an image can carry the better it is. However large embedded data may degrade image quality significantly.

Rest of the paper is organized as follows. Section II presents literature survey and theoretical background. In section III proposed method is described in detail with skin tone detection, DWT, embedding and extraction procedure step by step. Section IV demonstrates the experimental results. Finally conclusions are provided in section V.

II. LITERATURE REVIEW

A. Steganography in Spatial Domain

This is the simplest Steganographic technique that embeds the bits of secret message directly into the least significant bit (LSB) plane of the cover image. In a gray level image, every pixel consists of 8 bits. The basic concept of LSB substitution is to embed the confidential data at the rightmost bits, (bits with the smallest weighting) so that the embedding procedure does not affect the original pixel value greatly. The mathematical representation for LSB is:

$$x_i' = xi - xi \bmod 2k + mi \qquad (1)$$

In equation (1), xi'represents the ith pixel value of the stegoimage and xi represents that of the original cover image. Mi represents the decimal value of the ith block in the

confidential data. The number of LSBs to be substituted is k. The extraction process is to copy the k rightmost bits directly. Mathematically the extracted message is represented as:

$$m_i = x_i \bmod 2k \qquad (2)$$

Hence, a simple permutation of the extracted mi gives the original confidential data. This method is easy and straightforward but this has low ability to bear some signal processing or noises. And secret data can be easily stolen by extracting the whole LSB plane.

B. Steganography in Frequency Domain:

Robustness of steganography can be improved if properties of the cover image could be exploited. For example it is generally preferable to hide the message in noisy regions rather than smoother regions as degradation in smoother regions is more noticeable to HVS (Human Visual System). Taking these aspects into consideration working in frequency domain becomes more attractive. Here, sender transforms the cover image into frequency domain coefficients before embedding secret messages in it.

Different sub-bands of frequency domain coefficients give significant information about where vital and non vital pixels of image resides. These methods are more complex and slower than spatial domain methods; however they are more secure and tolerant to noises. Frequency domain transformation can be applied either using DCT or DWT or IWT.

C. Adaptive Steganography

Adaptive steganography is special case of two former methods. It is also known as "Statistics aware embedding" and "Masking". This method takes statistical global features of the image before attempting to embed secret data in DCT or DWT or IWT coefficients. The statistics will dictate where to make changes.

III. PROPOSED METHOD

Proposed method introduces a new method of embedding secret data within skin and as well as in the edge area, as it is not that much sensitive to HVS (Human Visual System).This method takes advantage of Biometrics features such as skin tone edge detection, instead of embedding data anywhere in Image, data will be embedded in selected regions like skin region. Overview of method is briefly introduced as follows. At first skin tone detection is performed on input image using HSV (Hue, Saturation, Value) color model.

Secondly cover image is transformed in Frequency domain. This is performed by applying DD- IWT. Then payload (Number of bits in which we can hide data) is calculated. Finally secret data embedding is performed in one of the high frequency Sub-band by tracing skin pixels in that band. Before performing all steps cropping on input image is performed and then in only cropped region embedding is done, not in whole image.Cropping results into enhanced security, since cropped region works as a key at the decoding side. Here embedding process affects only certain Regions of Interest (ROI) rather than the entire image. So utilizing objects within images can be more advantageous. This is also called as Object Oriented steganography. Then a stego DD-IWT image is produced, so the IDD-IWT is performed on that. Thereafter IDD-IWT image is merged with original image, and we get the final stego image.

A. Skin Color Tone Detection

A skin detector typically transforms a given pixel into an appropriate color space and then uses a skin classifier to label the pixel whether it is a skin or a non-skin pixel. The Skin classifier used for the proposed method is based on the following values of RGB [12]:

$$R > 95 \ and \ G > 40 \ and \ B > 20$$
$$\text{Max } R, G, B - \min R, G, B > 15$$
$$G > 15 \ and \ R > G \ and \ R > B$$

These RGB values can be converted into HSV by using eqn (3)

$$H = \begin{cases} h, B \le G \\ 2\pi - h, B > G \end{cases}$$

$$h = cos - 1\left(\frac{\frac{1}{2}(R-G)+(R-B)}{\left(\sqrt{(R-G)}\right)+(R-G)(G-B)}\right)$$

$$S = \left(\frac{(\max(R,G,B) - \min(R,G,B))}{\max(R,G,B)}\right)$$

$$V = \max(R,G,B) \qquad (3)$$

C. Integer Wavelet Transform (IWT):

This is another frequency domain in which steganography can be implemented. DCT is calculated on blocks of independent pixels, a coding error causes discontinuity between blocks resulting in annoying blocking artifacts. This drawback of DCT is eliminated using IWT. IWT applies on entire image. IWT offers better energy 40 compaction than DCT without any blocking artifact.

IWT splits component into numerous frequency bands called sub bands known as

LL – Horizontally and vertically low pass
LH – Horizontally low pass and vertically high pass
HL - Horizontally high pass and vertically low pass
HH - Horizontally and vertically high pass

Since Human eyes are much more sensitive to the low frequency part (LL subband) we can hide secret message in other three parts without making any alteration in LL subband. As other three sub-bands are high frequency sub-band they contain insignificant data. Hiding secret data in these sub-bands doesn't degrade image quality that much. IWT used in this work is DDDIWT.

D. Implementation of IWT in 1D:

In separable IWT the analysis filter bank decomposes the input signal x(n) into two sub band signals, c(n) and d(n). The signal c(n) represents the low frequency part of x(n), while the signal d(n) represents the high frequency part of x(n). We denote the low pass filter by af1 (analysis filter 1) and the high pass filter by af2(synthesis filter 2). As depicted in figure(1), the output of each filter is then down sampled by 2 to obtain the two sub band signals c(n) & d(n)

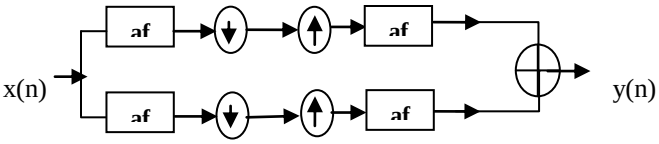

Fig 1. Analysis and Synthesis filter banks applied to 1D Signal

The Synthesis filter bank combines the two sub band signals c(n) & d(n) to obtain a single signal y(n). The synthesis filter bank up-samples each of the two sub band signals. The signals are then filtered using a low pass and high pass filter. We denote the low pass filter by sf1(synthesis filter 1) and the high pass filter by sf2(synthesis filter 2). The signals are then added together to obtain the signal y(n). If the four filters are designed so as to guarantee that the output signal y(n) equals the input signal x(n), then the filters are said to satisfy the perfect reconstruction condition.

E. 2-D Integer Wavelet Transform :

Image-processing applications require two-dimensional implementation of wavelet transform. Implementation of 2D IWT is also referred to as multidimensional wavelet transform in literature. In the 2D case, the 1D analysis filter bank is first applied to the columns of the image and then applied to the rows. If the image has N1 rows and N2 columns, then after applying the 1D analysis filter bank to each column we have two sub band images, each having N1/2 rows and N2 columns; after applying the 1D analysis filter bank to each row of both of the two sub band images, four sub band images are obtained, each having N1/2 rows & N2/2 columns. This is combines the four sub band images to obtain the original image of size N1 by depicted in figure (2) given below. The 2D synthesis filter bank N2.

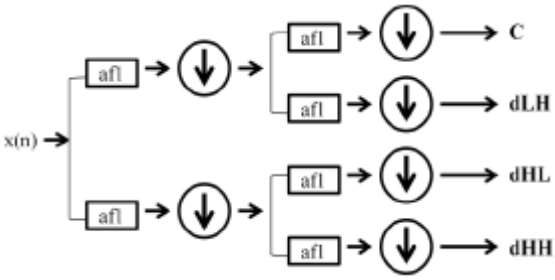

Fig 2. Analysis and Synthesis filter banks applied to 2D Signal

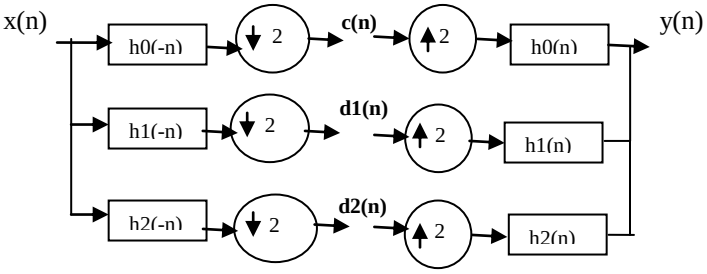

Fig 3. A 3-Channel Perfect Reconstruction Filter Bank.

F. Double-Density Discrete Wavelet Transform:

The double-density DWT is an improvement upon the critically sampled DWT with important additional properties: (1) It employs one scaling function and two distinct wavelets, which are designed to be offset from one another by one half, (2) The double-density DWT is over complete by a factor of two, and (3) It is nearly shiftinvariant.

In two dimensions, this transform outperforms the standard DWT in terms of denoising; however, there is room for improvement because not all of the wavelets are directional. That is, although the double-density DWT utilizes more wavelets, some lack a dominant spatial orientation, which prevents them from being able to isolate those directions.

G. Implementation of DD-IWT:

To implement the double-density DWT, we must first select an appropriate filter bank structure. The filter bank proposed in Figure 3 illustrates the basic design of the double-density DWT.

The analysis filter bank consists of three analysis filters—one low pass filter denoted by $h_0(-n)$ and two distinct highpass filters denoted by $h_1(-n)$ and $h_2(-n)$. As the input signal x(n) travels through the system, the analysis filter bank decomposes it into three sub-bands, each of which is then down-sampled by 2. From this process we obtain the signals c(n), $d_1(n)$, and $d_2(n)$, which represent the low frequency (or coarse) subband, and the two high frequency (or detail) sub-bands, respectively.

The synthesis filter bank consists of three synthesis filters—one lowpass filter denoted by $h_0(n)$ and two distinct highpass filters denoted by $h_1(n)$ and $h_2(n)$—which are essentially the inverse of the analysis filters. As the three subband signals travel through the system,

they are up-sampled by two, filtered, and then combined to form the output signal y(n).

One of the main concerns in filter bank design is to ensure the perfect reconstruction (PR) condition. That is, to design $h_0(n)$, $h_1(n)$, and $h_2(n)$ such that y(n)=x(n).

G. Thresholding Techniques:

Generally two types of thresholding techniques are there in spread spectrum denoising:

1) *Hard Thresholding:* Hard Thresholding is a straight forward technique for implementing wavelet denoising (i.e., keep' or _kill' strategy). If T is the threshold, then hard thresholding operation on the wavelet coefficient w_t is given by δ_T

$$\delta_T^H = W_t\,, if\ |Wt| > T$$
$$= 0, otherwise \qquad (4)$$

This operation is not a continuous mapping and only affects the input coefficients that are less than or equal to the threshold. Proposed method uses hard Thresholding.

2) *Soft Thresholding:* The other standard technique for denoising is soft Thresholding of the wavelet coefficient w_t via,

$$\delta_T^S(Wt)[|Wt| - T]$$
$$Where, sign(Wt) = +1\ if\ Wt = 0,$$
$$= 0\ if\ Wt = 0,$$
$$= -1\ if\ Wt < 0,$$
$$and\ x+ = x\ if\ x \geq 0,$$
$$= 0\ if\ x < 0\ \ldots\ldots (5)$$

Where, sign(w_t) is the signum function. Instead of forcing w_t to zero or leaving it untouched, soft thresholding pushes all the coefficients towards zero. Hence the smoothing effect is better in soft thresholding than the hard thresholding. So, soft thresholding is referred in this work.

H. RSA and OAEP Encryption

1) RSA Encryption: The RSA cryptosystem, named after its inventors R. Rivest, A. Shamir, and L. Adleman, is the most widely used public key Cryptosystem. It may be used to provide both secrecy and digital signatures and its security is based on the intractability of the integer factorization.

The scheme makes use of an expression with exponentials. Plaintext is encrypted in blocks, with each block having a binary value less than some number n. That is, the block size must be less than or equal to log2 (n); in practice, the block size is i bits,
where

$2i < n < 2i+1$.

Encryption and decryption are of the following form, for some plaintext block M and cipher text block C:

$C = Memod\ n$ …….. (6)
$M = Cd\ mod\ n = Me\ d\ mod\ n = Med\ mod\ n$ ……(7)

Both sender and receiver must know the value of n. The sender knows the value of e, and only the receiver knows the value of d. Thus, this is a public-key encryption algorithm with a public key of,

PU = {e, n} and a private key of PU = {d, n}.

For this algorithm to be satisfactory for public-key encryption, the following requirements must be met:

i) It is possible to find values of e, d, n such that Med mod n = M for all M < n.
ii) It is relatively easy to calculate mod Me mod n and Cd for all values of M < n.
iii) It is infeasible to determine d given e and n.

The algorithm is described as

Key Generation:

i) Select two random numbers p and q such that both are prime and p≠q.
ii) Calculate n=p×q
iii) Calculate φ(n)=(p-1)(q-1)
iv) Select public key e such that gcd(φ(n),e)=1 and 1<e< φ(n).
v) Calculate private key d such that d=e-1(mod(φ(n)))
vi) Public key is given by PU={e,n}
vii) Private key is given by PR={d,n}

Encryption:

i) Plaintext M should be such that M<n.
ii) Cipher text C=Me mod n.

Decryption:

i) M = Cd mod n.

2) *Security of RSA:*

Four possible approaches to attacking the RSA algorithm are as follows:

i) Brute force: This involves trying all possible private keys.
ii) Mathematical attacks: There are several approaches, all equivalent in effort to factoring the product of two primes.
iii) Timing attacks: These depend on the running time of the decryption algorithm.
iv) Chosen cipher text attacks: This type of attack exploits properties of the RSA algorithm.

The defense against the brute-force approach is the same for RSA as for other cryptosystems, namely, use a large

key space. Thus, the larger the number of bits in d, the better.

However, because the calculations involved, both in key generation and in encryption/decryption, are complex, the larger the size of the key, the slower the system will run. We can identify three approaches to attacking RSA mathematically:

i) Factor n into its two prime factors. This enables calculation of f(n) = (p - 1) x (q - 1), which, in turn, enables determination of d e^-1 (mod f(n)).
ii) Determine f(n) directly, without first determining p and q. Again, this enables determination of d e1 (mod f(n)).
iii) Determine d directly, without first determining f(n).

3) OAEP:

To overcome the drawbacks of RSA, a randomization approach is combined to it namely OAEP. Optimal Asymmetric Encryption Padding (OAEP) is a padding scheme in the form of a Feistel network which uses a pair of random oracles G and H to process the plaintext prior to asymmetric encryption. When combined with any secure trapdoor one-way permutation f, this processing is proved in the random oracle model to result in a combined scheme which is semantically secure under chosen plaintext attack (IND-CPA). When implemented with certain trapdoor permutations (e.g., RSA), OAEP is also proved secure against chosen cipher text attack.

OAEP can be used to build an all-or-nothing transform. OAEP satisfies the following two goals:

(i) Add an element of randomness which can be used to convert a deterministic encryption scheme (e.g., traditional RSA) into a probabilistic scheme.
(ii) Prevent partial decryption of cipher texts (or other information leakage) by ensuring that an adversary cannot recover any portion of the plaintext without being able to invert the trapdoor one-way permutation f.

4) Implementation of OAEP:

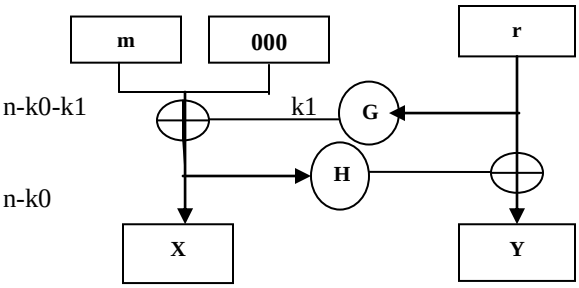

Fig 4. OAEP Diagram

i) n is the number of bits in the RSA modulus.
ii) k0 and k1 are integers fixed by the protocol.
iii) m is the plaintext message, an (n – k0 – k1) bit string.
iv) G and H are typically some cryptographic hash functions fixed by the protocol.

To encode,
i) Messages are padded with k1 zeros to be n − k0 bits in length.
ii) r is a random k0-bit string
iii)G expands the k0 bits of r to n − k0 bits.
iv) X = m00..0 ⊕ G(r)
v) H reduces the n − k0 bits of X to k0 bits.
vi) Y = r ⊕ H(X)
vii) The output is X || Y where X is shown in the diagram as the leftmost block and Y as the rightmost block.
To decode,
i) Recover the random string as r = Y ⊕ H(X)
ii) Recover the message as m00..0 = X ⊕ G(r)

The "all-or-nothing" security is from the fact that to recover m, you must recover the entire X and the entire Y; X is required to recover r from Y, and r is required to recover m from X. Since any changed bit of a cryptographic hash completely changes the result, the entire X, and the entire Y must both be completely recovered.

I. Encoding and Data Hiding Process

Suppose C is original 24-bit color cover image of PXQ Size.

$$C = \left\{x_{ij}, y_{ij}, z_{ij} \middle| 1 \le i \le P, 1 \le j \le Q, x_{ij}\, y_{ij}\, z_{ij} \in \{0,1,\ldots..255\}\right\}$$

Let size of cropped image is Pc×Qc where Pc≤P and Qc≤Q and Pc=Qc. i.e. Cropped region must be exact square as we have to apply DWT later on this region. Let S is secret data. Here secret data considered is binary image of size a×b. Figure 5 represents flowchart of embedding process. Different steps of flowchart are given in detail below.

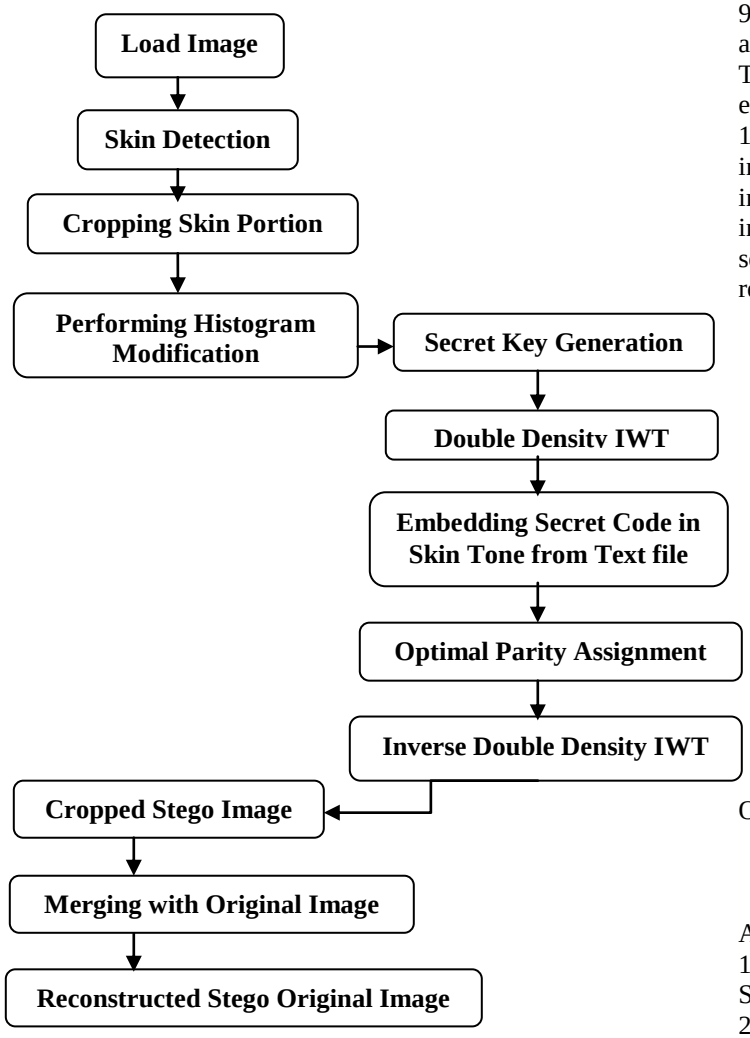

Fig 5. Flowchart of Encoding Process

Steps:
1. Initially load the cover object in which we will hide the secret message (text).
2. After loading the cover object, skin tone detection is performed. This enables us to know where and how much data can be hidden.
3. Cropping: From the detected skin portion, cropping is performed. This is done so that within skin pixels data is hidden at only limited pixel positions. This feature of cropping enhances security, as any eavesdropper cannot detect secret message just by detecting the skin pixels.
4. Histogram Modification: This is performed to adjust the contrast of the colors.
5. Key Generation: This is the step where the secret message to be selected and is encrypted using RSA and OAEP.
6. Double Density DWT: Double Density Discrete Wavelet Transform is applied to the cropped skin portion.
7. Secret encrypted message is now merged into the transformed skin pixels.
8. Optimal Parity Assignment is used to assign secret code values to limited areas of cropped skin portion, so as to have least effect over the HVS (human visual system).
9. Inverse DD-DWT: Now the transformed image has secret code as well, so it is ready to be merged with the original cover object. The first step to merge this transformed secret message embedded image, with cover object is to inverse transform it.
10. After applying inverse DD-DWT, we get the original cropped image along with secret code. This image is now called stego image. This stego image is now merged with original cover image to get the final reconstructed cover image along with secret data embedded in it. This Stego image is now sent to the receiver by some transmission medium.

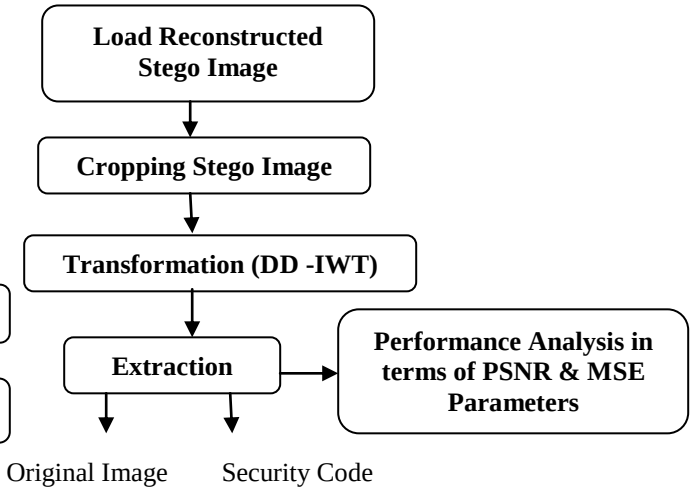

Fig 6. Flowchart of Decoding Process

At the Decoding End following steps are performed:
1. From the Stego Image skin pixels are detected and cropping of Stego image is performed.
2. Now the DD-DWT is performed to get the transformed cropped image.
3. Secret encrypted message is extracted from the transformed cropped stego image. This encrypted message is decrypted (using RSA+ OAEP decryption) to get the secret message.
4. Results of Extraction process are measured in terms of PSNR and MSE. This are discussed below in detail.

Fig 7: Cover image

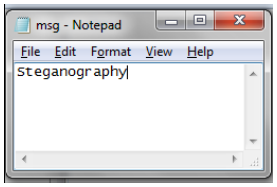

Fig 8: Secret message image

Performance measurement for image distortion is well known as peak signal to noise ratio (PSNR) which is classified under the difference distortion metrics and can be applied on stego images. PSNR is used to evaluate quality of stego image after embedding the secret message. Secret message can be any word. The performance in terms of capacity and PSNR (in dB) is demonstrated for the method in the following subsections. PSNR is defined as per Eq.9

$$PSNR = 10\ log_{10}\left(\frac{255^2}{MSE}\right) \quad (9)$$

$$MSE = \left(\frac{1}{M*N}\right)\sum_{I=1}^{M}\sum_{j=1}^{N}(aij - bij)^2 \qquad (10)$$

aij and bij represents pixel values of original cover image and stego image respectively as in Eq.10 The calculated PSNR as in Eq.9 usually adopts dB value for quality judgment, the larger PSNR is higher the image quality (which means there is a little difference between cover image and stego image). On the contrary smaller dB value means there is a more distortion. PSNR values falling below 30dB indicate fairly a low quality.

However, high quality strives for 40dB or more.

A. Result Discussion of proposed work:

After embedding secret data in cropped image, resulted cropped stego image is shown in Fig. 9. Cover image is now merged with cropped embedded Stego image as is shown in Fig.10. For merging, co-ordinates of first and last pixels of cropped image are calculated and then replaced with the one in original cover image. After performing decoding process on stego image, retrieved output text file consisting of the secret message is shown in Fig 11.

Fig 9: Cropped Stego Image

Fig 9: Cropped Stego Image

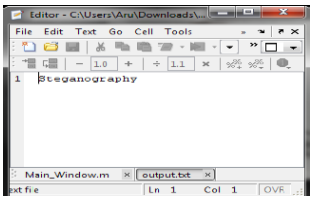

Fig 11: Output Text File (having the secret message)

PSNR for different cases is shown in table 1. Average PSNR of proposed method is calculated based on the obtained PSNR. Average PSNR obtained by the proposed method is much better than the ones proposed by Rekha Nagar and Anjali Shejul (as can be seen in table 2). Table 1 also includes PSNR of considered image after addition of noises (like Gaussian, Salt and Pepper, Speckle, Poisson, and Image Rotation), which are fairly acceptable (having PSNR greater than 40). Thus the proposed method is better than previous ones as well as robust against various noises.

TABLE I
RESULTS OF PSNR FOR DIFFERENT METHODS

METHOD	MSE	PSNR	ACCURACY
LSB	1.25	18	90%
PPM (Pixel Pair Matching)	0.96	22	98%
DWT -SVD	0.8	25	935
Proposed	0.55	28	96%

V. CONCLUSION

Digital Steganography is a fascinating scientific area which falls under the umbrella of security systems. Proposed framework is based on steganography that uses Biometric feature i.e. skin tone region. Skin tone detection plays a very important role in Biometrics and can be considered as secure location for data hiding. Secret data embedding is performed in DD-IWT domain than the IWT as DD-IWT outperforms than IWT as well as DCT and DWT. Using Biometrics resulting stego image is more tolerant to attacks and more robust than existing methods.

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IPROB – EMERGENCY APPLICATION FOR WOMEN

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Abstract: This project presents an alert system for PROB detection using common commercially available electronic devices to both detect the PROB and alert authorities. We use an Android based smart phone with an integrated tri-axial accelerometer. Data from the accelerometer is evaluated with several threshold based algorithms and position data to determine a PROB. The threshold is adaptive based on user provided parameters such as: height, weight, and level of activity. The algorithm adapts to unique movements that a phone experiences as opposed to similar systems which require users to mount accelerometers to their chest or trunk. If a PROB is suspected a notification is raised requiring the user's response. If the user does not respond, the system alerts pre-specified social contacts with an informational message via SMS. If a contact responds the system commits an audible notification, automatically connects, and enables the speakerphone. If a social contact confirms a PROB, an appropriate emergency service is alerted. Our system provides a realizable, cost effective solution to PROB detection using a simple graphical interface while not overwhelming the user with uncomfortable sensors. IPROB is very powerful software especially developed for the safety of girls, whenever some body is in trouble they don't have to sit and find contacts or find ways to send short message service, or message the near ones. They might not have so much time.. All that they have to do is shake the smart phone above the threshold value, vigorously. Immediately a message alert is sent to the person's mom, dad and whoever they wish to, if their guardians also have a smart phone. Even though if it is in silent mode. When a message called ALERT is received it automatically changes its profile to general, and gives a voice notification YOUR SON // DAUGHTER IS IN TROUBLE PLZ HELPS…. PLZ HELP…. PLZ HELP…. REPEATEDLY AS A RING TONE until they listen and stop it

I. INTRODUCTION

This application is generally meant for the attention of the authorities or public in the emergency response capabilities such as terrorist attacks and the natural disaster by facilitating the communication with their respective along the mobile phones.

The difficulties in the existing application are the lack of situational awareness and communication terminology among their respective. Due to this response and recovery is Difficult to the authorities. In respect of the public safety with the support of the network provider the application runs in the android phones in efficient way to identify and recover the problem by the natural disaster or terrorist attacks etc…

Furthermore users are likely to operate the mobile devices for the security purpose to intimate the problem detection to their respective in the emergency cases.

II. APPLICATION REQUIREMENTS

To develop the IPROB android based mobile application the station and the environment of the surrounding has to been interviewed then the dangerous and the suspicious activates should be notified to the device by the user .if the device detects the problem then only other process creates the attention for reporting to the authority.

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A. Tri-axial accelerometer:

Tri axial accelerometer is a device which is used for the detection of trigger using the higher threshold value, which is generally works on the basis of three parameters such as height, weight, and level of activity. The algorithm adapts to unique movements that a phone experiences as opposed to similar systems which require users to mount accelerometers to their chest or trunk.

B. Detection of speaker phone:

Detection of the speaker phone is the part as the unique movement of a phone is triggered, the speaker phone enables and recognize the voice and identifies the detection of problem.

As the problem is detected it creates the command as ALERT and sends to the control and monitoring system through the network provider.

C. Network provider support:

Network provider has got the important role, by sending the commands through the short message type to the different applications.

D. GPS (Global positioning system)

GPS is a Global positioning system which is used to track the location by receiving the LOC, ENABEL command from the Control and monitoring application. And it stops working by giving command as DISABLE using the network provider support.

E. SMS Manager Module

Text messaging, or texting, refers to the exchange of written messages between fixed-line phone or mobile phone and fixed or portable devices over a network. SMS Manager contains a powerful rule editor which can be used to automate message processing. This allows deploying common scenarios such as SMS voting polls, but also much more complex schemes.

- React to events like message being received or connection going down.
- Reply to messages.
- Create contacts and add them to distribution lists.

III. APPLICATION DESIGN

Once the requirement of the application are fulfilled then the application can be designed in the way of detecting the problem by shaking the mobile phone by the user and the mobile phone detects the voice which can be recognized and identifies the problem .as the problem detected the alert message should be created by the user application and sends to the authorities application through the network provider when the authorities Application receives the alert message which runs the applications and alert the authorities by giving the voice notification .When the authorities application get notified then the location can be identified and traced by the enabling the GPS, by creating enable message and sends to the user application through the network provider.

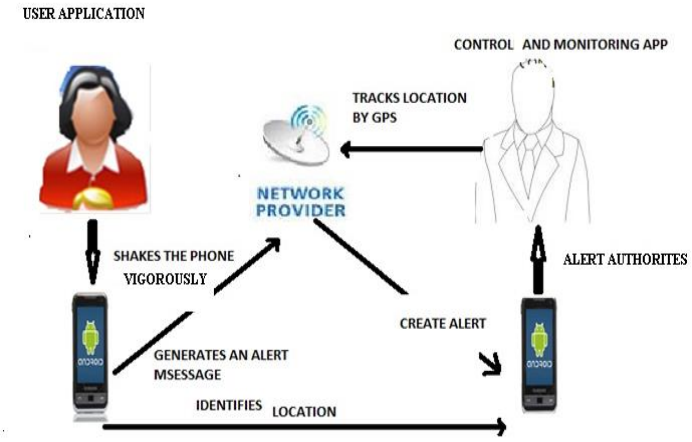

Figure 1 overview of application

IV. OPERATING SYSTEM

By considering the today's environment most of the people using the android based mobile phones and android is the open source which can be used and adapted easily so android operating system can be used.

Android is an operating system based on the Linux kernel, and designed primarily for touch screen mobile devices such as smart phones and tablet computers. Initially developed by Android, Inc., which Google backed financially .Android was unveiled in 2007 along with the founding of the Open Handset Alliance: a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. The first publicly available Smartphone running Android, the HTC Dream, was released on October 22, 2008

The user interface of Android is based on direct manipulation, using touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching and reverse pinching to manipulate on-screen objects. Internal hardware such as accelerometers, gyroscopes and proximity sensors are used by some applications to respond to additional user actions, for example adjusting the screen from portrait to landscape depending on how the device is oriented. Android allows users to customize their home screens with shortcuts to applications and widgets, which allow users to display live content, such as emails and weather information, directly on the home screen. Applications can further send notifications to the user to inform them of relevant information, such as new emails and text messages.

Android is open source and Google releases the source code under the Apache License. This open-source code and permissive licensing allows the software to be freely modified and distributed by device manufacturers, wireless carriers and enthusiast developers. In practice, Android devices ship with a combination of open source and proprietary software. Android has a large community of developers writing applications ("apps") that extend the functionality of devices, written primarily in the Java programming language. In October 2012, there were approximately 700,000 apps available for Android, and the estimated number of applications downloaded from Google Play, Android's primary app store, was 25 billion. A developer survey conducted in April–May 2013 found that Android is the most popular platform for developers, used by 71% of the mobile developer population.

Android is the world's most widely used Smartphone platform, overtaking Symbian in the fourth quarter of 2010. Android is popular with technology companies who require a ready-made, low-cost, customizable and lightweight operating system for high tech devices. Despite being primarily designed for phones and tablets, it also has been used in televisions, games consoles, digital cameras and other electronics. Android's open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced user or bring

Android to devices which were officially released running other operating systems.

As of November 2013, Android's share of the global Smartphone market, led by Samsung products, has reached 81%.The operating system's success has made it a target for patent litigation as part of the so-called "Smartphone" between technology companies. As of May 2013, 48 billion apps have been installed from the Google Play store, and as of September 2013, 1 billion Android devices have been activated.

A. Applications**:**

These are applications written in Java. Some of basic applications include a calendar, email client, SMS program, maps, making phone calls, accessing the Web browser, accessing your contacts list and others.
If you are an average user, this is the layer you will us most, rest all layers are used by Google programmers, developers and hardware manufacturers.

B. Application Framework

This is the skeleton or framework which all android developers has to follow. The developers can access all framework APIs an manage phone's n to keyword ki:
basic functions like resource allocation, switching between processes or programs, telephone applications, and keeping track of the phone's physical location. The **architecture** is well designed to simplify the reuse of components. Think of the application framework as a set of basic tools with which a developer can build much more complex tools.

C. Libraries

This layer consists of **Android** libraries written in C, C++, and used by various systems. This library tells the device how to handle different kinds of data and are exposed to Android developers via Android Application framework. Some of these libraries includes media, graphics, 3d, SQLite, web browser library etc. The Android runtime layer which includes set of core java libraries and DVM (Dalvik Virtual Machine) is also located in same layer.

D. Runtime Android

This layer includes set of base libraries that are required for java libraries. Every Android application gets its own instance of Dalvik virtual machine. Dalvik has been written so that a device can run multiple VMs efficiently and it executes files in executable (.Dex) optimized for minimum memory.

E. Kernel – Linux:
This layer includes Android's memory management programs, security settings, power management software and several drivers for hardware, file system access, networking and inter-process-communication. The kernel also acts as an abstraction layer between hardware and the rest of the software stac.

V. CONCLUSION

The problem of the women safety is increased rapidly in this environment, so I proposed as an effective Android application to prevent such type of the suspicious or natural disaster, by alerting the concern authorities using the android mobile phone which helps to stop such type of illegal activates and to trace the concern..

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Usage of alternative fuel in boiler for cost reduction in a chemical industry

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Abstract- Overall cost reduction is the important objective of every industry. In a chemical industry electricity and fuel are the important raw materials. From this study it is found that furnace oil is the mainly used fuel in chemical industry. Mainly it is used in the operation of boilers, as steam is an important requirement in every chemical industry. It is found that during every financial year the amount spend on purchasing furnace oil goes on increasing. Several studies say that cost of furnace oil (low grade diesel) increases in the coming years and also there is a chance of fuel scarcity. In this chemical industry, during the process study it is found that hydrogen is formed as a byproduct during production process, and a part of this hydrogen is getting wasted. This paper aims in study the opportunities of using hydrogen as fuel in place of furnace oil. This study is very important for Government sector chemical industries for reducing the overall production cost.

Index Terms- Boilers, chemical industry in India, cost reduction, furnace oil, hydrogen gas.

I. Introduction

This study was carried out in a public sector chemical industry located at Kerala state in India. The main products of the plant are Caustic soda, chlorine, hydrochloric acid, caustic soda flakes and sodium hypochlorite. The main raw materials of the company are sodium chloride (rock salt), electricity and water. The plant has an installed capacity to produce 175 metric tons of caustic soda per day. To produce one metric ton of caustic soda, it requires 1.72 metric ton of sodium chloride. Company uses membrane cell technology in the production.

The first step is to identify the amount of furnace oil use in boiler. Then we suggest hydrogen in place of existing fuel in boiler. The its comparative cost analysis is carried out. After that we studied whether existing boiler is able to use hydrogen as fuel, and whether any replacement of the firing burner system is required. And at last if replacement of the burner system is required, then its payback period is calculated.

II. DATA COLLECTION

It is found that amount spend on purchasing furnace oil is increasing every financial year. Furnace oil is a low grade diesel and its requirement is also increasing every year. The graph shows the increase in purchase price of furnace oil for last five years.

During 2011-2012 financial year, company spends Rs.111452000 on purchase of furnace oil.

Annual consumption of furnace oil	= 3391.41 metric ton
Average cost of furnace oil per ton	= 111452000/3391.41
	= Rs 32853.02 per ton
Gross calorific value of furnace oil	= 41858 KJ/Kg
Energy from furnace oil	= furnace oil consumed * GCV of furnace oil
	= 3391410Kg * 41858 KJ/Kg
	= 141957639800 KJ

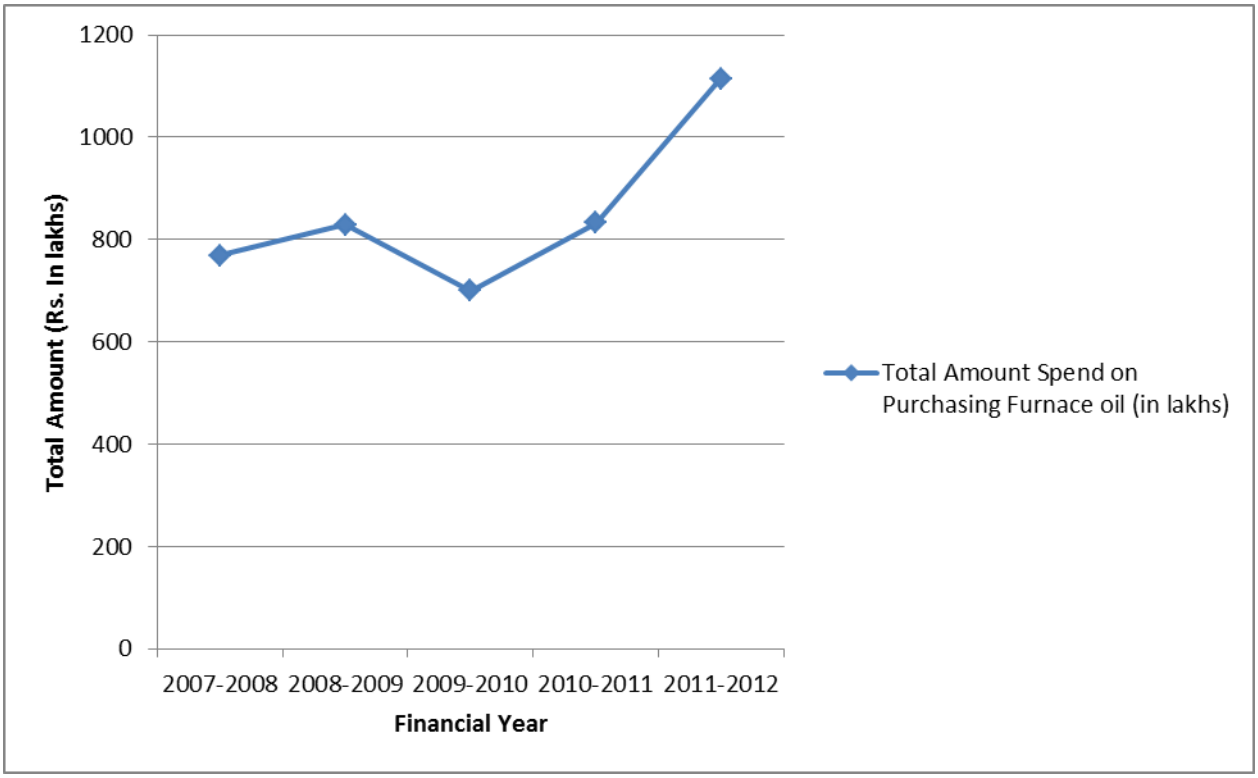

Fig 1: Total amount of money spend on purchasing furnace oil for last five years

III. WORK DONE

From the process study carried out in chemical industry it is found that hydrogen is produced during the electrolysis as a byproduct. A part of hydrogen is used for producing hydrochloric acid. But it is found that still an amount of hydrogen is getting wasted. This is can be utilized as an alternative fuel in boilers in place of furnace oil.

3.1 CALCULATION OF THE AMOUNT OF HYDROGEN WASTED

The main process is

$NaCl + H_2O \longrightarrow NaOH + H^+ + Cl^-$

Based on the data available from the company, 1.72 tons of raw salt is needed to produce 1 tons of caustic soda.

Production rate of caustic soda per day = 175TPD
Quantity of Raw salt required to produce 175 T caustic soda = 1.72*175
= 301 TPD

Molecular weight of NaCl = 58.5 g/mol
Molecular weight of H_2O = 18 g/mol
Molecular weight of NaOH = 40g/mol
Atomic weight of hydrogen = 1g/mol
Atomic weight of chlorine = 35.5g/mol

Then from the equation we know that 58.5 g NaCl produces 1 g hydrogen
Then, 1 g NaCl produces 1/58.5 g of hydrogen
301 T of NaCl produces 1/58.5 * 301 of hydrogen
Quantity of hydrogen produced = 1/58.5 * 301
= 5.14529 T

To find the total amount of chlorine produced per day,
From the equation we know that 58.5 g of NaCl produces 35.5 g of chlorine
Then, 1 g of Nacl produces 35.5/58.5 g of chlorine
301 T of NaCl produces 35.5/58.5 * 301 of chlorine
Total chlorine produced during electrolysis per day = 35.5/58.5 * 301
= 182.65 T

In this 72T of chlorine is liquefied for sale
Remaining Chlorine = 182.65 – 72
= 110.65 T
This chlorine is utilized for producing HCl
Hydrogen required for producing HCl

$H_2 + Cl_2 \longrightarrow 2HCl$

35.5 g of chlorine using 1 g of hydrogen produces 36.5 g of HCl
Therefore, 1 g chlorine requires 1/35.5 g of hydrogen
110.65 T chlorine requires 1/35.5 * 110.65 T of hydrogen

Amount of hydrogen required to produce HCl	= 1/35.5 * 110.65
	= 3.1169 TPD
Balance hydrogen	= Total hydrogen produced – Hydrogen required to produce HCl
	= 5.14529 – 3.11690
	= 2.02839 TPD
Amount of hydrogen getting wasted annually (approximately 330 woking days in a calander year)	= 2.02839 * 330
	= 669.3687 T

669.3687 T of hydrogen is getting wasted annually during the shutdown. This hydrogen can be utilized as an alternative fuel in boilers for producing steam.

3.2 HYDROGEN AS FUEL

Gross calorific value (GCV) of hydrogen	= 141790 KJ/Kg
Balance hydrogen (annual)	= 669.3687 T
Energy from hydrogen	= balance hydrogen * GCV of hydrogen
	= 669368.7*141790
	= 94909787970 KJ
Unavailability of energy (less in energy)	= 141957639800 – 94909787970
	= 47047851830KJ
Corresponding amount of furnace oil required	= less in energy/ calorific value of FO
	= 47047851830/41858
	=1123987.095 Kg
	=1123.987 T
Amount of furnace oil saved per year	= 3391.41 - 1123.987
	=2267.423 T
Total amount saved per year (money saving)	= 2267.423 * 32863.02
	= Rs. 74514367.4
Percentage oil saving	= (2267.423/3391.41) *100
	=66.86%

From the above calculation, we are able to determine that hydrogen alone cannot meet the need of steam production in boiler. Thus we need hydrogen and furnace oil as fuels at the same time. For this either existing boiler must be replaced or the burner system of the existing boiler must be replaced with a dual fuel burner. Replacing the entire boiler system is too costly. Replacement of burner system with a dual fuel burner system in which firing of furnace oil and hydrogen fuels are possible costs about approximately Rs8200000, which was far below when compared with profit achieved by this. But in coming years, based on the finance availability it is better to purchase a new boiler which can use multiple fuels in steam production. This work suggests the replacement of firing unit.

3.3 PAYBACK PERIOD

Approximate cost of new fire injection unit (including installation and other miscellaneous cost)	= Rs. 8200000 (82 lakh)
Amount saved annually by using hydrogen	= Rs.74514367.4
Payback Period (PBP)	= 8200000/74514367.4
	= 0.110 year
	= 0.110 * 365
	= 40.166
	= 41 days.

IV. RESULT

Annual consumption of furnace oil	= 3391.41 T
Amount of hydrogen getting wasted	= 669.3687 T
By using hydrogen as fuel, amount of furnace oil saved per year	= 2267.423 T
Total amount saved per year	= Rs. 74514367.4
Percentage oil saving	= 66.86%
Payback Period (PBP) for new fire injection unit	= 41 days

V. CONCLUSION

The study shows that, using hydrogen as fuel in place of furnace oil in boiler is very economical to the company. By this change in fuel there will be a saving of 7.45 crore rupees per year. This work founds that in this chemical industry the amount of hydrogen wasted alone cannot replace the entire furnace oil usage. There will be an oil saving of 66.86% .So existing burner system is to be replaced for using multiple fuels. The payback period for this burner system replacement is calculated as 41 days.

APPENDIX

T – Metric ton
FO – Furnace oil

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Total concentration and bioavailability of lead in urban sewage sludge: Test case inthe WWTP of the city of Dolores Hidalgo, México

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Abstract- In recent years, the production of sludge from wastewater has greatly increased worldwide due to demand for better water quality and the imposition of stricter environmental laws. One of the main problems of pollution of the sewage sludge is the concentration and availability of heavy metals which may contain, because these sludges represent a risk to the environment and to human health. Hence the importance of finding alternatives to generate stable and non-hazardous waste for proper disposal or reuse in order to contribute to sustainable development. One of the alternatives for the disposal of sludge is its use for agricultural soil improvement, because they are an important source of nutrients due to its content of organic matter, macronutrients like N, P and K and some micronutrients such as Cu and Zn. However, it should be considered the risk posed by the use of sludge because may contain high concentrations of potentially toxic elements such as heavy metals, thus concentration and speciation studies of metals are needed to obtain more detailed information on their bioavailability. The sludge used in this study are samples from a urban-municipal WWTP in state of Guanajuato. This sludge was found to not meet the maximum permissible lead (Pb) content in dry basis according to the provisions of the NOM-004-SEMARNAT 2002, because they exceed the maximum lead limit by approximately 25%. The lead availability was determined by the speciation method of the Community Bureau of Reference(BCR) where it was observed that the exchangeable and reducible fraction occupy approximately 24% of the lead in the sludge sample. While the residual fraction and oxidizable fraction occupy 45% and 30%, respectively.

Index Terms- Bioavailability, lead, urban sewage sludge, spetiation.

I. Introduction

The sewage sludge is a solid, semisolid or liquid waste, obtained from the treatment of wastewater and are composed of microorganisms which remove organic matter from wastewater which use as food[1].The handling and disposal of this residue becomes increasingly complex problem due to the large amount of sludge produced from treatment of wastewater.Only in Mexico, in the early 90s, it was estimated that the sludge production was 12 million tons per year [2].One of the main problems of pollution of the sewage sludge is the concentration and availability of heavy metals which may contain, because these sludge represent a risk to the environment and to human health [3], despite these

without any pretreatment in land and landfills.Considering the above, there are two problems: first, the dumping of sludge in inappropriate places can generate severe pollution problems, and secondly, the beneficial properties such as nutrient content and organic matter that could be exploited in agriculture or soil improvement, are being wasted, hence the importance of determining the bioavailability of heavy metals.

Knowledge of the distribution of heavy metals in sludge is important to understand its bioavailability. The distribution of these metals in the exchangeable, reducible, oxidizable and residual fractions can be evaluated using a sequential extraction analysis [4], which is based on sequential solubilization of metals, using chemical reagents that increment its extraction capacity in each successive stage of fractionation [5].

A large number of sequential extraction methods have been reported in the open literature, many of which are variations of the procedure of Tessier [6]. To harmonize the different sequential extraction schemes, the (BCR) proposed an extraction protocol in three stages [7].The origin of heavy metals, particularly lead, in sewage sludge used in this study is mainly associated with pottery and ceramics, which are important economic activities in the city of Dolores Hidalgo, México. In the above activities, it is used thelitharge orlead monoxide, which is the main component of silicates used to give a glossy or glazed finish to the pieces[8].

The objective of this research is focused on determining the total concentration of lead, as well as its distribution in the different fractions of the sewage sludge from the wastewater treatment plant (WWTP) in the city of Dolores Hidalgo, in order to determine their bioavailability and proper use without affecting the environment.

II. Methods and materials

A. Sampling of sewage sludge

The sludge samples were collected from the WWTP of the city of Dolores Hidalgo, Mexico, at three different points: the first was taken immediately after leaving the filters press, the second in the drying beds, with a period of 8 days of drying,
and the third in the dry stack sludge, with about 9 months drying.According to the Mexican standard NOM-004-SEMARNAT-2002 [9], 4 kg were collected from each sample to secure reliability and representativeness in the later study. The samples were placed in polyethylene bagsand stored in a recipient with ice for transport to the laboratory of university.To homogenize the composite samples, the quartering method established in the aforementioned Mexican standard was used. Samples were identified with numbers 1, 2 and 3, according to the chronological order in which they were taken.

B. Determination of moisture content in sewage sludge

Approximately 60 g of each of the composite samples were placed in an oven at 105 ° C to have a constant weight. The percentage of moisture content in the sewage sludge was calculated by the difference between the weights of the sample in dry and wet, according to the following expression [10],

$$\%M_s = \frac{W_w - W_d}{W_w} x100\% \quad (1)$$

where W_w is the weight of the wet sample and W_d corresponds to the weight of dry sample, both weights measured in grams.

C. Drying and screening samples

Once the composite samples were homogenized by quartering method, these were dried in an oven at a constant temperature of 105 °C for 72 h.The dried samples were pulverized in a mortar and were screened through a No.12 mesh to obtain samples with particles below 1.7 mm, which were stored in polyethylene bags at room temperature.

D. Determination of total heavy metals in sewage sludge

The heavy metal content in sewage sludge was determined by acid digestion.To carry out the acid digestion of the sludge, 0.5 g of sample were placed in a test tube with screw and 5 ml of concentrated nitric acid (JT Baker analytical grade) were added, then, the sample was placed in a thermoreactorC-9800 HANNA Instruments for test tubes at high temperature for 2 hours.Subsequently, 5 ml of hydrogen peroxide 30% (JT Baker analytical grade) were added and the tubes are left in the thermoreactor for 1 additional hour.After the digest time is completed, the tubes are allowed to cool to room temperature. The sample at room temperature is filtered through a Whatman 40 filter to remove insoluble particles and interference.

Finally, the content of heavy metals was quantified by atomic absorption spectrometry using a flame atomic absorption spectrometer (FAAS) Perkin Elmer, model AAnalyst 100. The operation conditions ofthe spectrometer used in the determination of total heavy metals in sewage sludge are shown in Table A of Appendix.

E. Determination of the bioavailability of lead (Pb) by sequential extraction

To determine the bioavailability of lead, sequential extraction method of BCR, which distinguishes three fractions in descending order according to their availability, was used. The method is summarized in Table 1.

Table 1. Fractions of the sequential extraction method of the BCR.

No.	Solid phase (fraction)	Reactive	Mol/L	Time/°T
1	Exchangeable	HCH_2COOH	0.11	16h/°RT
2	Reducible	$NH_2OH.HCl$/ HNO_3	0.1	16h/°RT
3	Oxidizable	H_2O_2 H_2O_2 CH_3COONa	30%(W/V) 30%(W/V) 1	1h/°RT 1h/85°C 16h/°RT

RT. Room Temperature.

1) Exchangeable fraction

A sample of 1 gram of sludge (dry and sieved) was placed in a polypropylene centrifuge tube with 15.2 ml of acetic acid 0.11 M.The sample was shaken in a horizontal shaker, model TTR-200, for 16 hours at room temperature.

The extract was separated from the solid residue by centrifugation for 5 min. The supernatant liquid was filtered through Whatman No. 40 paper and stored at 4 °C in a polyethylene container for a subsequent analysis by FAAS.The solid residue remaining in the centrifuge tube was washed with distilled water by shaking for 5 min and centrifuged for 5 min to remove the washing water.

2) Reducible fraction

To the clean residue from the previous stage, the second extractant solution was added, consisting of 15.2 ml of hydroxylamine hydrochloride (JT Baker, analytical grade) to 0.5 M (pH 2 with concentrated nitric acid) and it was shaken for 16 hours.The separation of the extraction solution and the washing of the residue were carried as described in the exchangeable fraction.In this fraction, the liquid obtained by decantation was again filtered through Whatman No. 40 paper and stored at 4 °C in a polyethylene container for a subsequent analysis by FAAS.

3) Oxidizable fraction

To the residue from the previous stage, 10 ml of 30% hydrogen peroxide (JT Baker) was added into the polypropylene centrifuge tube with lid.The residue was digested for 1 hour at room temperature and then an additional digestion was performed by heating the residue at 85 °C in a water bath for 1 hour.The stopper of the centrifuge tube was removed and the content of the tube was reduced by evaporation to a volume of approximately 1 ml. Then the third extractantsolution, 19 ml of ammonium acetate (JT Baker) to 1.0 M (pH 2 with concentrated nitric acid), was added and it was shaken for 16 hours.

The separation of the extraction solution and the washing of the residue, were developed in the same manner as the exchangeable fraction.Similarly to the previous fraction, the liquid obtained by decantation was again filtered through Whatman No. 40 paper and stored at 4 °C in a polyethylene container for a subsequent analysis by FAAS.

The solid residue of the third stage of the extraction process was dried at room temperature and was used to determine the residual fraction by acid digestion.

III. Results and discussion

The results of the moisture content and the total heavy metal content in the samples of the sludge, as well as lead bioavailability are presented in this section.

A. Moisture content in sewage sludge

The sludge samples under study are composed of a high water content, which must be removed by dehydration to more adequately manipulate the sludge and significantly reduce its volume.In Figure 1 the percentage of moisture content in each of the samples taken is shown.In this figure it can be observed as the moisture content decreases in the sludge samples greatly, from the output of the filters until its final disposal.

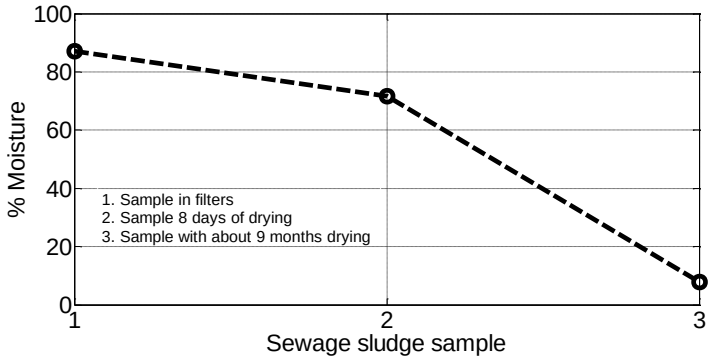

Figure 1. Percentage of moisture content in the sludge samples collected from the WWTP.

B. Total heavy metals in sewage sludge by FAAS

The results of the total heavy metals in sewage sludge for each of the three samples analyzed are presented in Figure 2 andTables 2, 3 and 4.

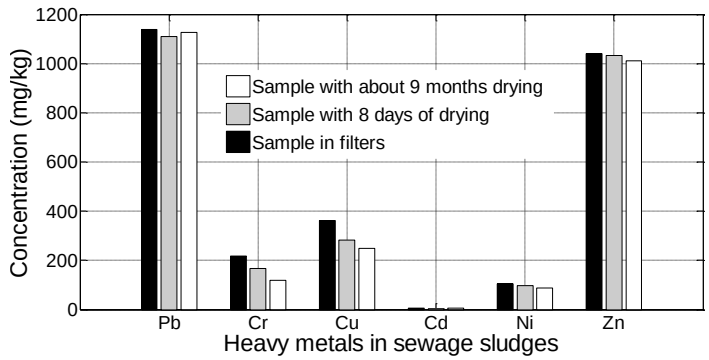

Figure 2. Average total concentration of heavy metals in the sludge samples.

Figure 2 shows that the metals with the highest concentrations in the three samples of sewage sludge are lead and zinc, however, this last element does not represent potential risk to health or the environment, unlike lead.
The data in the tables show that the concentrations of Cr, Cu, Cd, Ni and Zn are much lower than the minimum limits established in NOM-004-SEMARNAT-2002, which are considered excellent values, while the concentration of Pb is outside the maximum limit permitted by approximately 32-35%.

Table 2. Average total concentration of heavy metals in the sludge samples and its comparison with the NOM-004-SEMARNAT-2002: Sludge sample collected from the filters.

Metal	Sludge sample in filters	Excellent (mg/kg, dry basis)	Good (mg/kg, dry basis)
	Concentration (mg/kg, dry basis) Media ± S, n=3	NOM-004-SEMARNAT-2002	
Pb	**1139.37 ± 14.97**	300	840
Cr	218.27 ± 2.20	1200	3000
Cu	362.05 ± 8.76	1500	4300
Cd	4.81 ± 0.32	39	85
Ni	105.21 ± 3.81	420	420
Zn	1039.03 ± 13.72	2800	7500

S: Population standard deviation.
NOM-004-SEMARNAT-2002. Sludge and Biosolids: Specifications and maximum permissible contaminant limits for their use and final disposal.

Table 3. Average total concentration of heavy metals in the sludge sample and its comparison with the NOM-004-SEMARNAT-2002: Sludge sample with 8 days of drying.

Metal	Sludge sample 8 days of drying	Excellent (mg/kg, dry basis)	Good (mg/kg, dry basis)
	Concentration (mg/kg, dry basis) Media ± S, n=3	NOM-004-SEMARNAT-2002	
Pb	**1109.36 ± 35.48**	300	840
Cr	166.46 ± 5.88	1200	3000
Cu	282.68 ± 8.14	1500	4300
Cd	4.62 ± 0.26	39	85
Ni	94.57 ± 3.27	420	420
Zn	1033.15 ± 21.47	2800	7500

S: Population standard deviation.
NOM-004-SEMARNAT-2002. Sludge and Biosolids: Specifications and maximum permissible contaminant limits for their use and final disposal.

Table 4. Average total concentration of heavy metals in the sludge sample and its comparison with the NOM-004-SEMARNAT-2002: Sludge sample with about 9 months drying

Metal	Sludge sample with about 9 months drying	Excellent (mg/kg, dry basis)	Good (mg/kg, dry basis)
	Concentration (mg/kg, dry basis) Media ± S, n=3	NOM-004-SEMARNAT-2002	
Pb	**1126.38 ± 2.08**	300	840
Cr	119.79 ± 0.81	1200	3000
Cu	248.74 ± 2.02	1500	4300
Cd	4.88 ± 0.19	39	85
Ni	88.32 ± 10.29	420	420
Zn	1012.29 ± 11.74	2800	7500

S: Population standard deviation.
NOM-004-SEMARNAT-2002. Sludge and Biosolids: Specifications and maximum permissible contaminant limits for their use and final disposal.

Failure to comply with the specifications of the NOM-004-SEMARNAT-2002 regarding "Maximum permissible limits for heavy metals in biosolids," is set out in paragraph 4.3 of the same standard as thesesewage sludge cannot be used and based on the NOM-052-SEMARNAT-2005 (section 6) where procedures are established to determine whether a waste is hazardous, it is defined in Section 6.3.1 that sludge and biosolids are regulated by the NOM-004-SEMARNAT -2002. Therefore and in accordance with the provisions of the two Mexican Official Standards mentioned above, these sewage sludges are classified as hazardous waste.
Based on the results obtained in the above tables, it was decided to work only with a sludge sample to determine the bioavailability of lead, since the total of the heavy metals is very similar for each of the three samples. In this case, the sample of sludge selected was the sample 8 days of drying.

C.Bioavailability of lead (Pb)

The average concentrations of lead in the sample of sewage sludge and its distribution in the three fractions determined by the method of the BCR and the residual fraction are presented in Figure 3.This figure shows that the exchangeable and reducible fraction, which

are the most available in the sample, occupy about 24% of total lead in the sludge sample, while the oxidizable fraction occupies 31% of total and the residual fraction, which is the more stable and less available, occupies 45% of total lead.

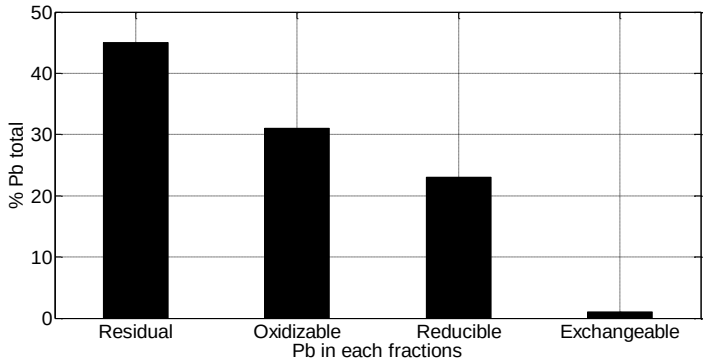

Figure 3. Percentage distribution of Pb in the three fractions extracted by sequential extraction method and the residual fraction.

IV. Conclusions

The total concentrations of Cd, Cr, Cu, Ni and Zn determined in the sewage sludge samples do not exceed the limits set by Mexican standards, specified in NOM-004-SEMARNAT-2002, while the Pb exceeds these limits by 33% approximately.It must be pointed out that excessive lead content in sewage sludge is due to the activities of pottery and ceramics that are developed as an important part of economic activity in the city of Dolores Hidalgo, México.

Lead concentrations in the fractions obtained by sequential extraction procedure shows that the highest values correspond to more stable chemical forms, such as the oxidizable fraction and the residual fraction, indicating a very low bioavailability of the metal.

Based on the results of lead in samples of sewage sludge and in accordance with the provisions of NOM-052-SEMARNAT-2005, it can be stated that the sewage sludge collected from the WWTP of the city of Dolores Hidalgo, are classified as hazardous waste, which limits its use and exploitation. Therefore, it is recommended to propose a technique for lead extraction of the sludge, in order to exploit their properties as biofertilizers in various crops.

Appendix

Table A. Operation conditions of the spectrometer used in the determination of total heavy metals in sewage sludge.

Metal	Wavelength (nm)	SLIT (nm)	Integration time (sec)
Pb	283.3	0.7	0.1
Cu	324.8	0.7	0.1
Cd	228.8	0.7	0.3
Ni	232	0.2	0.3
Zn	213.9	0.7	0.5
Cr	357.9	0.7	0.1

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The Role of Spermatheca in Ovarian Maturation of the Fiddler Crab, UCA TRIANGULARIS BENGALI (CRANE, 1975)

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Abstract- In Uca triangularis bengali, when mating occurs, the spermatophores get stored in the spermatheca which in turn induces the maturation of the ovary. The sperm plug prevents further mating and the spermatophores are released in batches. By the time the spermatheca is empty, the ovary reaches the advanced stage of maturation and mature eggs are released for fertilization.

Index Terms- Fertilization, Ovary, Spermatheca, Sperm plug, Triangularis Bengali

I. INTRODUCTION

Among the non-insectan arthropods , the reproduction of crustaceans has received maximum attention (Adiyodi and Adiyodi, 1974).Male members of the crustaceans do not possess an elaborate array of accessory sex glands. However, the vas deferens in many forms is highly specialized and compartmentalized for the production of spermataphore and mucous substance of the nature of gelatin (Spalding, 1942; Mathews ,1956; Berry and Heydon,1970; Malek and Bawab,1974). From this, it is evident that the vas deferens in the crustaceans serves the main function of the accessory sex glands of insects. However , Artemia salina (Wolfe,1971), Squilla oratoria (Komai ,1920) and Dolops ran arum (Fryer,1960) stand out significantly from other crustaceans by possessing accessory reproductive glands. A histological study of the development of the ovary and accessory organs of the blue crab, Callinectes sapidus was reported by Cronin,1942.

Unlike the males, the female crustaceans possess well developed accessory sex glands such as cement glands and sternal glands , secreting dense mucous substances for the agglutination of the eggs and their maintenance thereof (Yonge,1937).Deecaraman and Subramonium(1983) had demonstrated in Squilla holochista that the elaborated secretions composed of sulphated and non-sulphated acid mucopolysaccharide substances of the cement gland were used for the agglutination of the eggs and the maintenance of the embryos.

In female Paratelphusa hydrodromus, the spermathecal gland is considered to be the main accessory reproductive gland providing ideal fluid medium for the inseminated sperm survival(Anilkumar and Adiyodi,1977).The oviduct of some anamuran crustaceans ,viz.,Diogenes pugilator, Emerita asiatica had also been reported to secrete substances that dehisee the spermatophore(Mouchet ,1931; Bloch ,1935 ; Subramanian,1977).

Gallo (2012) has elaborated the storage of spermatophores in female spermatheca regulated by sinus gland extracts in Penaeus semisulcatus .Jensen (2012) has studied on the functional anatomy of the male reproductive system and female spermatheca in the snow crab,Chionocetes opilio.C .Jeyalectumie (1991)focused on the biochemistry of seminal secretions of the crab,Scylla serrata with reference to the sperm theca of the unmated female crabs which are poor in organic nutirents.B.S. Sant'Anna(2007) has worked on the histological and histochemical aspects of spermatheca of the mangrove crab Ucides codatus .C.Becker (2012) has studied about the two distinct regions of the spermatheca by function and storage in brachyura.J .Lu(2006) reported the structural changes of the oviduct of the shrimp, Macro brachiumfrom that of the wall of the spermatheca of the snow crab,Chinocetea opilio.

There is no much information on the histological and histochemical aspects of the ovary, sperm theca, oviduct ,vagina and sperm plug during maturation in crabs expect on the spermathecal activity and ovarian maturation in Scylla serrata and therefore, it has been presently attempted to investigate morphological, histological and histochemical aspects of ovary, sperm theca, oviduct, vagina and sperm plug of fiddler crab Uca triangularis bengali of Pulicat lake, Tamilnadu to fill up the lacunae.

II. MATERIAL AND METHODS

The live specimens of fiddler crab Uca triangularis bengali (Crane,1975)were collected from the Pulicat lake of Tamilnadu.The specimens were collected by hand picking and also by digging the mud below up to a depth of one meter with the help of a shovel. They were washed and cleaned of mud. Females alone were selected and the immature,mature-mated,and berried females were isolated.Further,the specimens were carefully examined for the presence or absence of mating plug in the vulval openings and then fixed in 1% neutral buffered formaldehyde, Later they were brought to the laboratory for various analyses. For studying the morphology, anatomy of reproductive system and spermatheca,crabs of different sizes (immature, mature-mated and berried) were dissected and the viscera was exposed, and examined under dissecting binocular microscope after sprinkling 1% neutral buffered formaldehyde(for hardening).Different stages of ovarian tissues, sperm theca, oviduct, vagina and sperm plug were carefully dissected out and transferred into different glass vials containing 1% neutral buffered formaldehyde and aqueous Bouin's fluid separately.

For the routine histological preparations, the tissues viz.(1) spermatheca (immature, mature-mated and berried stages), (2) ovaries (immature, mature-mated and berried) stages, (3) oviducts, (4) vagina and (5) mated specimens' sperm plug were fixed in 1% neutral buffered formaldehyde and Bouin's fluig independently.

III. RESULTS

The ovaries in Uca triangularis bengali are paired and 'H' shaped. They occupy the anterio-lateral regions beneath the carapace and asymmetrical in nature in which the right limb is longer the left. Both the limbs are connected by the ovarian bridge. They are situated above the alimentary canal and intermingled with the hepatopancreas. They contain many ovarian lobes which are uneven in shape particularly in mature stages. The ovaries exhibit different colours depending upon the stage of maturation The ovaries are classified into the following four maturity stages(I, II, III and IV) depending upon the colour, nature and size of oocytes.

The spermatheca is an enlarged appendix of the oviduct and varies much in size and condition depending on the degree of reproductive status of the individual.

In Uca triangularis bengali, the spermatheca is enlarged on the right oviduct, whereas the spermatheca on the left oviduct is reduced considerably. Interestingly, the sperm plug is always found only on the right vulval opening. This obviously indicates the deposition of sperms in the right vulval opening and their consequent storage in the right spermatheca of the oviduct. In the present investigation, the spermatheca of female is morphologically categorized into (I) immature spermatheca as the stage-I spermatheca , (II) mated spermatheca as the stage-II spermatheca and spent spermatheca as the stage-III spermatheca. Oviduct and vagina are not observable in any one of the ovarian and spermathecal stages but seen distinctly only on the histological analysis.

The sperm plug is distinctly visible only in the recently mated females on the inner margin of the right vulval (genital) opening of the sixth thoracic segment, whereas in the left genital opening it is absent. This indicates that during mating spermatophores are deposited only in the right vulval opening. Further it is also proved by the presence of bulged right spermatheca, and the normal (not bulged) left spermatheca. The shape of the sperm plug resembles the stopper of a reagent bottle.

In Uca triangularis bengali while the ovary exhibited four stages of development in a progressive manner, the spermatheca did not show a synchronized development. The ovary, over a phase of time elaborates oocytes ,accumulates ooplasmic contents and empties them (spent stage) by the time the female becomes berried. On the other hand the spermatheca is merely a pouch and combines its own secretions with the sperm received during mating. Therefore, the sperm theca does not show a phase of development over a period of time as exhibited by the ovary but only represents three phases ,viz.,(I) ready receptacle, (II) full receptacle of sperm and (III) an emptied receptacle. However, the onset of maturation of ovary is triggered by the deposition of spermatophores during mating, which are stored in the spermatheca.

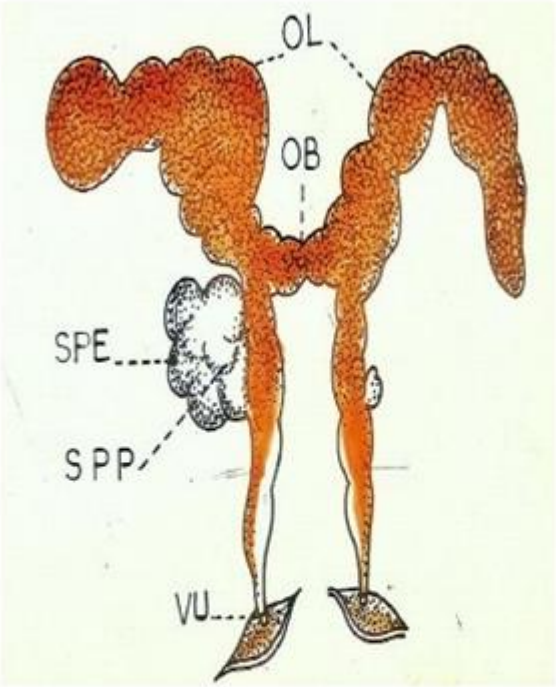
In Uca triangularis bengali , the order of events in the ovary and in the spermatheca can be described as follows. When the ovary is immature ,the spermatheca is a small pouch with thick muscular and epithelial layer, ready to receive the spermatophores. When mating occurs, the spermatophores are received and stored in the spermatheca and the latter becomes enlarged. At this stage, the sperm plug ensures maturation of ovary and also prevents further mating. Now the sperms are liberated in batches from the spermatophores, from the spermathecal pouches, by the spermathecal secretions and by the time the sperm theca becomes fairly empty, the ovary attains advanced stage of maturation. At this time, the matured oocytes are liberated from the ovary and they are fertilized by the sperms, when they reach the junction of the opening of spermatheca into oviduct. Thus, the fertilized eggs, find their way exterior facilitated by the disintegration of sperm plug. Now ,the eggs are deposited on the ventral surface and at this stage, the females are called 'berried females'.

It is evident that in Uca triangularis bengali the role of spermatheca is associated with the reception, retention and release of sperms during the process of maturation of the ovary. In other words when the ovary exhibit's a process of development in terms of cellular differentiation, the spermatheca does not show any characteristic cellular differentiation but remains only as a mere receptacle.

As the maturation of the oocyte is in progress, histological investigations have revealed significant changes in the oviduct. Initially , the oviduct is inconspicuous but as maturation progresses, the oviduct becomes distinct and forms a clear duct with a thick outer cuticular layer and an inner chitinous layer staining deep blue and red respectively with Mallory. Now, the oviduct is ready for the mobilization of unfertilized ova. Along with the oviduct, the vagina becomes conspicuous. Histological studies also reveal the process of fertilization in the vagina.

The role of sperm plug needs some special mention. Its presence on the vaginal orifice indicates that the female has undergone mating. Non-mated females are conspicuous by the absence of sperm plug. The sperm plug is a device to retain the spermatophores in the spermatheca so as to ensure complete fertilization of the ova. Microscopic observations reveal that the sperm plug is a bilayered structure and peg in shape.

In the present investigation ,it is interesting to note that in Uca triangularis bengali the spermathecal secretion is glycolipoprotein complex as evidenced by its heterogeneous composition of proteins, carbohydrates and lipids associated with tyrosine and ss-sh reactive sites.



OL - Ovarian Lobe; OB - Ovarian Bridge;
Stage II
SPE - Spermatheca; SPP - Spermathecal pouches
VU - Vulva
Figure 1. Female Reproductive System of Uca Traiangularis bengali

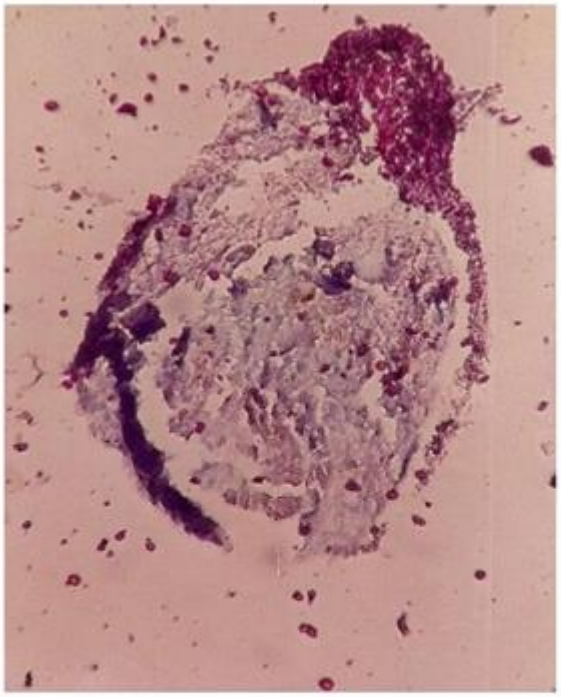


Figure 2. Longitudinal Section of Spermatheca

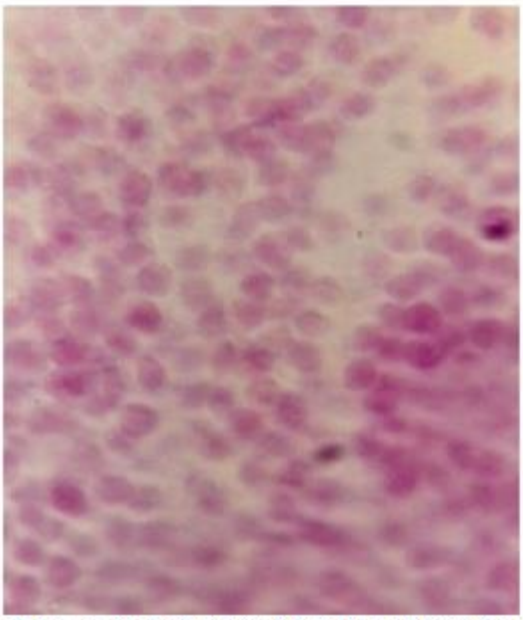
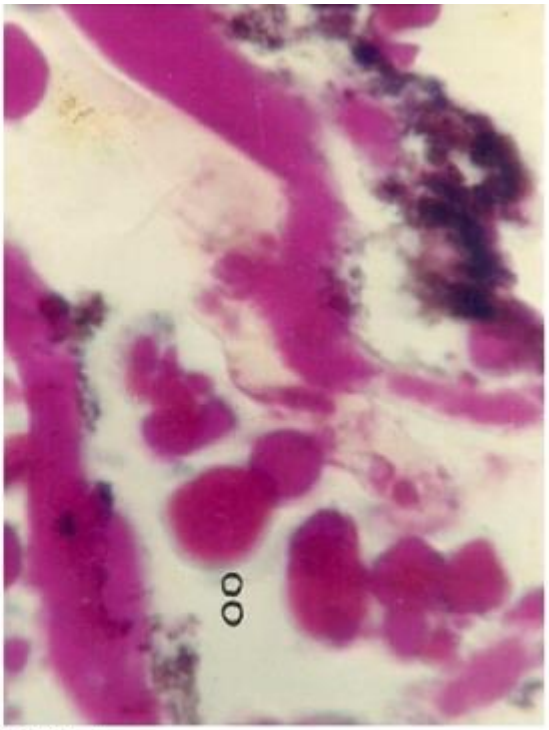


Figure. 3. Non-flagellated free sperms found in the

FOO - Fertilized oocytes; S – Sperm
Figure.4.Proximal region of Vagina showing Fertilization

CH-Chitin; CU-Cuticle
Figure 5. The Oviduct of Uca Triangular bengali



OO - Oocytes
Figure 6. The loading of oocytes in the lumens of the oviduct.

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Agro-botanical Characterization of some released F1 hybrids in rice (*Oryza sativa* L.)

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Abstract- Success and sustenance of hybrid rice technology solely depends on the exploitation of heterosis in F_1 generation. A study was conducted to find out the performance of released F_1 rice hybrids (developed by both public and private sector) comparing with hybrid check KRH 2 and HYV check Satabdi (IET 4786) on the basis of different agrobotanical traits. The hybrid 'DRH 775' was revealed as an early maturing hybrid variety, while 'HKRH 1' was a late maturing hybrid. The number of panicle per plant ranged from 11.67 to 22. The hybrid 'Indira Sona' was exhibited highest panicle per plant and least was found in 'Sahyadri'. All rice hybrids included in trial were performed better yield than high yielding check Satabdi. Highest yield was produced by 'Indira Sona' (7.37 t/ha) followed by 'Sahyadri 2' (7.23 t/ha), 'CORH 2' (7.20 t/ha), 'HKRH 1'(7.10 t/ha) and 'Sahyadri 3' (7.00 t/ha) respectively with the mean yield of 6.28 t/ha. The high yielding check Satabdi and hybrid check KRH 2 were produced 4.27 t/ha and 6.33 t/ha respectively. High positive correlations were observed between yield and yield attributing traits. The results clearly evinced that hybrid rice technology could offer a pivotal role in augment the rice productivity.

Index Terms- Correlation, Genetic variability, Hybrid rice and Yield.

I. Introduction

Rice is a universal food, feeding more than half of the world's population every day. Rice provides 20 percent of the world's dietary energy supply, while wheat supplies 19 percent and maize 5 percent (FAO, International year of rice, 2004). In Asia, it has a special significance, where about 90% of the rice is produced and consumed as a staple food. In concern over the growing population in India, it needs to increase the productivity of rice (Sidharthan *et al*. 2007). During last two decades, rice yield growth has reached a plateau and no significant increase is being realized in productivity levels. There is no further scope of horizontal expansion of rice production. Hybrid rice offers a wide opportunity to augment rice productivity in India. Hybrid rice has the potential to increase yields by 15% to 20% over those of conventionally bred varieties (Virmani, 1994). Chinese rice scientists developed rice hybrids utilizing cytoplasmic male sterile (CMS) system which boosted up the yield by about 20 percent over semi dwarf rice varieties (Yuan, 1977 and Yuan *et al.*, 1989).

The Government of India has launched a special programme of 'Bringing Green Revolution in Eastern India (BGREI)' - a sub scheme of Rashtriya Krishi Vikas Yojana (RKVY) from the year 2010-11 in the eastern states with an objective to increase the productivity of rice based cropping system. In theses seven states comprises of Assam, Bihar, Chhattisgarh, Jharkhand, Odisha, Uttar Pradesh (East) and West Bengal. Under this programme, increase of area for hybrid rice cultivation is one of the key component. The Govt. of India (GOI) announced in February 2012 that BGREI resulted in a robust increased in foodgrain production. Rice production from the included area under programme was estimated at 562.6 lakh tones with an increase of 19.8 % over the last year. The increase across the country was estimated at 7% (Source: www.gktoday.in/bgrei/).

II. Materials and Methods

The experiment was carried out at Rice Research Station (Govt. of West Bengal), Chinsurah, West Bengal during Kharif 2012. The study was included twenty (20) released F_1 hybrids in rice developed by both public and private sector. Evaluations of hybrids were done along with two check varieties, one high yielding variety Satabdi (IET 4786) and another check was hybrid variety KRH 2.

Table.1 : Details about the twenty released rice hybrids.

Sr. No.	Hybrid Variety	Developed by	Year of released
1	DRRH2	Directorate of Rice Research (DRR), Hyderabad, India	2005
2	DRRH3	Directorate of Rice Research (DRR), Hyderabad, India	2009
3	Sahyadri	Regional Agricultural Research Station, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Karjat, Maharashtra	1998
4	Sahyadri 2	Regional Agricultural Research Station, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Karjat, Maharashtra	2005
5	Sahyadri 3	Regional Agricultural Research Station, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Karjat, Maharashtra	2005
6	Sahyadri 4	Regional Agricultural Research Station, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Karjat, Maharashtra	2008
7	PA 6129	Bayer Bio-Science, Hyderabad, India	2007
8	PA 6444	Bayer Bio-Science, Hyderabad, India	2001
9	PSD 1	Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand	1997
10	PSD 3	Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand	2004
11	US 312	Seed Works International Pvt Ltd, Hyderabad	2010
12	CORH 2	Tamil Nadu Agricultural University, Coimbatore	1999
13	Pusa RH10	Indian Agricultural Research Institute (IARI), New Delhi	2001
14	Indira Sona (IRH 5)	Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh	2007
15	GK5003	Ganga Kaveri Seeds Private Limited, Hyderabad, Andhra Pradesh	2008
16	Suruchi	Mahyco Ltd. , Maharashtra	2004
Sr. No.	**Hybrid Variety**	**Developed by**	**Year of released**
17	HKRH 1	Regional Research Station , Chaudhary Charan Singh Haryana Agricultural University,Karnal, Haryana	2006
18	DRH775	Metahelix Life Sciences *Limited*, Bangalore	2009
19	NSD 2	Narendra Deva University of Agricultre and Technology (*NDUAT*), Faizabad ,Uttar Pradesh	1998
20	CRHR 5	Central Rice Research Institute (CRRI), Cuttack, India	2005
Check 1	Shatabdi	Central Rice Research Institute, Cuttack (1977) *Identified at* Rice Research Station, Chinsurah, W.B	2000 (SVRC,W.B)
Check 2	KRH 2	Vishweshwaraiah Canal (V.C) Farm. University of Agricultural Science, Mandy, Karnataka, India	1996

Twenty released rice hybrids along with two check varieties (Table - 1) were analyzed in a randomized Block Design with three replications. Each replication consisted of twenty two blocks. Each block was 15sqm in size. Twenty five days old seedlings raised in nursery were transplanted at 20 cm x 15 cm. Normal recommended cultural practices and protections measured were followed. Five representative plants for each hybrid in each replication were randomly selected to record observations on the quantitative characters under study.

Observations were recorded for quantitative characters on –

Days to 50% flowering : Days to heading of each genotype was determined when 50% plants of an entry have shown ear emergence starting from the date of sowing and days to maturity of each genotypes was determined at the maturity stage when 50% plants of an entry have matured starting from the date of sowing.

Plant height : Plant height was measured in cm from the plant base to the tip of panicle.

Number of panicle per plant : Productive tillers of each plant were counted to determine the total number of panicles in each plant.

Panicle length : The panicle length of the central tiller of the each plant was measured in cm.

Grains per panicle : Seeds per panicle of main tiller of each plant was counted separately after harvesting.

1000 seed weight : The 1000 seed weight of each genotype was measured by weighting 1000 filled grains after harvesting.

Yield per plant : The whole plant yield of each genotype was measured in grams after harvesting of each genotype.

Plot yield per : Plot yield of each hybrid was taken by the total yield of a plot after threshing.

III. Results and Discussion

Assessment of mean performance of hybrid varieties for various agrobotanical traits.

The data pertaining to the mean performance of F_1 rice hybrids for various quantitative characters is presented in table – 2. Days to 50% flowering ranged from 80.67 days to 111.33 days with the mean of 100.37 days. The hybrid 'DRH 775' was noted to be early maturing hybrid variety, while 'HKRH 1' was a late maturing hybrid. Early maturing hybrids are desirable as they produce more yield per day and fit well in multiple cropping systems (Neelam *et al*,.2009). Highest plant height was observed in 'PA 6444' (127 cm) and lowest in 'US 312' (102 cm). Among the hybrids investigated, the number of panicle per plant ranged from 11.67 to 22. The hybrid 'Indira Sona' was exhibited highest panicle per plant and least was found in 'Sahyadri' while check KRH 2 and Satabdi exhibited 14 and 13 respectively. Hybrids are generally characterized by having longer panicles indicating their efficiency in partitioning of assimilates to reproductive parts (Neelam *et al*,.2009).The trait panicle length was varied from 23.33 (in US 312) to 32.20 (in Sahyari 3). Filled grain per panicle was exhibited highest in 'CORH 2'(203.67) and lowest in 'PSD 3' (118.00). Hybrid 'HKRH 1' was exhibited highest 1000 seed weight (25.97 gm), while 'DRRH 3' and 'PSD 1' both were exhibited lowest (19.33 gm) along with mean 22.62 gm.

All rice hybrids included in trial were performed better yield than high yielding check Satabdi. Higher yield of hybrids resulted from their increased spikelet number and to some extent increased grain weight, which enhanced the sink capacity (Ponnuthurai *et al*., 1984). Peng *et al*. (2003) reported that the average yield of F_1 hybrid rice was 17% higher than that of indica inbreds. Yield per plant was recorded highest in 'CORH 2' (49.47 gm) and lowest in 'DRH 775' (25.6 gm). Plot yield was transformed into yield ton per hectare. Highest yield was produced by 'Indira Sona' (7.37 t/ha) followed by 'Sahyadri 2' (7.23 t/ha), 'CORH 2' (7.20 t/ha), 'HKRH 1'(7.10 t/ha) and 'Sahyadri 3' (7.00 t/ha) respectively with the mean yield of 6.28 t/ha. The high yielding check Satabdi and hybrid check KRH 2 were produced 4.27 t/ha and 6.33 t/ha respectively.

Assessment of Genetic Variability

Analysis of variance (ANOVA) of all eight (8) characters exhibited in the table- 3. The calculated values of F ratio for all the replications of eight characters are lesser than the tabular value at 1% level of significance with degree of freedom 2. Hence, the differences within replications are not significant. The calculated values of F ratio for treatments (varieties) with respect to eight characters are much greater than the tabular value of F at 1% level of significance with degree of freedom 19. Analysis of variance reveals that varietal differences are signified and wide variability present among the genotypes with respect to all the characters.

Analysis of Genetic Components

The estimation of genetic parameters like genotypic coefficient of variation, heritability and genetic advance are presented in table –3. Both genotypic and phenotypic variation recorded maximum for the character of yield per plant. Low PCV & GCV estimates for days to 50% flowering and panicle length have been reported by Shinha *et al.* (2004) and Patil *et al.* (2003). The phenotypic coefficient of variation (PCV) was greater than genotypic coefficient of variation (GCV) in all included characters. It was also indicated close resemble between the corresponding estimation of PCV and GCV in almost all characters, concluded that the characters were least affected by the environment factors in their expression. Similar findings were earlier reported by Singh and Chakraborty (1996), Devi *et al.* (2006).

High heritability percentage was observed in almost all characters. Highest heritability percentage was recorded 99.04 % for the character 1000 seed-weight, followed by days to 50% flowering (98.04 %), yield per plant (92.51 %) and grain per panicle (84.33 %) respectively. High heritability percentage were also reported by Shivani and Reddy (2000), Devi *et al.* (2006) and Yadav *et al*. (2008).

Correlation Analysis among pairs of the quantitative characters

The phenotypic and genotypic correlations among the traits are presented in table- 4. The phenotypic and genotypic correlations were closely agreed for the most of characters, where as in some cases the difference was higher that signified the role of environmental effects in estimating these characters. Highest strong positive significant correlation was observed in between yield/plant and yield (t/ha) at both genotypic and phenotypic level [r = 0.935 (at genotypic level), 0.915 (at phenotypic level)] respectively followed by in between no. of panicle/plant and yield/plant [r = 0.839 (at genotypic level), 0.774 (at phenotypic level)] respectively, no. of panicle/plant and yield (t/ha) [r = 0.727(at genotypic level), 0.698 (at phenotypic level)] respectively. Grain yield has been reported to be influenced by the number of grains per panicle and 1000 grain weight (Yang, 1986), number of grains per panicle (Ram, 1992), plant height and tiller number (Kumar, 1992).

Panicle length and filled grain per panicle were correlated positively and significantly at both genotypic and phenotypic level [r = 0.623(at genotypic level), 0.686 (at phenotypic level) respectively]. Positive significant correlation also present in between filled grain per panicle and yield per plant [r = 0.668 (at genotypic level), 0.664 (at phenotypic level)] respectively. Bhadru *et al*., (2011) with study on 93 rice genotypes involving hybrids and their parental lines reported that plant height, filled grains per panicle, days to 50 percent flowering and panicle weight had a significant positive association with yield. Gulzar *et al.,* (2012) demonstrated that grain per panicle had maximum positive effect and highly significant genotypic correlation coefficient with grain yield. Ravindra Babu *et al*., 2012 evinced that productive tillers per plant possessed positive association with yield.

Negative correlation also present in between no. of panicle/ plant and panicle length [r = - 0.459(at genotypic level), -0.422(at phenotypic level)] respectively. Non significant and negligible associations were also present in some characters like days to 50% flowering, plant height etc.

IV. Conclusion

These results clearly indicate that hybrid rice technology is one of the most feasible and promising technology to augment the rice productivity. Highest yield was produced by 'Indira Sona' (7.37 t/ha) followed by 'Sahyadri 2' (7.23 t/ha), 'CORH 2' (7.20 t/ha), 'HKRH 1'(7.10 t/ha) and 'Sahyadri 3' (7.00 t/ha) respectively. 'DRH 775' was noted to be early maturing (108 days) hybrid variety. The increased yield efficiency of hybrid rice can revolutionize in global agrarian economic scenario.

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Table - 2 : Mean values of hybrid varieties for various agrobotanical traits.

Sr. No.	Hybrid Variety	Days to 50% Flowering	Plant Height (cm)	No. of Panicle/ Plant	Panicle Length	Filled grain per Panicle	1000 SW	Yield / Plant	Yield (t/ha)
1	DRRH2	107.67	108.00	14.00	25.73	181.33	23.17	30.27	5.70
2	DRRH3	109.33	113.67	12.33	23.47	159.33	19.33	27.30	6.19
3	Sahyadri	100.33	115.00	11.67	28.73	143.33	24.57	29.07	5.87
4	Sahyadri2	94.00	106.00	20.33	30.17	176.00	22.37	42.13	7.23
5	Sahyadri3	103.67	121.33	15.33	32.20	180.00	23.37	38.07	7.00
6	Sahyadri4	92.00	107.67	12.33	23.20	124.67	21.47	26.50	6.13
7	PA 6129	91.33	114.33	14.33	26.70	146.33	21.53	32.20	6.27
8	PA 6444	103.00	127.00	12.00	26.57	151.33	23.33	27.20	6.00
9	PSD 1	97.00	106.33	12.33	25.50	123.33	19.33	26.30	5.63
10	PSD 3	103.33	113.67	15.33	28.70	118.00	23.93	26.73	5.80
11	US 312	100.67	102.00	15.33	23.33	141.33	22.13	26.47	5.33
12	CORH2	101.33	111.33	20.33	29.47	203.67	20.30	49.47	7.20
13	Pusa RH10	104.00	113.00	16.00	31.40	149.33	23.40	31.07	6.30
14	Ind. Sona	99.33	112.00	22.00	30.03	165.67	25.53	45.17	7.37
15	GK5003	101.33	116.00	16.67	27.47	168.67	20.20	40.27	6.97
16	Suruchi	108.33	104.67	14.00	25.50	142.33	19.97	26.47	5.43
17	HKRH 1	111.33	122.67	17.33	25.37	131.67	25.97	40.57	7.10
18	DRH775	80.67	104.67	15.67	24.80	153.67	25.17	25.60	5.57
19	NSD 2	97.67	114.00	16.33	26.10	144.33	24.47	25.83	5.77
20	CRHR 5	101.00	124.33	17.33	27.80	151.67	22.77	37.23	6.83
	MEAN	**100.37**	**112.88**	**15.55**	**27.11**	**152.80**	**22.62**	**32.70**	**6.28**
Check	Shatabdi	90.33	83.67	13.00	22.57	149.00	17.77	24.13	4.27
Check	KRH 2	99.00	108.00	14.00	26.33	157.33	22.70	34.57	6.33
	SE(1%)	**0.578**	**1.857**	**1.016**	**0.840**	**5.232**	**0.116**	**1.214**	**0.166**

Table - 3 : Analysis of Variance (ANOVA) and comparative study of Critical Difference (CD),Coefficient of Variance (CV), Genetic Coefficient of Variance (GCV), Phenotypic Coefficient of Variance (PCV), Heritability % (H%) and Genetic Advance (GA), Genotypic Variance (σ^2g), Phenotypic Variance (σ^2p) and Environmental Variance (σ^2e) of different agrobotanical traits

Characters	MEAN SUM OF SQUARE			CD		CV	GCV	PCV	H %	GA	σ^2g	σ^2p	σ^2e
	Replication (2)	Variety (19)	Error (38)	at 1%	at 5%								
Days to 50% Flowering	0.617	151.51**	1.01	2.248	1.669	0.998	7.057	7.127	98.04	14.30	50.17	51.17	1.00
Plant Height	44.01	144.36**	10.35	7.224	5.364	2.850	5.921	6.571	81.19	12.41	44.67	55.02	10.35
No. of Panicle/ Plant	3.15	25.41**	3.09	3.952	2.934	11.318	17.539	20.874	70.60	4.73	7.44	10.54	3.10
Panicle Length	4.03	21.04**	2.12	3.266	2.425	5.365	9.265	10.706	74.89	4.47	6.31	8.43	2.12
Filled grain per Panicle	299.55	1408.01**	82.11	20.346	15.108	5.930	13.759	14.982	84.33	39.77	441.97	524.08	82.11
1000 SW	0.05	12.59**	0.04	0.452	0.336	0.891	9.047	9.091	99.04	4.20	4.19	4.23	0.04
Yield / Plant	2.02	168.27**	4.42	4.723	3.507	6.433	22.604	23.501	92.51	14.64	54.62	59.04	4.42
Yield (t/ha)	0.068	1.351**	0.082	0.646	0.479	4.575	10.345	11.311	83.64	1.20	0.42	0.51	0.08

*significant at 5% probability level, **significant at 1% probability level

Table - 4: Correlation Analysis among pairs of the agrobotanical traits

	Days to 50% Flowering	Plant Height	No. of Panicle/ Plant	Panicle Length	Filled grain per Panicle	1000 SW	Yield / Plant	Yield (t/ha)
Days to 50% Flowering	1.000							
Plant Height	G 0.377 P 0.348	1.000						
No. of Panicle/ Plant	G -0.070 P -0.073	G -0.019 P -0.229	1.000					
Panicle Length	G 0.097 P 0.066	G 0.351 P 0.221	G -0.459* P -0.422	1.000				
Filled grain per Panicle	G 0.081 P 0.065	G 0.067 P 0.111	G 0.129 P 0.153	G 0.623** P 0.686**	1.000			
1000 SW	G -0.106 P -0.108	G 0.307 P 0.279	G 0.287 P 0.257	G 0.271 P 0.261	G -0.119 P -0.094	1.000		
Yield / Plant	G 0.141 P 0.128	G 0.269 P 0.244	G 0.839** P 0.774**	G 0.598** P 0.558*	G 0.668** P 0.644**	G 0.469* P 0.483*	1.000	

Yield (t/ha)	G	0.126	G	0.416	G	0.727**										
	P	0.109	P	0.374	P	0.698**	G	0.610**	G	0.539*	G	0.114	G	0.935**		
							P	0.598**	P	0.511*	P	0.128	P	0.915**		1.000

*significant at 5% probability level, **significant at 1% probability level, P=Phenotypic correlation coefficient, G= Genotypic correlation coefficient.

Laboratory Evaluation of Fipronil on Biological, Parameters, Gut Microflora and Physiology of Eudrilus Eugeniae

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Abstract- Earthworms are economically important organisms and play key role in environmental management. Vermiculture is entirely natural process which maintains the environmental balance. In the present studies an attempt was made to observe the effect of soil mixed insecticide, viz. Fipronil on biological parameters, reproductive physiology of and total count of gut microflora of *Eudrilus eugeniae* and the ability of these micrflora to produce enzymes. It was observed that in Fipronil treated soil the earthworm population was reduced and its growth and reproductive potential was adversely affected. The number of cocoons and juveniles formed was decreased in Fipronil treated soil than in control. In addition to that carbon and phosphorus content of the treated soil is significantly reduced as compared to the control. In case of earthworms from treated soil there was reduction in total viable count of gut microflora as well as enzyme production ability of microflora as compared to that in control.

Index Terms- Fipronil, gut microflora of earthworm, soil fertility

I. Introduction

In order to get maximum crop yield there is a need to protect the crop from insect pests. Farmers are applying several kinds of insecticides to get rid of pests. Tons of synthetic pesticides are applied annually to crops worldwide. Whereas pesticides are used for precise purposes, to eliminate weeds, kill fungus, and eradicate insects all of which can damage crops chemicals can move off site and create non-target impacts. A small share of pesticides applied on a given field or in a given area actually reaches the intended target. It is estimated that less than 0.1 per cent of the pesticides applied to crops reach the target pests[1]. Thus, more than 99 per cent of applied pesticides have the potential to impact non-target organisms and become widely dispersed in the environment as potential contaminants. These uncontrolled and continuous malpractices result in the accumulation of insecticides in the soil. Consequently the quality and fertility of the soil is reduced due to reduction in the essential microflora and fauna and soil dwelling animals like earthworms. The later are animals which are the most essential to build the soil to support the vegetation. They benefit soil quality by shading residues and improving soil fertility. Earthworms are part of a host of organisms that decompose organic matter in the soil. As earthworms digest the microorganisms in soil and organic matter, the form of nutrients is changed as materials pass through the earthworm's gut. Thus, worm casts are richer in nutrients than the surrounding soil and containing nutrients changed into forms that are more available to plants. It was found that in a sample of soil with 4% organic matter worm casts contained 246 pounds of N per 1000 square feet while the surrounding soil contained 161 pounds of N per 1000 square feet[2]

Insecticides are proved to be toxic to earthworms by various workers[3,4]. They have been used to assess impact of soil pollution[5,6,7,8]. The laboratory toxicity of insecticides on various species of earthworms have been investigated[9,10,11,12]

Fipronil is a broad spectrum phenyl pyrazol insecticide toxic by both contact and ingestion in insects. It is neurotoxic, contact poison. It is used as pesticide to control horticultural and pests on agricultural products. Chemically the Fipronil is 5-amino-1-[2,6-dichloro-4-(trifluoromethyl) phenyl]-4- (trifluoromethylsulfinyl)-1H-pyrazole-3-carbonitrile. Fipronil was 1st registered for use by the U. S. Environmental Protection Agency in May 1996. Currently, 49 registered products contain Fipronil as an active ingredient. It is used to control ants, cockroaches, termites, weevils, beetles, flea, ticks and other insects[13]. It is used in granular turf products, seed treatments, topical pet care products, gel baits, liquid termicides and in agriculture.

Earthworms effectively harness the beneficial soil microflora, destroy soil pathogens and convert organic wastes into enzymes, antibiotics, growth hormone and protein rich casts. Earthworm bioreactors have an in-house supply of enzymes such as amylase, cellulose, nitrate reductase and alkaline phosphtases. The digestive enzymes of earthworm are responsible for the decomposition and humidification of organic matter. The compost thus formed has high economic value as soil conditioner for plant growth.

In the present work an attempt was made to study effect of soil mixed insecticide, Fipronil on exotic species of earthworm viz. *Eudrilus eugeniae* and on the soil properties with respect to pH, carbon, phosphorus, potash content under laboratory conditions. Also observations on gut microflora and assay of gut enzymes of *E. eugeniae* in Fipronil treated and control samples were made.

II. Materials and Methods

1. **Preparation of mother culture:**

A container with an outlet at the bottom to drain excess of water is used to prepare mother culture. A polythene paper was spread at the base of the box on which 3 inch layer of soil was spread. Above the soil layer 1 inch layer of vermiculture bed was prepared by mixing 1/3rd of soil with 2/3rd of organic matter such as kitchen wastes. Above vermiculture bed 1 inch layer of soil was made. This was followed by1 inch layer of cow dung. Top most 3 inch layer was of dried leaves, roots, stems and grass. Water was sprinkled to maintain the moisture. Top of the box was covered by wet Jute cloth.

2. Experimental sets:

a) To study the effect of Fipronil on biological parameters of earthworm, *Eudrilus eugeniae:* Earthworm cocoons were isolated, maintained in separate containers and observed for hatchings. The juveniles of the same age were collected for experimental purpose. Soil is mixed with Fipronil to make different concentrations. Vermiculture beds were prepared using Fipronil mixed soil. Three replicates of each concentration were prepared. Ten earthworms were released in each replicate. Untreated soil was used to make controls. Observations were made on mortality of juveniles after 24hr. of treatment. Dose response was calculated by regression analysis.

A dose of LC_{20} (20.7mg Fipronil/Kg. of soil) was used to determine the effect of Fipronil on biological parameters such as growth, development and reproductive potential of *E. eugeniae.*

Effect on soil properties: Analysis of control and treated soil for pH, Phosphorus and potash content was done.

b) To study effect of Fipronil on gut microflora of *E. eugeniae*: Earthworms from control and Fipronil treated soils were dissected under aseptic conditions. Guts were collected in the sterile homogenizer and homogenized them in the saline. Serial dilutions were made and used to streak the plate on the sterile nutrient agar plate.

c) To study effect of Fipronil on gut enzymes of *E. eugeniae*:

Cellulase assay: Plates of Czapex dox agar plates were prepared with 1% cellulose and streaked with the culture suspension. They were incubated at room temperature for 24 hours. Plates with growth of microorganisms were taken for assay. They were inoculated with one colony in different flask with 100ml sterile cellulose broth and incubated on rotary shaker for 4days at room temperature at 100rpm.After 4days of incubtion broth was taken in microfuge tubes and spin for 5min at room temperature. Supernatant was collected as a test sample and cellulase content was estimated using DNSA reagent at 530nm absorbance using colorimeter.

Same procedure as that for cellulase assay was repeated except the media used that is 1% starch agar plates were streaked for amylase assay, 1%sucrose agar plates were streaked for invertase assay and 1% pectin was used for pectinase assay.

III. Results

LC values calculated by regression analysis were $LC_{20,}$ 20.7mg Fipronil/Kg. of soil and LC_{40} 33 mg Fipronil/Kg. of soil (Fig. 1)

Effect of Fipronil on biological parameters of *Eudrilus eugeniae*:

In *Eudrilus eugeniae*, it was observed that the cocoon formation was reduced to **7.**6±0.3 in Fipronil treated soil as compared to that in control (12±0.3) on 90th day (Table 1). Further it was found that the number of juveniles developed was less (4±1.3) in experimental sets as compared to that in control sets (10±0) on 90th day (Table 1).

Effect of Fipronil mixed vermiculture bed with *Eudrilus eugeniae* on Soil properties: It was observed that in Fipronil treated vermiculture bed there was reduction in pH, carbon, phosphorus and potash content of the soil than that of control.Also, under laboratory conditions pH, phosphorus and potash content of the soil in control is more than the normal poeta soil (Table 2)

Effect of Fipronil on Gut Microflora of *E. eugeniae* :

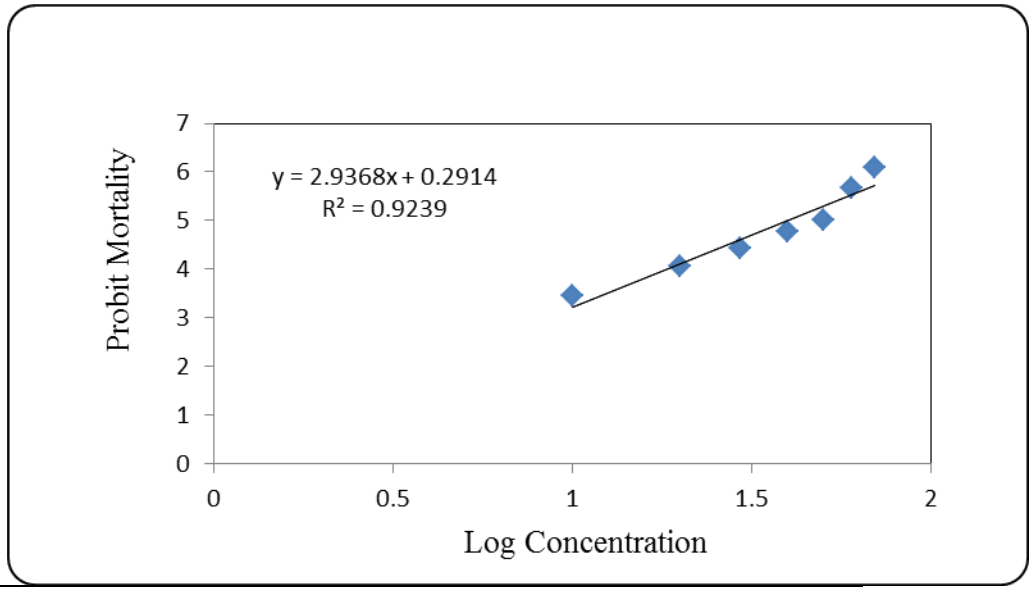
a) On the basis of morphological and biochemical characters colonies identified were:

1) Nocardia	2) Cellulomonas	3) *E. coli*
4) Bacillus	5) *Citrobacter frundii*	6) Enterobacter

b) Effect of Fipronil on total gut microflora of *E. eugeniae*: It was observed that the total count of the gut microflora of *E. eugeniae* was decreased with the days after treatment with Fipronil (Fig.2)

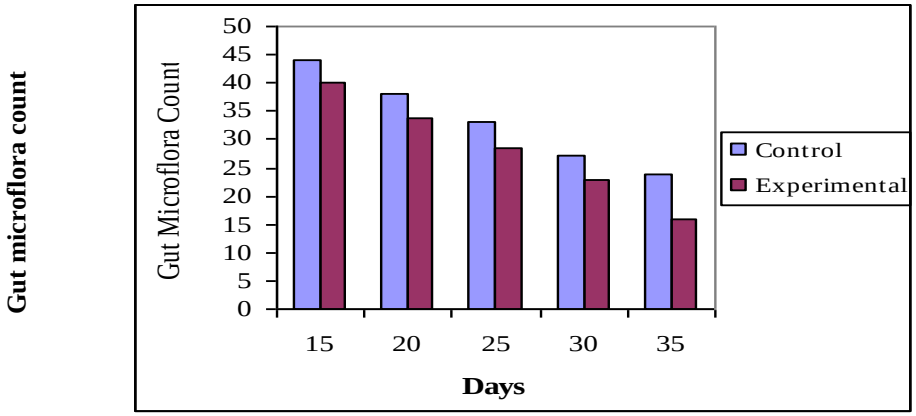
c) Assays of the enzymes amylase, cellulase, invertase and pectinase from the gut microflora of *E. eugeniae* revealed that their production was reduced in the Fipronil mixed with soil as compared to that of control (Fig. 3, 4, 5, 6).

Fig. 1



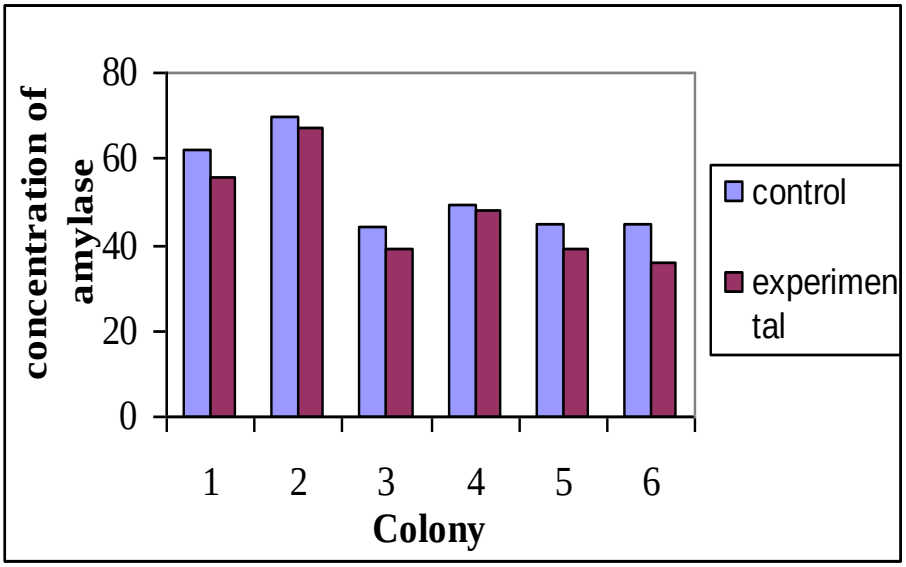
Dose response for Fipronil on mortality of *E. eugeniea*

Fig. 2



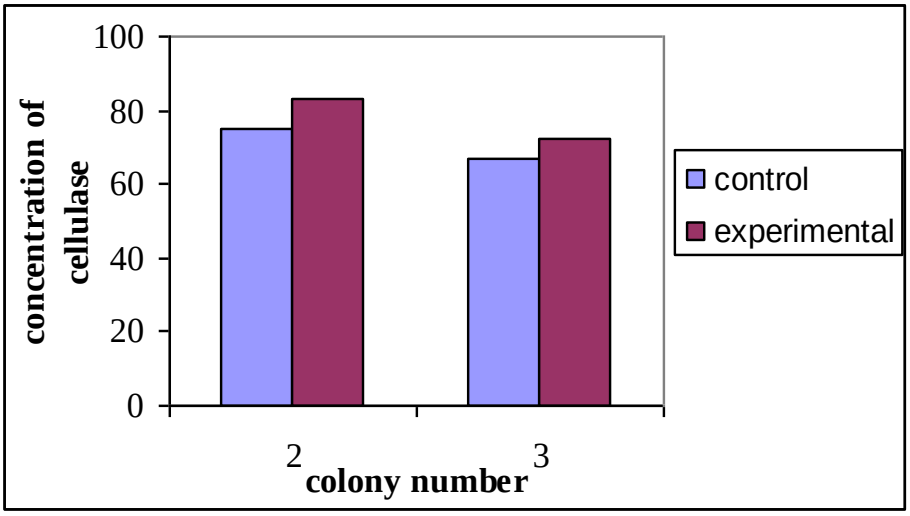
Effect of Fipronil on total gut microflora of *E. eugeniae*

Enzymes assay
Fig. 3



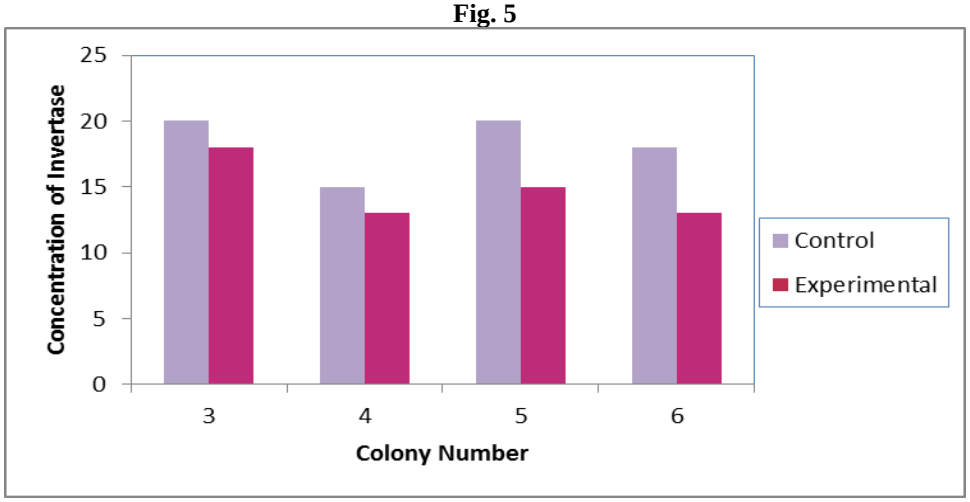
Amylase assay

Fig. 4



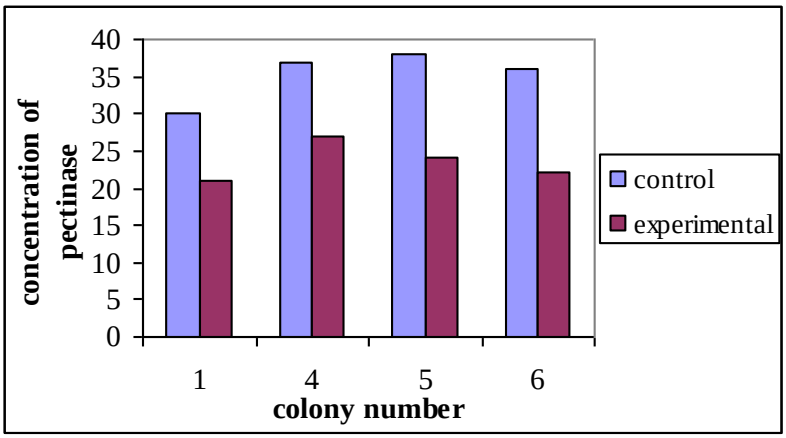
Cellulase assay

Fig. 5



Invertase assay

Fig.6



Pectinase assay

Table 1

Effect of Fipronil mixed vermiculture bed on biological parameters of *E. eugeniae*

Stages	21st day		35th day		90th day	
	Control	Treated	Control	Treated	Control	Treated
Cocoons (Number)	8±0	4±1	9 ±0.2	7.6±1.02	12±0.3	7.6±0.3
Juveniles (Number)	5±1	3.3±1	8±0.5	4.6±1.5	10±0	4±1.3
Adults (Number)	10±.1	6.3±1	10±0.2	6.6±1	10±0	6±0.5

Table 2
Effect of Fipronil mixed vermiculture bed with *Eudrilus eugeniae* on Soil properties

Properties	Initial before treatment	On 35th day	
		Control	Treated
pH	6.69	6.8	6.7
Carbon	0.453%	0.253%	0.134%
Potassium	14.745 kg/h	16.971kg/h	15.766kg/h
Phosphorus	359.09kg/h	389.09/kg/h	327.41kg/h

IV. Discussion and Conclusion

Vermiculture is entirely natural process that maintains the environmental balance. In the present studies an attempt is made to observe the effect of insecticide Fipronil on *Eudrilus eugeniae*. It was observed that the earthworm population is reduced in Fipronil treated soil and growth and reproductive potential of *Eudrilus eugeniae* was adversely affected as revealed by reduction in number of cocoons and juveniles as compared to that of the control. Similar observations were made in parathion treated *Eiseina fetida*[14]. A characteristic coiling of the body of insecticide treated earthworms was observed. It impairs with burrowing, copulation and feeding activities of earthworms. Our results thus, in agreement with those observed in different species of earthworm due to pesticides incorporated in the food material l (mixture of soil, dried leavs and farmyard

manure)[15].

Studies were made to analyze properties of Fipronil treated and control soil of vermiculture bed with respect to pH, carbon, phosphorus and potash content to monitor the effect on soil fertility**.** It was observed that there was reduction in pH, carbon, phosphorus and potash content in Fipronil treated soil than in control. Also under laboratory conditions pH , carbon, phosphorus and potash content of the soil in control is more than the normal poeta soil, but the rate at which these components increases was lower in treated soil than in control.

Studies on different microorganisms isolated from the gut of *Eudrilus eugeniae* from treated and control soil revealed that total viable count of gut microflora as well as their enzymes production ability was reduced as compared to that in the control. In conclusion, the data suggests that insecticide Fipronil is not only toxic to earthworms but also reduces the fertility of soil to a greater extent.

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Oral Iron Therapy in Anaemic and Non Anaemic Pregnant Women

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Abstract- Anaemia is defined as decreased Hb% below 15.0g/dl in males and 11.5g/dl in females. The occurrence of anemia in pregnant women is attributed mainly to malnutrition. Anemia may contribute to maternal mortality and morbidity.

METHODS :

Role of oral iron therapy (Zincofer) in assessing the statues of pregnant mild anemic women was taken up as the study. The changes in the blood picture and indices in the subjects over the pregnancy period will probably provide a guidance for planning the dosage regime. The Cyanomethemoglobin method was used to measure the Hb level and RBC count was done using Hayems fluid. The study group comprised of 46 pregnant anemic and 44 non anemic women (age group 21 -35yrs)

RESULTS :

The change in the RBC count between the two groups was insignificant through out the pregnancy period. Physiological anemia probably explains the same. A significant increase in the Hb %, MCH and MCHC has been observed in all trimesters. This is indicative of increased iron absorption and probably decreased stored iron capacity. The difference between the two groups is significant in non anemic probably due to the utilization of the total therapeutic iron for pregnancy itself. The MCV level is also significantly high in the first two trimesters. The insignificant change in the third trimester is probably due to physiological reasons.

CONCLUSION :

The findings in present study indicate that oral iron supplementation during pregnancy increases Hb concentration, RBC count as well as the blood indices like MCV, MCH and MCHC in anemic as well as non-anemic pregnant women. Oral iron supplementation is advised in not only anemic but also non anemic women during pregnancy.

Index Terms- Anemia, pregnancy, Oral iron therapy, Hb concentration, RBC count, MCV, MCH and MCHC

I. Introduction

The World Health Organization (WHO) defines anemia in pregnancy as a hemoglobin (Hb) concentration of less than 11 gm/dL. Iron deficiency anemia defined as depletion of iron stores and signs of a decreased supply of iron to the tissues. Ferrous form of iron is important than ferric form for synthesis of hemoglobin. Iron deficiency anemia (IDA) is the most common type of anemia in pregnancy. The iron content of the body is normally kept constant by regulating the absorbed iron and loss of iron. Two known factors contributes to development of iron deficiency anemia (IDA) in pregnancy, woman's iron stores at the time of conception and amount of iron absorbed during gestation.

An increase in loss along with inadequate intake can lead to depletion of body iron stores and eventually to anemia. Iron requirements are increased during infancy, puberty, pregnancy, and during menstruation. The WHO estimates that 58% of pregnant women in developing countries are anemic mainly because of iron deficiency. Anemia affects over two billion people Worldwide. World Health Organization (WHO) estimated half of these are due to iron deficiency. I**n developing countries over 4 million pregnant women suffer from iron deficiency anemia (IDA).**

Anemia has a significant impact on the health of the fetus as well as that of the mother. It impairs the oxygen delivery through the placenta to the fetus and interferes with the normal intrauterine growth leading to fetal malformations and perinatal deaths. Anemia is associated with increased preterm labor (28.2%), preeclampsia (31.2%), and maternal sepsis. Severe anemia can lead to palpitations, tachycardia, breathlessness, and increased cardiac output leading to cardiac stress which can cause decompensation and cardiac failure. Anemia is responsible for 40%–60% of maternal deaths in non industrialized countries.
During the first 2 trimesters of pregnancy iron-deficiency anemia increases the risk for preterm labor, low-birth-weight babies, and infant mortality and predicts iron deficiency in infants[5,6]. It is estimated that anemia accounts for 3.7% and 12.8% of maternal deaths during pregnancy and childbirth in Africa and Asia respectively. Therefore it is important to diagnose and treat anemia to ensure the optimal health of the mother and the newborn. **Normal pregnancy needs extra 900 mg of ferrous iron. Hence daily routine oral supplementation with iron folic acid is beneficial. iron dose was calculated from the following formula: Weight before pregnancy (kg) × (120 g/L — Actual hemoglobin [g/L]) × 0.24 + 500 mg.**

II. MATERIALS AND METHODS

The study was conducted in the department of Physiology in collaboration with the department of Obstetrics and Gynecology, Konasima Institute of Medical Sciences, Amalapuram, E.G. Dist, Andhra Pradesh. This study was conducted on 46 pregnant women of reproductive age group with mild anemia (hemoglobin levels between 7-8 mg %), and 44 pregnant women

of reproductive age group with out anemia (hemoglobin levels above 11gm %).

EXCLUSION CRITERIA : Patients with a history of anemia due to any other causes such as chronic blood loss, hemolytic anemia, and Thalassaemia, sickle cell anemia, were excluded from this study. Pregnant women with Hb < 7 g/dL (severe anemia), hepatic diseases , renal diseases, hematologic diseases, cardiovascular abnormalities, acid-peptic disorders, esophagitis, hiatus hernia, hypersensitivity to iron preparations.Written informed consent was obtained from all patients prior to screening and enrollment. The study protocol was approved by the Institute ethical committee.The primary efficacy parameter was the proportion of women achieving normal Hb level (> 11 g/dL) in the treatment groups. Other efficacy parameters were packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC).

Tab Zincofer 150 mg was given on monthly basis, Compliance with study medication was determined by pill counting at each visit. Hb, PCV, RBC, were measured at the end of every trimester.

Hemoglobin concentration was measured by Cyanomethemoglobin method. PCV was determined by using Wintrobe's tube method and RBC count was done using haemocytometer. MCV was calculated using the following formula: MCV = PCV/RBC count x 10 (femtoliter). MCH was calculated by the formula: MCH = Hb Gm % / RBC count x 10 (picogram).

MCHC was calculated by the formula: MCHC = Hb Gm % / PCV % x 100.

III. RESULTS

Present study comprise of 90 pregnant women of reproductive age group. 46 pregnant women were having mild anemia (hemoglobin levels between 7-8 mg %) and 44 pregnant women were not anemic (hemoglobin levels above 11gm %). The study parameter were measured at the end of each trimester and the results are tabulated as follows

Table 3- showing parameters at the end of first trimester

FIRST TRIMESTER	RBC (Mean ± SD)	Hb (Mean ± SD)	MCV (Mean ± SD)	MCH (Mean ± SD)	MCHC (Mean ± SD)
Anemic	3.64 ± 0.38	7.76 ± 0.52	79.2 ± 3.45	20.9 ± 2.41	27.2 ± 3.61
Non-anemic	3.70 ± 0.32	10.6 ± 0.68	85.3 ± 4.82	27.8 ± 2.81	32.6 ± 3.21
P = Value.	0.0002	0.0001	0.0001	0.0001	0.0001

Table-1 & Table-2 depicts that increased hemoglobin in both anemic group from 7.76 ± 0.52 to 8..66 ± 0.42 and non anemic group from 10.6 ± 0.68 to 10.9 ± 0.72 after first trimester.

Increased RBC count in both anemic group from 3.64 ± 0.38 to 3.70 ± 0.32 and non anemic group from 3.70 ± 0.32 to 3.81 ± 0.35 after first trimester.

Increased MCV in both anemic group from 79.2 ± 3.45 to 83.2 ± 3.12 and non anemic group from 85.3 ± 4.82 to 89.3 ± 5.42 after first trimester.

Increased MCH in both anemic group from 20.9 ± 2.41 to 22.8 ± 2.64 and non anemic group from 27.8 ± 2.81 to 28.8 ± 2.61 after first trimester.

Increased MCHC in both anemic group from 27.2 ± 3.61 to 28.2 ± 3.41and non anemic group from 32.6 ± 3.21 to 32.8 ± 3.31after first trimester.

Table 4- showing parameters at the end of second trimester

SECOND TRIMESTER	RBC (Mean ± SD)	Hb (Mean ± SD)	MCV (Mean ± SD)	MCH (Mean ± SD)	MCHC (Mean ± SD)
Anemic	3.70 ± 0.32	8..66 ± 0.42	83.2 ± 3.12	22.8 ± 2.64	28.2 ± 3.41
Non-anemic	3.81 ± 0.35	10.9 ± 0.72	89.3 ± 5.42	28.8 ± 2.61	32.8 ± 3.31
P = Value.	0.0001	0.0001	0.0001	0.0001	0.0001

Table-2 & Table-3 depicts that increased hemoglobin in both anemic group from 8.66 ± 0.42 to 9..45 ± 0.51 and non anemic group from 10.9 ± 0.72 to 11.9 ± 0.62 after second trimester.

Increased RBC count in both anemic group from 3.70 ± 0.32 to 3.79 ± 0.36and non anemic group from 3.81 ± 0.35 to 3.98 ± 0.55 after second trimester.

Increased MCV in both anemic group from 83.2 ± 3.12 to 83.6 ± 4.12 and non anemic group from 89.3 ± 5.42 to 90.3 ± 4.22 after second trimester.

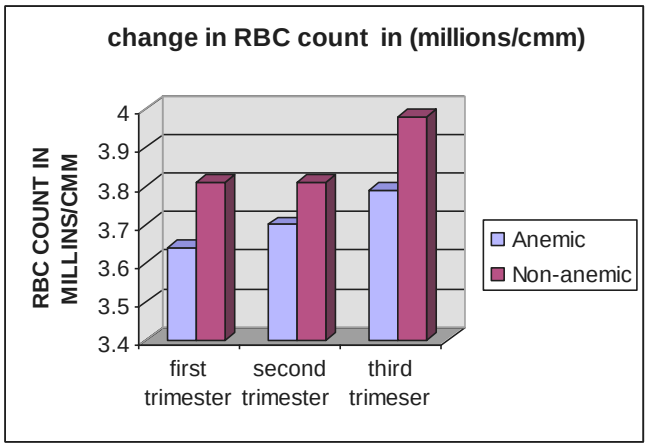
Increased MCH in both anemic group from 22.8 ± 2.64 to 25.8 ± 3.64 and non anemic group from 28.8 ± 2.61 to 30.8 ± 2.89 after second trimester.

Increased MCH C in both anemic group from 28.2 ± 3.41 to 30.2 ± 3.52 and non anemic group from 32.8 ± 3.31 to 33.3 ± 5.31 after second trimester.

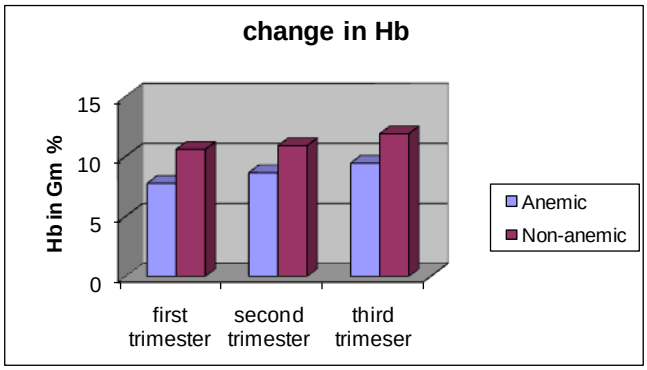
Table 5- showing parameters at the end of third trimester

THIRD TRIMESTER	RBC (Mean ± SD)	Hb (Mean ± SD)	MCV (Mean ± SD)	MCH (Mean ± SD)	MCHC (Mean ± SD)
Anemic	3.79 ± 0.36	9..45 ± 0.51	83.6 ± 4.12	25.8 ± 3.64	30.2 ± 3.52
Non-anemic	3.98 ± 0.55	11.9 ± 0.62	90.3 ± 4.22	30.8 ± 2.89	33.3 ± 5.31
P = Value.	0.0002	0.0001	0.0001	0.0001	0.0001

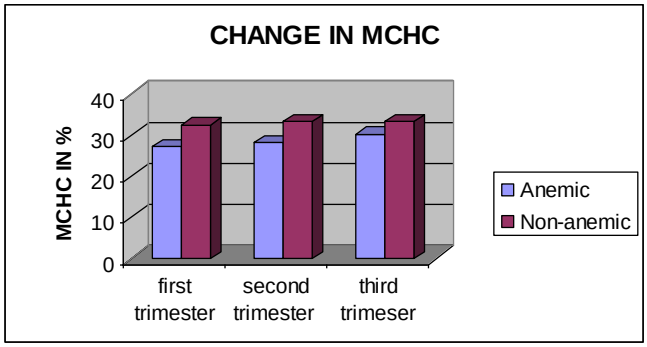
Graph 1 shows change in RBC count in three trimesters after treatment with oral iron preparation



Graph 2 shows change in Hb in three trimesters after treatment



Graph 3- shows change in MCHC in three trimesters after treatment with oral iron therapy



The results shows that there was a significant increase in RBC count in both the groups (anemic & non anemic group) after treatment with zincofer [graph-1 and 2], during three trimesters and is highly significant. The increase in Hb was also statistically significant in both the groups after treatment with Zincofer. The increase in the MCV, MCH and MCHC which was also statistically significant in both the group after treatment with zincofer [graph -3].

IV. DISCUSSION

In this study effect of Zincofer 150 mg as iron supplementation during pregnancy was studied in both anemic and non anemic pregnant females reporting in first trimester for routine ante-natal checkup. The subjects were supposed to take the iron supplementation throughout the pregnancy and monthly supply of tablets were made during there visit to hospital.

The effect of iron supplementation was studied by assessing the change in RBC count, Hb Concentration and blood indices like MCV, MCH and MCHC at the end of each trimester. Hemoglobin concentration was increased in anemic and non-anemic women after oral iron supplementation in every trimester. This can be explained on physiological basis of pregnancy induced anemia which is due to haemodilution due to increased extra cellular fluid in pregnancy. RBC count also increased after treatment with Zincofer, the rise in every subsequent trimester was statistically significant. This may be due to iron supplementation as the iron requirement during pregnancy is increased and if the iron is not taken during pregnancy anemia may develop. Significant increase in MCV, MCH and MCHC is due to iron supplementation as this will increase the rate of synthesis of hemoglobin as well as the rate of erythropoiesis which will increase the RBC count which will improve the deranged values of blood indices.

V. CONCLUSION

The findings in present study indicate that oral iron supplementation during pregnancy increases Hb concentration, RBC count. Blood indices like MCV, MCH and MCHC are also improved in anemic as well as non-anemic pregnant women. Oral iron supplementation is advised in not only anemic but also non anemic women, during pregnancy. **Prophylactic iron supplement and food fortification with iron improves the maternal and child health.**

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Studies on Economic Viability of Weed Management Practices in Zero Till Sown Rice Fallow Black gram (*Vigna mungo* L.)

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Abstract- Field experiments were conducted consecutively over a period of two years at Agricultural College & Research Institute, Madurai to study the economic viability of weed management practices in zero till sown rice fallow black gram during *rabi* season. The experiments were laid out in split plot design replicated thrice. In the experimental field, grasses were found to be dominant followed by broad leaved weeds and sedges. Among different methods of sowing, dibbling the seeds three days after pre-sowing application of paraquat @ 0.5 kg ha^{-1} recorded significantly lower values of total weed density, total weed dry matter production and weed index in both years of study and hence better growth and reproductive parameters were obtained under the same treatment. Application of fenoxaprop-p-ethyl @ 75 g ha^{-1} or cyhalofop butyl @ 100 g ha^{-1} on 15 DAS significantly reduced the density and dry weight of dominant grassy weeds over the other treatments and increased the yield of rice fallow black gram. The interaction effect was also found to be significant. The maximum seed and haulm yield were recorded with dibbling the seeds three days after pre sowing application of paraquat @ 0.5 kg ha^{-1} with post emergence application of either fenoxaprop-p-ethyl @ 75 g ha^{-1} or cyhalofop butyl @ 100 g ha^{-1}. However, higher monetary return was obtained in dibbling the seeds three days after pre sowing application of paraquat followed by post emergence application of fenoxaprop-p-ethyl @ 75 g ha^{-1}.

Index Terms- Economics, Methods of sowing, Post emergence herbicides, Rice fallow black gram, Weed control and Zero till

I. Introduction

Pulses are cultivated under irrigated as well as rainfed conditions. They are also cultivated in another unique eco-system known as Rice fallow crop. In Tamil Nadu, rice fallow pulses contribute 40-50 % of total pulse production in which black gram occupies a major share. The productivity of rice fallow black gram is always far below the normal. The main reason for low productivity is poor plant population and severe weed infestation due to zero tilled conditions. The traditional practice of broadcasting of seeds in the standing crop of rice does not ensure uniform plant population and severe weed infestation under zero tilled conditions deprives the crop of its major requirements of nutrients and moisture which results in poor crop growth and yield (Rao, 2000). Weed infestation in black gram may culminate yield up to an extent of 45 to 60 % (Rao *et al*., 2001). Manual weeding is also difficult and uneconomical to practice in this system because of dense rice stubbles and non availability of labour in time. The application of either pre-sowing or pre emergence herbicides is also difficult due to lack of field preparation and limited period of their application. In the light of the above report, the present investigation was carried out to find out economically viable weed management practices for controlling weeds already established before sowing and those germinated in rice fallows, thus providing weed free environment to the crop during the critical period of crop weed competition.

II. Material and Methods

Field investigations were conducted for efficient weed management in zero till sown rice fallow black gram at Agricultural College & Research Institute, Madurai during *rabi* season of 2004 and 2005. The experimental field was characterized by tropical climate with mean annual rainfall of 808.2 mm, the daily mean maximum and minimum temperatures were 30.9 ^{o}C and 21.1 ^{o}C. The soil of the experimental field was sandy clay loam in texture. The soil was about neutral in pH and low, medium and high in available N, P and K respectively. Black gram variety ADT 3 released by Tamil Nadu Agricultural University was selected for this study. The experiments were laid out in split plot design with methods of sowing of rice fallow black gram under zero tilled conditions as main plots and weed management practices (WMP) as sub plot treatments replicated thrice. The treatment details were as follows.

Main plots: Methods of sowing of rice fallow black gram under zero tilled condition (5)

M_1: Broadcasting of seeds in the standing crop of rice.

M_2: Broadcasting of seeds in the standing crop of rice followed by sand mix application of pendimethalin @ 1 kg ha^{-1}.

M_3: Dibbling the seeds immediately after harvest of rice.

M_4: Dibbling the seeds immediately after harvest of rice followed by sand mix application of pendimethalin @ 1 kg ha^{-1}.

M_5: Pre-sowing application of paraquat @ 0.5 kg ha^{-1} followed by dibbling the seeds three days after paraquat application.

Sub plots: Weed management practices (WMP): 5

S_1: Fenoxaprop-p-ethyl @ 75 g ha^{-1}

S_2: Imazethapyr @ 100 g ha^{-1}

S_3: Cyhalofop butyl @ 100 g ha^{-1}
S_4: One manual weeding at 20 days after sowing of black gram
S_5: Unweeded check
All post emergence herbicides (PoE) were applied at 15 DAS.

Black gram seeds were treated with multi-strain rhizobium @ 600 g ha^{-1} and recommended seed rates of 40 kg ha^{-1} and 20 kg ha^{-1} were used in broadcasting and dibbling methods respectively. In case of broadcasting, the treated seeds were broadcasted uniformly in the standing crop of rice 5 days before the harvest when the soil was at wet condition. In case of dibbling, two to three seeds were dibbled per hill at a depth of 3 to 4 cm adopting a spacing of 30X10 cm. Pendimethalin @ 1 kg ha^{-1} was mixed with sand and applied as per treatment schedule on the same day of broadcasting or dibbling the black gram seeds. Paraquat @ 0.5 kg ha^{-1} was sprayed on existing weeds after harvesting of rice and black gram seeds were dibbled 3 days after paraquat application. Foliar spraying of 2 % DAP was given twice at flower initiation stage and 15 days after the first spray. Data on parameters like weed density, weed dry matter production, crop seed yield and haulm yield were recorded. Details of post emergence herbicides used for the study are furnished below.

Common name	Fenoxaprop-p-ethyl	Imazethapyr	Cyhalofop butyl
Manufacturer	Aventis	BASF	Denocil
Trade name	Whip Super	Pursuit	Clincher
Formulation	9 % EC	10 % SL	10 % EC
Chemical group	Aryloxyphenoxy	Imidazolinones	Phenoxy propionics
Mode of action	Inhibits fatty acid synthesis	Inhibits amino acid bio synthesis	Inhibits fatty acid synthesis

III. RESULTS AND DISCUSSION

Weed flora

The weed flora observed in the experimental field during the course of study consisted of grasses, sedges and broadleaved weeds. The predominant weeds were grasses followed by broad leaved weeds and sedges. Among grassy weeds, *Echinochloa colonum* was the dominant species. The major weeds were *Echinochloa colonum* (L.) Link, *Echinochloa crusgalli* Beav and *Panicum repens* (L.) among grasses, *Cyperus rotundus* (L.) *and Cyperus difformis* (L.) among sedges and *Sphaeranthus indicus* (L.), *Eclipta alba* (L.) Hassk and *Cleome viscosa* (L.) among broad leaved weeds.

Effect on weed parameters

Total weed density and weed dry matter production before spraying of post emergence herbicides and at maturity were significantly influenced by different methods of sowing in both years of study (Table 1). Before spraying of post emergence herbicides, dibbling the black gram seeds three days after pre sowing application of paraquat @ 0.5 kg ha^{-1} (M_5) recorded lowest total weed density of 47.36 and 43.33 No. m^{-2} in 2004 and 2005 respectively. This was in accordance with the findings of Subramanian *et al.* (2001) who reported that paraquat was an excellent contact herbicide to kill the establishing weeds. The next best method of sowing was dibbling the seeds after harvest of rice followed by application of pendimethalin @ 1 kg ha^{-1} (M_4) in recording lower total weed density. This was due to effective suppression of newly emerging grasses and broad leaved weeds by the application of pendimethalin after dibbling of black gram seeds. Similar findings were also reported by Murti *et al.* (2004). However, pendimethalin had no effect on control of sedges and on established weeds. Higher total weed density of 144.06 No. m^{-2} in 2004 and 152.51 No. m^{-2} in 2005 was recorded at maturity under broadcasting of seeds in the standing crop of rice (M_1) which was found to be inferior to dibbling the seeds after harvest of rice (M_3) in reducing weed density and weed dry matter production (DMP). This was due to maintenance of optimum density of 33 plants m^{-2} under dibbling method of sowing which filtered sunlight reaching the ground level to suppress the weed growth. The smothering effect of crop on the weeds at later stages of crop growth decreased the weed density and DMP considerably.

Application of fenoxaprop-p-ethyl @ 75 g ha^{-1} (S_1) or Cyhalofop butyl @ 100 g ha^{-1} (S_3) recorded lower total weed density and DMP at maturity in both years of study and were found at par with each other (Table 1). These two herbicides reduced the population of dominant grassy weeds significantly but found to be ineffective against sedges and broad leaved weeds. This was in accordance with the findings of William (2000) and Choubey *et a*l. (2001). Though the effect of imazethapyr @ 100 g ha^{-1} on reduction of grassy weds was next to fenoxaprop-p-ethyl and cyhalofop butyl, it reduced density and DMP of broad leaved weeds. However, application of PoE herbicides was superior in reducing weed density and weed (DMP) of grasses in rice fallows compared to one manual weeding which was found to be difficult because of presence of dense rice stubbles. The effective control of grassy weeds which constituted the major portion of total weed population by application of either fenoxaprop-p-ethyl or cyhalofop butyl was reflected in lower weed index values. Similar findings were reported by Singh and Tripathi (2003). Lower values of weed index were recorded with the combination of M_5S_1 in 2004 and M_5S_3 in 2005.

Effect on crop parameters

Dibbling the seeds three days after pre sowing application of paraquat recorded higher values of seed yield, haulm yield and harvest index (1072 kg ha^{-1}, 2366 kg ha^{-1} and 0.312 in 2004 and 945 kg ha^{-1}, 2087 kg ha^{-1} and 0.309 in 2005) respectively (Table 2). This might be due to reduction of weed competition in early stages of crop growth with simultaneous increase in crop growth parameters. Among WMP, application of fenoxaprop-p-ethyl or cyhalofop butyl were found comparable in recording crop parameters during both years of study (Table 2). Application of post emergence herbicides (S_1 or S_3) provided a weed free situation by timely control of weeds during the critical period of crop weed competition in rice fallow black gram. Application of imazethapyr increased the crop yield next to fenoxaprop-p-ethyl and cyhalofop butyl. A similar effect on growth parameters and yield by the application of imazethapyr was also reported by Vasuki (2001). The conventional method of one manual weeding at 20 DAS was inferior to the application of post emergence herbicides to obtain increased crop growth parameters. This might be due to the growth of weeds up to one

manual weeding at 20 DAS and subsequent rejuvenation of weeds registered in traditional manual weeding practice.

Economics

The highest net return of Rs. 14,707 ha^{-1} in 2004 and Rs. 12,111 ha^{-1} in 2005 and B:C ratio of 3.14 in 2004 and 2.76 in 2005 were recorded with dibbling the seeds three day after pre sowing application of Paraquat @ 0.5 kg ha^{-1} (Table 3). Among WMP, application of fenoxaprop-p-ethyl @ 75 g ha^{-1} recorded maximum net return and B:C ratio of Rs. 10,855 $ha^{-1}$and 2.72 in 2004 and Rs. 9326 ha^{-1} and 2.37 in 2005 respectively.

IV. CONCLUSION

The investigation conclusively proved that integration of dibbling the black gram seeds three days after pre sowing application of Paraquat @ 0.5 kg ha^{-1} with post emergence application of either fenoxaprop-p-ethyl @ 75 g ha^{-1} or cyhalofop butyl @ 100 g ha^{-1} at 15 DAS effectively controlled the weeds and increased the seed yield of rice fallow black gram. However, higher monetary return was obtained in dibbling the seeds three days after pre-sowing application of Paraquat with fenoxaprop-p-ethyl @ 75 g ha^{-1} in zero till sown rice fallow black gram.

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Table 1. Effect of methods of sowing and WMP on weed parameters in zero till sown rice fallow black gram

Treatments	2004				2005			
	Weed density (No. m^{-2})		Weed DMP (kg ha^{-1})	WI (%)	Weed density (No. m^{-2})		Weed DMP (kg ha^{-1})	WI (%)
	Before spraying of PoE herbicides	At Maturity			Before spraying of PoE herbicides	At Maturity		
Methods of sowing								
M_1	133.51 (2.131)	144.06 (2.164)	105.56	26.70	142.25 (2.159)	152.51 (1.161)	112.34	27.60
M_2	100.59 (2.011)	111.76 (2.055)	82.52	23.05	111.81 (2.056)	121.07 (2.090)	89.79	23.59
M_3	133.34 (2.131)	116.36 (2.073)	87.93	19.94	142.25 (2.159)	124.04 (2.100)	92.38	20.62
M_4	100.75 (2.011)	87.09 (1.949)	64.14	14.72	111.93 (2.056)	95.24 (1.987)	71.72	16.07
M_5	47.36 (1.693)	44.50 (1.667)	32.87	13.68	43.33 (1.656)	47.82 (1.697)	36.30	14.80
SEd	0.051	0.040	6.05		0.045	0.045	5.79	
CD (P:0.05)	0.108	0.083	12.38		0.092	0.097	11.54	
Weed Management Practices (WMP)								
S_1	103.14 (2.021)	74.13 (1.881)	55.76	-	110.62 (2.051)	79.94 (1.913)	57.48	2.70
S_2	103.01 (2.021)	89.94 (1.963)	66.51	9.78	110.60 (2.051)	96.01 (1.991)	71.98	10.79
S_3	103.10 (2.021)	74.36 (1.882)	56.08	2.25	110.67 (2.052)	79.52 (1.911)	57.30	-
S_4	103.43 (2.022)	105.30 (2.030)	76.85	19.58	110.60 (2.051)	113.04 (2.060)	81.52	21.66
S_5	102.83 (2.020)	159.95 (2.209)	115.05	46.87	110.58 (2.051)	172.17 (2.240)	124.26	46.98
SEd	0.035	0.030	4.9		0.058	0.032	4.51	
CD (P:0.05)	NS	0.06	9.86		NS	0.065	9.05	

Data in parenthesis were log (x+2) transformed values

Table 2: Effect of methods of sowing and WMP on seed yield, haulm yield and HI of rice fallow black gram

Treatments	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	HI	Seed yield (kg ha^{-1})	Haulm yield (kg ha^{-1})	HI
Methods of sowing						
M_1	472	1232	0.271	434	1164	0.267
M_2	620	1563	0.276	566	1462	0.275
M_3	765	1877	0.286	668	1686	0.282
M_4	996	2243	0.307	862	1971	0.304
M_5	1072	2366	0.312	945	2087	0.309
SEd	16	28	0.002	17	24	0.003
CD (P:0.05)	46	58	0.004	45	56	0.005
WMP						
S_1	921	2077	0.305	802	1857	0.299
S_2	838	1951	0.296	741	1763	0.291
S_3	902	2048	0.303	823	1887	0.301
S_4	754	1871	0.286	655	1644	0.281
S_5	510	1389	0.263	453	1216	0.264
SEd	10	20	0.001	11	17	0.002
CD (P:0.05)	23	40	0.002	20	34	0.004

Table 3: Economics of methods of sowing & WMP on rice fallow black gram

Treatments	Cost of cultivation (Rs ha^{-1})	2004			2005		
		Gross returns (Rs ha^{-1})	Net returns (Rs ha^{-1})	B:C ratio	Gross returns (Rs ha^{-1})	Net returns (Rs ha^{-1})	B:C ratio
Methods of sowing							
M_1	5797	9436	3639	1.59	8680	2883	1.46
M_2	7225	12396	5119	1.69	11324	4099	1.54
M_3	6097	15296	9199	2.47	13360	7263	2.17
M_4	7527	19920	12393	2.63	17236	9709	2.27
M_5	6789	21448	14707	3.14	18900	12111	2.76
WMP							
S_1	6718	18424	10855	2.72	16044	9326	2.37
S_2	6970	16752	9829	2.38	14832	8201	2.11
S_3	7250	18040	10780	2.47	16464	9213	2.26
S_4	7036	15080	8044	2.12	13100	6064	1.84
S_5	5460	10200	4740	1.83	9060	3599	1.63

Collaborative Anti Spam Technique to Detect Spam Mails in E-Mails

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Abstract- In the field of collaborative spam filtering by near-duplicate detection, an e-mail abstraction scheme is required to more certainly catch the evolving nature of spams. Compared to the existing methods in prior research, in this work, we explore a more sophisticated and robust e-mail abstraction scheme, which considers e-mail layout structure to represent e-mails. The specific procedure SAG is proposed to generate the e-mail abstraction using HTML content in e-mail, and this newly-devised abstraction can more effectively capture the near-duplicate phenomenon of spams. The hash function is easily identified and it not an efficient. To overcome this drawback our proposed system using Feature-preserving fingerprint technique. To generate a TFset of a message M, we use a sliding window algorithm, in which a window of some predetermined length (W) slides through the message. At each step, the algorithm computes a Rabin fingerprint of W consecutive tokens that fall within the window. Each fingerprint is in the range (0, 2^K-1), where K is a configurable parameter. Feature-preserving fingerprint is just one level of privacy protection; the amount of information exchanged during collaboration can be further controlled for stronger privacy protection. In particular, we design the collaborative antispam system equipped with privacy-aware message exchange protocol based on the following spam/ham dichotomy that revealing the contents of a spam e-mail does not affect the privacy or confidentiality of the participants, whereas revealing information about a ham e-mail constitutes a privacy breach. Our proposed system to improving spam mail detection as well as provide privacy for message exchange.

Index Terms- antispam, e-mail abstraction, , fingerprinting, privacy.

I. INTRODUCTION

Detecting spam mails in e-mail is the most emerging research in e-mails must have the following ways, First, software-based spam detection on MTAs(Mail Transfer Agent) is not capable of detecting spam at high throughput and will not cope with the increase in future e-mail traffic.MTAs are e-mail servers that run on general-purpose processors (GPPs). GPP-based systems could not scale with increases in link speed .Even for custom GPP-based spam detectors , their throughputs are limited to hundreds Mbps. Specialized hardware architectures, with improved processing power, are needed for fast spam detection and to support the network bandwidth growth. Second, spam detection at the application layer (layer 7)1 restricts where, when, and how fast spam detection can be performed. Detecting spam at layer 7 makes detection at intermediate nodes (between the sending and the receiving MTAs) infeasible due to the need for complex Transport Control Protocol/Internet Protocol (TCP/IP) processing at link speed. TCP, which requires reassembly, byte alignment, and state tracking requires large computation overhead. As a result, spam control is restricted to MTA implementation as an end-to-end spam control mechanism.An improved spam detection approach, at lower e-mail abstraction levels, is needed to lift the end-to-end implementation restriction and to allow fast spam detection, closer to spam sources.

Third, due to the lack of outbound spam control, e-mails are effectively classless upon reception at the receiving MTA. In the current spam control, e-mail classes are unknown until e-mails have been classified and detected for spam. Thus, all incoming e-mails are queued in a common queue and delivered (to recipients) with equal priority. For e-mail traffic that consists mainly of spam, non-spam e-mails are delayed due to the presence of spam in the queue. Furthermore, non-spam e-mails maybe lost during queuing. Spam wastes MTA processing and bandwidth resources. Any attack on the common queue could disrupt server operations. A scheme at receiving MTAs to maintain e-mail delivery is needed to reduce the non-spam delay and loss due to queuing. [1]so the identified mail must be correctly identified .A more effective spam detection using vendors reply helps to detects spam more accurately and privacy is achieved by rabin fingerprinting hash algorithm, as only the hash values with ranges are sent to different vendors privacy is achieved in a this algorithm and spams are detected with more effectively.

II. RELATED WORK

In the evaluation of highest probability of nearest neighbour classifier they evaluate the performance of the highest probability SVM nearest neighbour classifier,which is an improvement over the SVM nearest neighbour classifier on the task of spam filtering.In order to classify a sample x,it first selects k samples to train an SVM model which is used to make decisions.As such,the SVM nearest neighbour algorithm proposes no rule for selecting the parameter made an attempt to estimate k by internal training and testing on a training data,but this approach brought uncertain results.[2]

By privacy aware collaborative spam filtering a large privacy aware collaborative spam filtering technique ALPACAS was designed inorder to detect spam effectively .But they were based on the content in e-mail.the spammers tried to defeat this algorithm by inserting a random paragraph like structures into the e-mail messages which does not detect spam mails effectively in e-mail.[3]

Mail ranking method which considered e-mail address of senders by ranking priority if it is detected as a spam by its content with its two mail rank variants basic mail rank and personalized mail rank.Trust and reputation algorithms have become increasingly popular to rank .Building upon the e-mail network graph,a power iteration algorithm is used to compute the score of e-mail address.This process does not have much scalability and faster executable and is more complicated.[4]

Markav random chain process uses the incoming mails with its contents are only identified and uses its its weighting scheme for spam filtering .As there is a chance of inserting a random paragraph into itwhile only contents are taken. This has a drawback of storage utilization is high and not efficient to use.[5]

In false positive safe neural network an approach of online cumulative training is proposed .If a system would learn each time something new it arrives ,the phrases are rephrased after sometime if the features are not too good the system would correctly recognize as a spam .This can be done on client side which makes a lot of work for user.The newral network defines whether the patterns are important a high false positive rates are achieved.[6]

III. PROPOSED SYSTEM

The input e-mail messages are etracted with its HTML content in e-mail. By rabin fingerprint hash algorithm a feature set (SF) is generated by overlapping the sequences and are numberedby converting a sequences into binary values.A hashing operation is performed for these binary values and the range of hash values with their ranges are sent to different vendors .Each vendors performs the same operation for different kinds of spam mails and stores the hash values into the databases .while transferring the hash values a privacy is achieved as only their ranges are sent to different vendors.each vendors with a database a hash value ranges for ham mails and for spam mails and thus spam mails are accurately identified with a true positive rate.

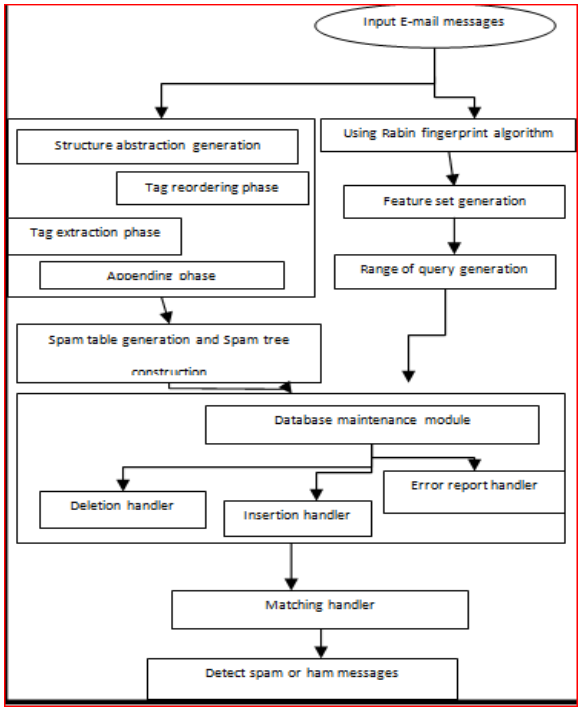

Figure 1 SYSTEM ARCHITECTURE

A. STRUCTURE ABSTRACTION GENERATION

In this module e-mail structure abstraction is to be generated. We propose the specific procedure SAG to generate the e-mail abstraction using HTML content in e-mail. SAG is elaborated with the example and the algorithmic form of SAG. Procedure SAG is composed of three major phases, Tag Extraction Phase, Tag Reordering Phase, and <anchor> Appending Phase. In Tag Extraction Phase, the name of each HTML tag is extracted, (i.e) the front and rare tags are eliminated ,mismatched tags, and mismatched positions are eliminated as the HTML tags in e-mail are abstracted. Tags attributes and attribute values are eliminated inorder to detect spam effectively. In addition, each paragraph of text without any tag embedded is transformed to <mytext=>. In lines 4-5, <anchor> tags are then inserted into AnchorSet, and the first 1,023 valid tags are concatenated to form the tentative e-mail abstraction.

i) SPAM TABLE AND SPAM TREE CONSTRUCTION

In this module SP table and SP tree are constructed for the above system fig2 .One major focus of this work is to design the innovative data structure to facilitate the process of near-duplicate matching. SpTable and SpTrees (sp stands for spam) are proposed to store large amounts of the e-mail abstractions of reported spams. As several SpTrees are the kernel of the database, and the e-mail abstractions of collected spams are maintained in the corresponding SpTrees. According to Definition 3, two e-mail abstractions are possible to be near-duplicate only when the numbers of their tags are identical. Thus, if we distribute e-mail abstractions with different tag lengths into diverse SpTrees, the quantity of spams required to be matched will decrease. However, if each SpTree is only mapped to one single tag length, it is too much of a burden for a server to maintain such thousands of SpTrees. In view of this concern,

each SpTree is designed to take charge of e-mail abstractions within a range of tag lengths. As SpTable is created to record overall information of SpTrees.

The ith column of SpTable links to the root of SpTree_i by a pointer, and e-mail abstractions with tag lengths ranging from 2^i to 2^{i+1} -1 belong to SpTree_i. Regarding how an e-mail abstraction is stored in SpTree, it gives an example with the same e-mail abstraction derived from Figure. An e-mail abstraction is segmented into several subsequences, and these subsequences are consecutively put into the corresponding nodes from low levels to high levels. As such, an e-mail abstraction is stored in one path from the root node to a leaf node of SpTree, and hence the matching between a testing e-mail and known spams is processed from root to leaf.

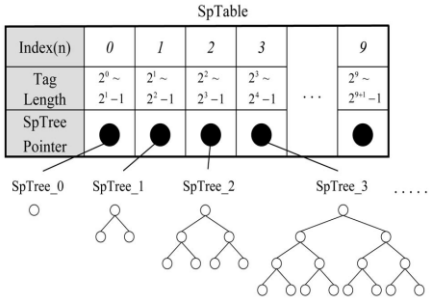

Figure 2 SP TREE AND SP TABLE

B. SPAM DETECTION

In this module, Matching Handler in Spam Detection Module takes charge of determining results. There are three types of e-mails, reported spam, testing e-mail, and misclassified ham, required to be dealt with by Cosdes in fig3.When receiving a reported spam, Insertion Handler adds the e-mail abstraction of this spam into the database except that the reputation score of this reporter is too low. Whenever a new testing e-mail arrives, Matching Handler performs the near-duplicate detection with collected spams to do the judgment. Meanwhile, if a testing email is classified as a spam, this e-mail will be viewed as a reported spam and be added into the database. Moreover,Error Report Handler copes with feedback misclassified hams and adjusts Cosdes by degrading the reputation of related reporters to prevent malicious attacks. For every Td, Deletion Handler is triggered to delete obsolete spams which exist over time Tm. The main functionalities of deleting outdated spams are not only to alleviate the overhead of the server, but to reduce the risk of accidental deletion of hams. Due to the evolving nature of spams, it is inappropriate to utilize old spams to filter current ones. Overall, Cosdes is self-adjusting and retains the most up-to-date spams for near-duplicate detection.

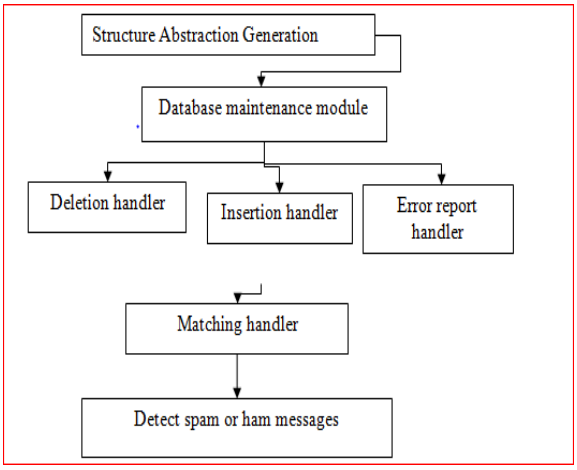

Figure 3 SPAM DETECTION MECHANISM

i) DATABASE MAINTEINANCE

A database maintainence module is designed with three handlers as insertion handler,deletion handler,error report handler.Insertion handler is used to insert a newly detected spam mails.Deletion handler deletes the mails which are detected earlier,thus making the memory space to free to insert a newly detected identified mails.Error report handler reports a false positive rate of the misclassified ham mails and higher rate of true positive rate is achieved in the proposed system.Each of the handlers has a ham and a spam databases to identify the accurate spam mails at a higher rate.

ii) REPUTATION MECHANISM

In this consists of, to ensure the truthfulness of spam reports and to prevent malicious attacks, we propose the reputation mechanism to evaluate the credit of each reporter. The fundamental idea of the reputation mechanism is to utilize a reputation table to maintain a reputation score SR of each reporter according to the previous reliability record. Each inserted spam is given a suspicion score equal to SR of the reporter. In such a context, when doing near-duplicate detection, if the sum of suspicion scores of matched spams exceeds a predefined threshold, the testing e-mail will be classified as a spam. The reputation mechanism is described in detail as follows:

1. Each reporter is assigned an initial score S initial when he submits a reported spam at the first time.
2. If a reporter submits any feedback spam once more, the reputation score will be incremented by a smaller incremental score Sincre. The value of Sincre is set as Sinitial10 in the experiments.
3. If a reporter is charged that his previous feedback spam is mistaken, the reputation score will be halved.

To prevent malicious error reports and to attain a near-zero false positive rate, we cautiously increase the reputation score but drop it drastically while a false positive error is issued. On the other hand, when SR of a reporter is smaller than Sinitial, his subsequent feedback spams will not be added into the database until SR is equal to or larger than Sinitial. Regarding the parameter Sth, we simply use a fixed small value (set as three in the experiments) instead of determining the threshold according to the ratio of total users. The reason is that as long as there are

certain trusty users reporting the e-mails with the same e-mail abstraction as spams, it is sufficiently reliable to classify the subsequent near-duplicate e-mails as spams.

C. PRIVACY PRESERVING COLLABORATIVE SPAM DETECTION

feature-preserving fingerprint hashing technique

In consideration of the privacy preservation, the message transformation uses a Rabin fingerprint algorithm, which is a one-way hash function such that it is computationally infeasible to generate the original e-mail from its TFset. However, it is possible to infer a word or a group of words from an individual feature value.

The transformation from message to feature set can be based on words rather than characters, i.e., the sliding window is over the W consecutive words rather than bytes. We choose to use character-based token selection because it is more general than word-based token selection and can be easily implemented. It considers important features, such as message layout symbols, rather than just the text. The character-based selection is also better suited for short messages, such as Picospam and comment spam.

To shuffle the e-mail content in an acceptable manner, our feature-preserving fingerprint scheme adopts a controlled shuffling strategy wherein the tokens are shuffled in a predetermined format. Further, the position of a token after shuffling is always within a fixed range of its original position. Specifically, the controlled shuffling scheme works as follows: The e-mail text is divided into consecutive chunks of tokens. Each chunk consists of z consecutive tokens of the email text, where z is a configurable parameter. The tokens in each chunk are shuffled in a predetermined manner, whereas the ordering of the chunks within the e-mail text remains unaltered. Concretely, each chunk is further divided into y subchunks (we assume that y is a factor of z). The tokens within an arbitrary chunk CK_h are shuffled such that the token at rth position in the sth subchunk is moved to (r *y +s)th position within CK_h.

i)PRIVACY-PRESERVING COLLABORATION PROTOCOL

Our protocol works as follows: When an agent EA_j receives a message M_a, EA_j computes its TFSet : TFSet(M_a). It then sends a query message to other e-mail agents in the system to check whether they can provide any information related to Ma. However, instead of sending the entire TFSet(M_a) as the query message to all agents, EA_j sends a small subset of TFSet(M_a) to a few other e-mail agents (the e-mail agents to which the query is sent is determined on the basis of the underlying structure;). The subsets of TFSet(M_a) included in the queries sent to various other e-mail agents need not be the same (our architecture optimizes the communication costs by sending nonoverlapping subsets to carefully chosen e-mail agents).

An e-mail agent that receives the query, say EA_k, checks its spam and ham knowledge bases looking for entries that include the feature subset that it has received. A feature set is said to match a query message if the set contains all the Fes included in the query. Observe that there could be any number of entries in both spam and ham knowledge bases matching the partial feature set. For each matching entry in the spam knowledge base, EA_k includes the complete TFSet of the entry in its response to EA_j. However, for any matching ham entries, EA_k sends back a small, randomly selected part of the TFset in fig4.

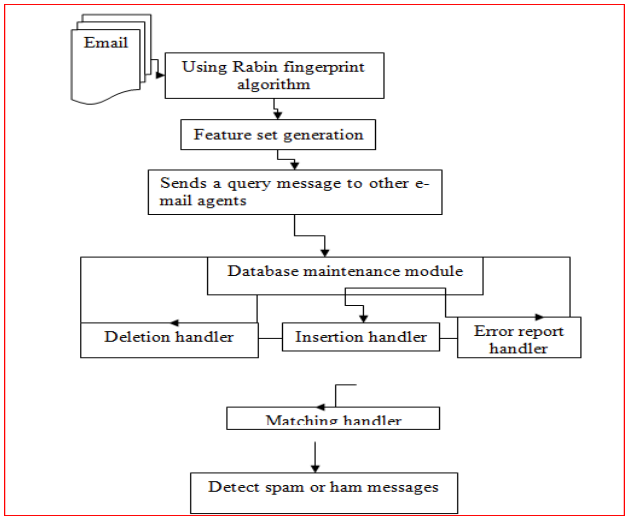

Figure 4PRIVACY PRESERVING MECHANISM

D.PERFORMANCE EVALUATION

In this module performance of proposed system is evaluated with the existing system. The performance evaluation consists of the following parameters such as, number of mails, execution time, Probability of matching, false negative, false positive, percentage of message trained. The execution time is also lesser than the time to execute in existing system.In fig5 the results show that the proposed system is more scalable than the existing system.The performance graph shows that the proposed system is more efficient than existing system.

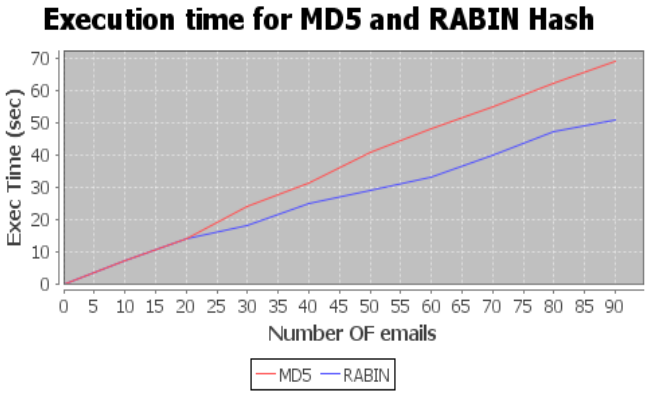

Figure 5 EXECUTION TIME FOR MD5 AND RABIN HASH

A high level of true positive rate is achieved as compared to existing system in fig 6.The spams are detected correctly and accurately by not misclassifying hams as a spams.

Figure 6 TRUE POSITIVE RATE OF SPAM DETECTION

IV. CONCLUSION

The project is implemented for detecting spam effectively in e-mail by using rabin hash fingerprinting algorithm and about 98% spams are detected efficiently.Privacy of emails is produced by rabin hash fingerprinting algorithm.By collaborative anti spam technique spam mails with their hash ranges are calculated in order to detect spams effectively .A new Algorithm must be proposed inorder to Detect Spams with much accuracy and with simple technique.

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Indigenous form of Paddy cultivation in Terrace and Jhum fields among the Nagas of Nagaland

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Abstract- Rice is considered as the staple food of the nagas in Nagaland. The state has over 70 per cent of the total area under rice cultivation which contribute to about 75 per cent to the total food production in the state. Naga farmers had been practicing Jhum and terrace form of paddy cultivation. Jhum or slash and burn cultivation, is a form of cultivation carried out on the slopes of a hill. This is done by clearing a patch of land for cultivation and rice is planted intermixed with large number of other crops. Terrace form of paddy cultivation is confined to few areas particularly practised by The Angamis and the Chakesangs. This form of paddy cultivation is possible in areas with uninterrupted water supply. Zabo system of rice cultivation is popularly practised by the farmers of Kohima and Phek district in Nagaland. Zabo is a combination of paddy, livestock rearing and fish rearing based on the locally available resources. It has an efficient arrangement to conserve water in the catchment and to supply water to the rice field. The farmers of Kohima and Phek district also plant alder trees in the jhum plot. The underlying aim of planting alder trees is to regain the soil fertility in the degraded land. After the soil fertility is restored the patch of land is used for cultivation. The farming system as stated is an innovation of the people developed through experience, wisdom and skill. Recent studies show that they have sustainable base and are environmental friendly. Apparently due to lack of proper irrigation facilities agricultural cycle in Nagaland continue to follow monsoon rain. and the monsoon is not uniform throughout the year. In the wake of monsoon uncertainty achieving self sufficiency in the food production is challenging. Thus a blend of the local indigenous knowledge with the modern technology is emphasized.

Index Terms- Indigenous farming, Terrace cultivation, Jhum cultivation, Paddy, Soil degradation, Water Conservation.

I. Introduction

The State of Nagaland falls between $25^0$60' and 27^0 40' latitude north of the equator and between 93^0 20' and 95^0 15' longitude. The state is a hilly terrain and has a geographical area of 16,579 square kilometres. The state is within eastern Himalayan agro climatic zone. The state receives an average annual rainfall of 2000 mm to 2500 mm. It rains for seven months long period from April to October and the rest of the year do not receive much rainfall. The major precipitation occurs between July to September. Both perennial and non perennial streams, springs, and rivers are the source of water in the state.

The major junk of the population resides in the rural areas and depend on agriculture to meet the basic needs. Agriculture is also the source of income to many people in the rural setting. Although people in the state also engages in other economic pursuit agriculture is the main economic activity. Apart from providing the food requirement and contributing to the economy agriculture is tied to the socio cultural life of the nagas. Among the food grain paddy occupies a central place with cultural connotation. The festivals of the nagas are celebration as pre harvest or post harvest of paddy. In Khezakenoma village in the Phek district of Nagaland a belief exist in the presence of a supernatural power in a particular slab of stone that on placing a paddy on it for drying multiplies the paddy. The Wanchos of Tirap district of Arunachal Pradesh protects the paddy and they believe that protection of paddy is essential to ensure security of other grains in the granary. Rice is also related to Godesses. The Assamese Hindus believe that it is the goddess Lakhimi that brought rice to the earth. The Meities of Manipur regards Phoinobi as a rice goddess. The Adis Of Arunahal Pradesh believe in seeking favour from goddess Mopin . They believe that Goddess Mopin gave the seeds for cultivation and taught the method of sowing to their ancestor (Ngachan, Mohanty & Pattanayak, 2012)). In the context of Northeast India there is so much diversity in the manner rice is cultivated due to the differences in physical conditions such as soil and climate. The geographical terrain is not uniform in the region and consists of both the valley and the hill areas. The people have different ways of cultivating the paddy as per the convenience and the resources available to them.

Terrace and Jhum cultivation are the predominant form of cultivation in Nagaland. Jhum cultivation is the older form of cultivation as compared to the terrace form of cultivation. Terrace cultivation is a recent intervention and operating in few rural pockets in the state. Paddy cultivation in Nagaland is further categorised into wet terrace paddy cultivation, wet paddy cultivation and Jhum paddy cultivation. Wet paddy cultivation are confined in the valley areas of Dimapur district. The Wet terrace cultivation is prevalent in Kohima and Phek district while the Jhum paddy cultivation is practiced in most of the districts. Jhum cultivation involves clearing of plots by cutting and burning down of forests. This has resulted in deforestation and serious environmental problem. The soil fertility is compromised and water balance is disturbed owing to excess deforestation. Thus people are becoming increasingly concerned and are looking for alternative means of efficient cultivation. Terrace cultivation is receiving wide appreciation and people are beginning to embrace terrace cultivation. The lesson imparted on efficient farming by the farmers of Phek and Kohima district is the focus of the discussion in the paper. Thus this paper looks at the various practices developed and adopted in Paddy cultivation

in the hill areas of Nagaland over the years based on the experience and wisdom of the people.

II. Importance of water in Indigenous farming

Agricultural sector is the largest consumer of water in the developing countries. Water supply to the crops is met through the exploitation of ground water reserve and the surface water. The growing demand for food due to overpopulation in the developing countries warrant to increase in food production through efficient water management. The amount of water required for crop production depend on the soil condition, the crop variety and other climate parameter such as temperature. In Nagaland Rice and Maize are the major crops and they also grow, millets, pulses, oilseeds, sugarcane, potato, and tobacco . The popular cash crops grown are tea, cardamom, jute, cotton, Potato and sugarcane. The vegetables grown are carrots, chillies, onions, spinach, cucumber, brinjal, tomatoes and mustard. Inspite of the effort the state still rely on the food grains imported from other parts of the country. One of major factor is due to the inefficient farming practise such as Jhum cultivation. Jhum cultivation results in soil and water deterioration. Thus some of the farmers begin to develop interesting farming practise as an alternative to Jhum cultivation.

We shall have a look at some indigenous farming practise in northeast India with efficient water management. The Apatanis constitute one of the major tribe in Arunachal Pradesh. They have developed indigenous practise of paddy cultivation cum fish rearing . The Apatanis work manually with their hands and divert the Water arising from the natural streams through networks of channels to the paddy fields. A pit is dug in each of the terrace field and fingerlings are introduced into the pit. During monsoon when the water is abundant the fishes move out of the pit to the terrace. The fishes then return to the pit when water is lessened in the terrace during the non monsoon period. In course of their mobility they receive essential nutrients in the form of paddy manures. This practise is ecologically viable as the land under this farming is used for cultivation again and again. Thus the Apatanis fish cum paddy culture is a perfect exemplary of efficient water and soil management (Rai, 2005). The tribal farmers in Jaintia hills of Meghalaya practise bamboo drip Irrigation. In this system the locally available bamboo resource is employed and the water from the natural streams is diverted to the crops land with the help of bamboo culms. The water is allowed to flow down through gravity. This practise is neatly laid out in such a manner that the leakage and loss of water is prevented at all stages and the site remains productive. Area nut, Betel vines and black pepper are the crops irrigated under this system. Since water is carried in bamboo culms there is no need of clearing of forest for creating water channels. This practise greatly add to the environment (Jeeva, Laloo & Mishra, 2006) .

Rainfall is an important factor influencing the pattern of crops. The seasons in the state is classified into pre monsoon, monsoon and Post monsoon. Pre monsoon occurs between March to May and monsoon period is from June to September . Post monsoon period is between October to February. 60.73% of rainfall is received during monsoon. which falls to 12.17% in post monsoon (Kusre & Singh, 2012). Rainfall is required to replenish surface water or the aquifers. The naga farmers grow their crops on the basis of the rain conditions. In fact the whole agricultural cycle in Nagaland is dependent on rainfall distribution. A good rainfall is also necessary for paddy cultivation. The cultivation of rice requires ploughing thoroughly and puddle with 3-5 cm of standing water in the field. The optimum depth of puddling is different for different types of soils. It is found to be around 10 cm in the clay and clay-loam types of soils. The purpose is to obtain a soft seedbed for the seedlings to establish themselves faster, to minimize the leaching losses of nutrients and thereby increase the availability of plant nutrients (Vermaagrian, 2011). The total area in the state under irrigation is 61,152.39 hectares. Most of the villages are scattered and perched on the hilltop and the cultivators traditionally cultivate the hill slopes either by making terraces or Jhumming. Irrigation is provided only in terraced fields wherever the facilities exist to bring water from the sources by gravity system through M.I. Channels. Jhum paddy is dependent on natural rainwater and no effort has been made to store the rain water in the field. The food grain production in the state could be raised if the land under forest and Jhum land is brought under permanent (Government of Nagaland)

III. Paddy cultivation in Jhum fields

In Nagaland the major land use pattern is slash and burn cultivation or Jhum cultivation. In this form of cultivation the patch of land that is to be cultivated is cleared of forest. On completion of cultivation the land is left fallow for some years Once the nutrient is replenished in the fallowed land the cultivation is done again on the same plot. Shifting cultivation, provide a source of livelihood to many people in the rural setting. And the region remained unaffected with the advancement of agriculture made possible by use of modern technology. They normally do not use any chemicals to restore degraded soil. However some indigenous technique are practised in some parts of the state to enhance soil fertility. Most of the farming activities is carried out manually with the use of simple tools and implements. Apparently there is no proper arrangement of supplying water to the crops in the Jhum field and the fallow period is increasing with lack of efforts to enhance degraded soil.

The recent trend of increase in population lead to excessive demand for food. And the area under forest are continuously converted into crop land. As a result of soil degradation due to excessive cultivation the cropping period in Jhum land is reduced. In Nagaland area under Jhum is about 56.50 % and contribute 49.26 % to total rice production. Studies show that the productivity of paddy in wet Terrace cultivation is more than the Jhum cultivation. The lower productivity of paddy under jhum is attributable to non adoption of efficient rain water management, weeding, improper sowing, and lack of sound plant protection measures (Rathore, 2008). The practice of growing varieties of crops in Jhum land is not new to the people in this region. In Wokha district alone about 20 to 40 crops are grown on the same plot with paddy as the main crop. In Koio village under Chukitong block of Wokha district the farmers grow few cash crops on the same plot with cardamom as the main crop. The boundary demarcation is set by planting Tung (Aleurite Montana). The farmers in the village also grow oil seed crop on the boundary. The passion fruit surrounds the main crop and it serves

as a fence to the crop. This practise is continuing for 20 years. This form of cultivation is done instead of shifting cultivation since Shifting cultivation is causing serious soil degradation. This form cultivation is helping the farmers in the village to improve their household income as well (ICAR)

Owing to problem of soil degradation in Jhum land the farmers of Khonoma village of Phek district of Nagaland grow Alder trees in great numbers. The idea behind planting Alder tree is to restore the soil fertility and make the soil suitable for cultivation. The soil fertility is restored through the root nodules of Alder by fixing atmospheric nitrogen. Apart from this Alder trees also provide shed to plantation crops such as coffee and cardamom thereby enhances their yield. This practice is in vogue for the past 100 years in the village. In the Jhum land cultivation is possible for 2 years within a span of nine years. But on the restored land in Alder farming the farmer is able to cultivate twice in 4 to 5 years period. The Alder seeds are usually planted on the degraded land and the tree is allowed to grow undisturbed. Only when the Alder attains full growth then only it is pollarded. Having pollarded the leaves and twigs that remain are burnt which later on serves as manure to the soil. Pollarding is done once in every four to six years. During the process the bigger branches are cut off from the tree and are used up as fire wood while the root nodules restore the soil fertility and prevents soil erosion in slopes (Singh, 1992).

The other benefits could be found in the Alder foliage which is used as fodder for Mithun and other cattle. The region receive high amount of rainfall during monsoon and the rate of the surface run off is high. This washes away the top layer of the Soil causing soil erosion. The Alder based farming also check soil erosion. This deep root system provide stability to the soil that tend to slip and erode. It is particularly useful in landslide prone area since it helps to prevent landslides . Alder tree grow even in less fertile soil they they are planted in the degraded land. Inspite of the many benefit alder plantation offers Jhum cultivation still continue to be a predominant indigenous practice of farming in the state. Jhum cultivation is tied to the socio cultural ethos as mentioned and is not easy to erase from the lives of the people. Nevertheless Alder based farming holds great potential and this practise need to be given due recognition, validated and even expanded to the rest of the region for amelioration of Jhum lands (Rathore, et al, 2010).

IV. Terrace form of Paddy cultivation

A Terrace is cut off from a sloped plane into successively receding flat surfaces or platforms that more or less appear like a staircase. They is formed in order to carry out farming activities in the form of bench terraces. Terraced field serves the advantage of reduced soil erosion and run off from the surface of the soil. It helps to retain water in the terraces that is used for growing crops such as rice. Zabo is an indigenous farming system devised by the people based on the available resources. This practise begin in Kikuma village of Phek district of Nagaland, The word “Zabo” means impounding of water and is a combination of forest, agriculture, livestock and fisheries management. The important aspect of the practise are efficient water and soil management and environmental protection thereby enhancing the crop productivity (Sharma & Sharma, 2004).

The top layer usually consist of the forest and the layer below the forest are the tanks specially constructed for the purpose of water storage from the catchment. The water along with soil from the catchment flows down and is stored in the tanks. Water from the main tank is released and it passes through animal yard. From the animal yard the dung and urine of the animals is carried to the field as manures. In case there is no available space for construction of tanks water from the catchment may be taken directly to the field. Ngachan, Mohanty and Pattanayak (2012) on their work on ‘Status paper on Rice in Northeast India described the various components of Zabo farming system as follows:

Forest land: The catchment area is about 1.5 ha or more and it is kept under undisturbed by allowing the growth of natural vegetation on upstream side of the pond and to enhance water availability .

Water harvesting system: Adjacent to the catchment area, water harvesting ponds or tanks are constructed by means of digging to form earthen embankment. The size of the pond is usually kept as 24 x 10 x2 m'. Silt retention tanks are also constructed at several points before the runoff water actually reaches the main pond. In the Silt retention tanks the water is cleared of succulents, soil and leaves and they are taken to the field as manures. This is done annually as a part of maintenance of the water harvesting system.

Cattle shed: The family that owns a cattle maintain the yard through an enclosure fenced with ordinary woods and bamboo branches. The cattle yard is managed jointly by a group of farmers on leaving the cattle in the enclosure on rotation basis. Buffaloes are the common animals kept in the enclosure and as many as 20 to 30 buffaloes are placed in a yard for 10 to 15 days. The enclosure is constructed preferably below the water harvesting pond. Water from the run off washes away the manure in the form of cattle urine and dung to the field. Split bamboo channels are also used to direct the dung and urine from the cattle yard to the exact point in the field from where it further gets distributed in the field

Agriculture land: Rice field are located in the foothills that is at a lower elevation than the water-harvesting pond. The area of the rice fields varies between 0.2-0.5 ha. The manures that reach the rice field are green manure of leaves, dung and urine of cattle. The rice field is also devoid of use of any kinds of chemical ferti1izers. Rice fields are thoroughly rammed at the time of puddling following different methods such as treading by human and cattle, wooden sticks and shoulder bunds with the use of paddy husks on the upstream side. Thus Zabo system undoubtedly is conservation based and can be a potential substitute to shifting cultivation but the difficulty lies in the fact that developing terrace farming in a hilly terrain like Nagaland could be challenging.

V. Conclusion

Indigenous farming systems occupies a special place in the life of the Naga farmers. It is based on local knowledge system and available resources. The indigenous practices such as Zabo and Alder farming is soil and water conservation oriented and is sustainable in the long run. But they are restricted to Kohima and Phek district and it needs to be promoted to other parts of Nagaland. This entails support and coordination between the

various concerned department, voluntary organization and the people for effective dissemination of knowledge and awareness. Since rice is a water intensive crop proper irrigation facilities need to be created and made available throughout the state. This will raise the food grain production enormously. Technological advancements enabled the people in different parts of the world to indulge in double cropping and attain self-sufficiency in food production. However most people in the region rely largely on the natural resource for meeting the basic needs. In spite of having bountiful natural resources the people have not been able to harness the most of it. Ignorance and careless handling of resource in many parts of the state resulted in much harm than benefit. Therefore an integrated understanding of the local knowledge and modern technology will best serve the people in the state.

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A Survey on Wireless Body Area Network

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Abstract- One of the most important emerging networks applicable in many fields is wireless body area networks (WBANS).In this paper we survey the wireless body area networks (WBANS) and their various applications in healthcare. In this paper a concise survey consisting of the various sections mainly focusing on the paramount aspect of WBANS and it applications in medicine to reduce the need for caregivers and to help the elderly and chronically ill people live an independent life.

Index Terms- WBAN, Wireless Body Area Network, Body Sensor Network, Mobile Healthcare, WBAN Survey.

I. Introduction

As healthcare costs are rapidly increasing with the world's population, there has been a need to monitor a patient health status anywhere both in and out of the hospital. This demand and the advancement in technology in mobile electronic devices, wireless communication, portable batters, and sensors as led to the development of wireless body area network (WBANS). A wireless body area network (WBAN) is a network with a special purpose design to operate automatically can autonomously connect and interact with various medical appliances and sensors, which is located inside or outside the human body. Apart from cost reduction and flexibility applications of WBAN in health care will offer significant advantages such as mobility of patients since portable monitoring devices and sensors are being used and secondly WBAN uses location independent monitoring devices which are not there in the contemporary electronic monitoring systems furthermore WBAN can connect itself to the internet and transmit data to a remote database or server and WBAN application can also be extended into military and sport areas where the soldier or player health status can be monitored. The main purpose of this paper is to present a very comprehensive and concise survey on WBAN and it various applications within the healthcare industries. Section (2) presents WBAN sensing and monitoring application in various medical scenarios, Section (3) examines the WBAN system architectures, WBANS network designs techniques such as the power reliability and efficiencies of WBAN is presented in Section (4). Section (5) explores various approaches to routing in WBAN, security techniques and protocols of WBAN are being presented in Section (6). While Section (7) presents the future scope of WBAN and its conclusion.

II. SENSING AND MONITORING

Sensing and monitory digital devices that an individual can wear on the body and are based on wireless technology are already in existence. There can be in the form of smart cloth or bandages which allows the continuous monitoring of blood glucose levels, blood pressure and other biometric data Wearable biosensors are the non-obstructive devices that helps to overcome the limitations of ambulatory technology and also provide a fast and energetic response to the need of monitoring patients over a long period of time and it works even in a distant area. We will like to start with the already existing sensors, basically there are two types of sensors which are the wearable sensors and the implanted sensor both type of sensor biological device which as a physiochemical transducer used to produce an electronic signal which is equal to a single analysis which is transmitted a to a detector. These sensors are been designs with respect to the fact that the outcome must be improved while the cost and bulkiness of the sensor are reduce. The real world physiological data gotten from the sensor is being sent wirelessly to the internet which is then forwarded to the doctor so this helps in the optimization of the well being of the patient's wellness by making the medical progress better and easier in the collection and analysis of the patient data.

A. Smart shirt

A smart shirt is like a wearable mother board. Basically a smart shirt is a cloth made from smart fabric mainly used to allow remote physiological monitoring of various vital signs of the wearer such as respiration rate, heart rate, temperature, activity, and posture. Vivo Metrics is claimed that Life Shirt was the first commercially available smart shirt, and recorded ECG, respiration using inductance plethysmography, accelerometry with optional plug-in pulse oximetry, GSR, microphone blood pressure, and electronic diary capture. Information from the shirt may be stored locally, or transfer to the wearer's doctor, coach, or through a personal server such as a wireless network like RF, WLAN, Bluetooth or cellular network.

A typical example of a smart shit is the Georgia Tech Wearable Motherboard as shown in figure 1.0 below. It uses optical fibers to detect wounds from bullets and special sensors to monitor the vital signs of the body. The smart shirt is the best possible solution to sensing, monitoring and information processing devices. With the Georgia tech wearable motherboard the vital signs of human beings could be measured in an un-obstructive manner. It was woven into a single piece garment on the weaving machine to fit 38-40" chest.

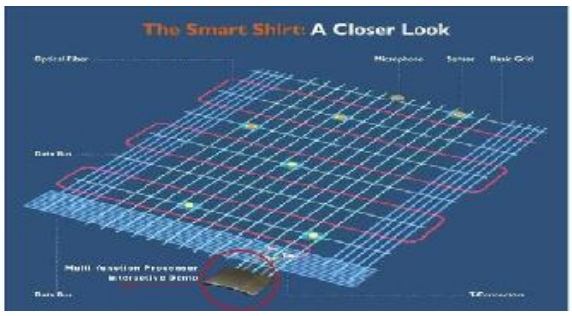

Fig.1. Georgia tech Smart Shirt (Wearable Motherboard)

The smart shirt technology shown in figure 2.0 has already led to an unobstructed and continuous monitoring for patients therefore play a major role in disease management such as heart disease, diabetes, high blood pressure ,chronic, depression by enabling early systematic intervention and bronchitis.

B. *Ring Sensor*

The ring sensor is a pulse oximetry sensor which helps in the continuous monitoring of oxygen saturation and heart rate in an un-obstructive manner. The ring sensor is a ring shaped device that can be worn for long periods comfortably. The ring sensor is made up of

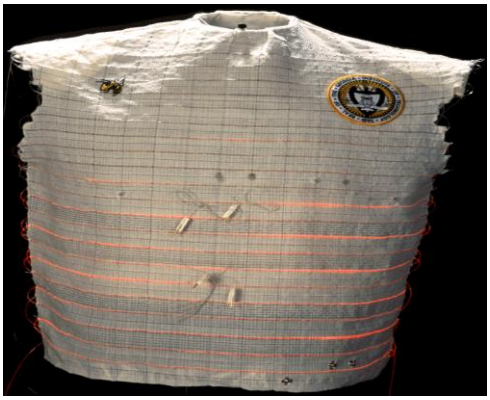

Fig.2 The Smart Shirt Technology

sensing devices like photodiodes, a transmitter, LED's and microprocessor in it. This sensor is made up of an optoelectric components which supports blood oxygen saturation non-invasively continuously and a long-term monitoring of the patient's arterial blood volume waveforms. These signals are transmitted to the doctor's computer for diagnosis of the patient's cardiovascular conditions. This system provides a continuous monitoring of the patient it provides unique and useful information for preventive diagnosis, which in long-term trends are more important.The ring sensor is design in such a way that the patient wear it comfortably 24 hous a day it is completely wireless. The principle of the ring sensor is mainly based on the contraction of the heart muscles Whenever the heart muscle contracts, then the blood is removed from the ventricles hence the transmission of pressure pulse takes place through the circulatory system. The displacement of vessel walls occur that that is measured to detect the changes in the blood volume when this pulse of pressure travels through the vessels.

The process is done by photoelectric method in which the photo conductors like photo resistors which are mainly used, then the amount of blood will increases in the finger when blood is forced to the extremities. It in turn changes the optical density and in turn reduces the light transmission through the finger and the resistance in the photoconductor increases. According to the increase of blood in the finger, a voltage divider circuit is connected with the photo resistor that produces a voltage that varies accordingly.

C. Activity/Motion Detection

An accelerometer is a sensor which can measures acceleration with respect to gravity, it can be used to determine the orientation of a body part even without movement hence The nature of motion and kind of activities an individual engages in can be detected by a system which combines a gyroscope with an accelerator Since a gyroscope is a sensor that helps to measure the angular velocity it can also be used to determine the orientation of a moving body.

D. Electroencephalography (EEG)

Electroencephalography (EEG) is simply the recording of electrical activity of the brain. In clinical enviroment, EEG is simply the recording of the brain's spontaneous electrical activity over a period of time, usually 28-43 minutes; Diagnostic applications mainly focus on the spectral content of EEG, that is basically the neural oscillations that can be observed in EEG signals. EEG measures the fluctuations voltage resulting from ionic current flows aroud the neuron of the brain. presently, ambulatory EEG (AEEG) recordings have been shown to have great value in the diagnosis of epilepsy and in the monitoring of patient response to therapy . Much of the information gotten from AEEG recordings may not be obtained during a routine, 20-min EEG test. This serves as motivation to develop wireless EEG sensors that will make there cording of AEEG signals during daily activities less obtrusive and less complicated.

E. Implantable Sensors

Implantable Neural Stimulators: Implantable neural stimulators send electrical impulses into the brain or spinal cord mainly use for the treatment of Parkinson's disease, intractable epilepsy and chronic pain. Spinal cord stimulation (SCS), in the simplest form, made up of stimulating electrodes, implanted in the epidural space, an electrical pulse generator, implanted usually in the lower abdominal area , conducting wires helps to connect the electrodes to the generator, and the remote control of the generator. Spinal cord stimulator is used mostly in treatment when failed back surgery syndrome occurs and complex regional pain syndrome.

III. WBAN SYSTEM ARCHITECTURES

In this section typical system architecture of a wireless body area network is presented with respect to its physical location, various network topology, applications and specific network design. A typical WBAN system architecture is made up of three main sections these are:

a. Wireless body area network(WBAN)
b. Personal server (PPS)

c. Medical sever for health monitoring system(MSHM)

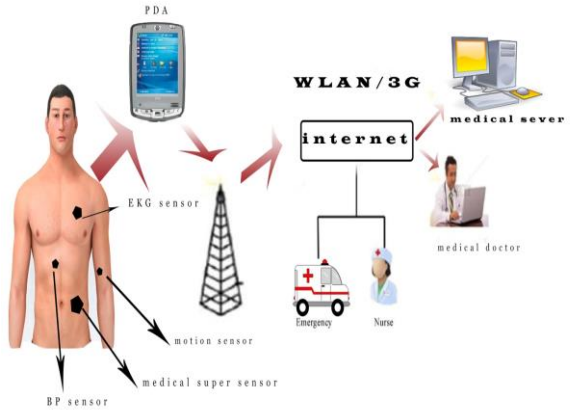

Fig.3 WBAN Architecture

in this section wearable sensors are being attached to the patent body this sensor will sense the necessary changes in health of the patient such ECG sensor, blood pressure sensor etc and providing a constant feedback to the healthcare monitoring system. the following are the most common main parts of the medical sensors.

A. *Radio trans-receiver*

A radio trans-receiver helps to transmit and receive sensed physiological data and it allso helps in communications between various nodes wirelessly

B. *Memory*

Helps to temporarly store the data that have sensed by the medical sensor.

C. *Micontroller/microproccessor*

Used to control the functionality of the component in the sensor node and also used local data processing

D.*sensor*

A sensor is the main chip which is used to sensed the physiological changes in the patient body and convert it into and electrical signals.

E. *Power supply*

Power supply happens to be a major factor in the medical sensor since it can easily affect the portability of the medical sensor. in the medical sensor batteries are normally used, this batteries can last up to several months even though a single sensor can sense and process many physiological signals at a time. a single battery power supply can power many sensors at a time such the electro- myogram(EMG) which is used for muscles monitoring activities, an electro cardio sensor (EKG) can also be used at the same time for monitoring the heart activities etc. This various sensors interacts with each other with the help of a local radio frequency while Zig-Bee can be used as the main communication protocol to communicate with the sever. in some cases a medical super sensor (MSS) is used to collect multiple samples of the sensed data from various body sensors and this reduces the amount of data that is to be transmitted by the BSNs because the Medical Super Sensors (MSS) helps to filter out all the redundant data. this in turn helps to improve the overall bandwidth utilization as well as a reduction in the power consumption of the BSs

F. *Personal server*

In this section the personal server uses a communication protocol with Zig-Bee to interfaces the WBAN nodes the setup is implemented on an Intelligent Personal Digital Assistant (IPDA). This keeps the authentication information of the patient and is configured with the medical server IP address in order to connect the medical services. It collects physiological vital signals from WBAN, when there is a sudden clinical change in the current patient health condition like changes in oxygen saturation, cardiovascular signals etc the transmission of critical data will be prioritizes and finally it processes it and forward it to the medical server. Moreover, the IPDA can perform the task of analyzing the physiological data intelligently and can also do a local reasoning to determine user's health status and provide feedback through a user friendly and interactive graphical user interface based on data received from MSS. A 3G communication protocol and other long range communications protocols such as GPRS and WWAN is used to connect personal server and the third tier together. In order to improve the overall quality of service for data transmission using IPDA, in terms of latency, band-width and power consumption a separated service based on two systems are showed. They are Data Compression and Priority Scheduling. In this method only the critical vital signs will transmit first while less critical signs are stored and transmit later this helps to reduces energy consumed by the IPDA during transmission.

G. *Medical Server for Healthcare Monitoring (*MSHM).

The Medical Server for Healthcare Monitoring (MSHM) receives data from the personal server, it is the backbone of the entire architecture. It is situated at a health care centers where medical services are provided like a clinic, hospital etc. MSHM keeps an electronic medical records (EMRs) of registered patients, which can be accessible by different medical staff in the medical center, this includes specialists, doctors and general practitioners from their offices in the medical center through the internet. MSHM is responsible for accepting data from various personal server, format the data and insert the received data into its EMRs and analyzing the data patterns. If the received data is out of range that is if there is a deviation from the normal threshold or an indication of a serious health anomalies condition, medical staff and doctors in the emergency unit can be notified to take necessary actions. if the patient is in an isolated area ,which is far away from the doctor and medical staffs a specialist doctor can observe the physiological data of the patient diagnose it, prescribe the necessary treatment and drugs for the patient. This information will sent back to the doctor in the isolated hospital through the internet. Moreover The MSHM also provides instructions to the patient, such as prescribed medications, exercises etc.

IV. WBANS NETWORK DESIGN ISSUES

Data transmission reliability and latency are very important in any WBAN which cololect non-critical and critical data from the various part of the human body. The reliability and latency of a WBAN will mainly depend on the design of the Medium Access Control layer and it physical design. The MAC layer helps to determine the network efficiency and utilization issues which mainly determine a system and operating costs of a WBAN. the design of the MAC layer also helps to determine the power consumption of a WBAN which is an important design issue. The physical layer also determines the reliability of the WBAN simultaneously.

A. Power efficiency

Power management is always an important operational issue in any design especially in WBAN. the power management in WBAN can be optimize by the PHY (physical) and the MAC (medium access control) layer processes. MAC layer introduces a much higher level of power saving by using several techniques such as packet transmission scheduling and channel access techniques it implements the use an intelligent signaling techniques and an optimal packet structure. By selecting appropriate modulation and coding techniques the PHY layer can increase the probability of successful transmissions. End to end packet delays and the power budget of a WBAN node can be reduce through a higher packet transmission probability.

B. Reliability

The reliability of WABN is directly proportional to the packet transmission delay and the packet loss probability. The probability of the packet loss is influence by the Bit Error Rate (BIR) of the MAC layer transmission procedures and that of the channel. by using an adaptive modulation and coding techniques which suites the channel conditions in which the transmission takes place the PHY layer of a WBAN can reduce the effective bit error rate of a transmission link. However the effective bit error rate can be reduce by implementing a forwards correcting error (EFR) technique. The use of this technique requires transmission of additional redundant bits which could increase the power budget of the WBAN node due to the transmission of extra bits. The situation of a network can also affect the can also affect the reliability and power budget of a WBAN. in order to transmit packets successfully when the interference and noise floor of a network is high a node needs to transmit at a very high transmitting power level.

C. Scalability

Scalability is very essential for a patient monitoring system such as WBAN because it is quiet often necessary to change the number of nodes and collect different physiological data from the patient body. when a WBAN is scalable it is easy for healthcare staffs to add or remove some nodes without affecting the entire WBAN operation. Since the PHY layers are fixed the scalability of WBAN is largely dependent on MAC layer this MAC layer plays a vital role in maintaining reliability under variable transmission and traffic conditions MAC layer also helps to maintain a good quality of service.

V. VARIOUS APPROACHES TO ROUTING IN WBAN

Frequent network partitioning due to postural mobility of the on-body sensors, , low transmission power of the sensors, high propagation loss across the human body and low reliability of end-to-end path from source to sink are the principal characteristics of a Wireless Body Area Network (WBAN) that make design of a routing protocol necessary. [1] Studied the Link layer behavior of WBANs at 2.4 GHz and observed the following:

(i) Environments do have an impact on PDR. In a lab setting more than 70% of links have PDR 90% or more; while in an open setting (on the roof) about 50% of links have 90% or more PDR.

(ii) Increasing transmission power at regions with low multipath increases PDR even more.

(iii) Average packet delivery ratio (PDR) increases with increase in transmission power.

The authors also found that channel symmetry is better in environments having more reflective surfaces (more multipath). Conventionally, there are mainly two approaches to routing in BANs. One approach is to design a routing layer on top of the MAC layer, where link qualities are measured based on selected parameters and taken into path computation the other is to implement the routing functions with the MAC layer, with a cross-layer approach.

The first approach has been investigated in [9] where the authors have proposed a probabilistic packet routing protocol, Probabilistic Routing with Postural Link Cost (PRPLC),using a stochastic link cost. The topology is being developed in the laboratory with on body sensor nodes using about 900 MHz Mica2Dot Motes operating in TinyOS. The motes consist of MTS 510 sensor cards from Crossbow Technologies and Chipcon's Smart RF CC1000 radio chips. The radio chips' transmission powers are decreased to set the range of transmission between 0.3 to 0.6 meters. The proposed protocol is based on postural link cost formulation using a time-varying cost, formulated for each link based on the area in the connectivity patterns of the links. The protocol uses postural link costs to compute probabilistic forwarding of data packets. The second approach has been studied and proposed in [3] Have proposed a cross-layer CICADA protocol that sets up a spanning tree and uses time slots for controlling each node's transmission and reception cycles. Each node tells its children about their turns for sending thier data. Data transfer takes place in a sequence of cycles: a data cycle and a control cycle. In the control cycle all nodes are informed about the order in of transmission. When all nodes receive their control schemes, that data cycle starts. In the data cycle each data scheme has two parts: a data period, and a waiting period. The data period also provides a contention slot to allow nodes to join the tree. This can provide mobility support for the network which helps nodes to get disconnected due to postural mobility also. The authors have also discussed the energy efficiency of the algorithm, which depends on the network topology. As the nodes have to spend time on idle listening and overhearing during the control cycle, depth of the tree plays a significant role in controlling the energy efficiency of the protocol.

VI. SECURITY PROTOCOLS OF WBAN

The WBAN and it infrastructure must implement a guarantee security operations with data integrity, confidentiality and privacy of the patients medical data. In addressing privacy issues in WBAN it must be ensured that the Health Insurance Portability and Accountability Act of 1996 (HIPAA) 1996 is observed.

Confidentiality: the network should be able to guarantee the secrecy of message exchange among nodes.

Data Integrity**:** it is needed to prevent the altering of data traversing the communication paths between nodes, and also to prevent replay attacks.

Privacy: The patients' data should not be disclosed to unauthorized entities. Medical information is one of the most sensitive forms of personal data.

Availability: Since this network carries highly sensitive, important and potentially life-saving information, it is of utmost importance that the network resources are available at all times.

Authentication: This is necessary to enable the WBAN to validate network nodes and thus prevent network compromise and/or node impersonation.

The below list shows the various emerging security approaches in WBANs.

A. *IEEE 802.15.4 Security*

Several security suites can be implemented under the IEEE 802.15.4. the security suite modes is classified mainly into two basic modes: the secured mode and unsecured mode. In the unsecure mode no security suite has been selected. The standard defines 8 distinct security suites .The first is the Null suite that provides no security at all. While the others can be further classified based on the various security properties they provide.The IEEE 802.15.4 Security Suites is given below:

Name	**Description**
Null	No security
AES-CTR	Encryption only. This provides access control, data encryption, and optional sequential freshness.
AES-CBCMAC-128 AES-BCMAC-64 AES-BCMAC-32	Authentication only allowing flexibility by the selection of different MAC lengths: 32, 64, 128 bits.
AES-CCM-128 AES-CCM-64 AES-CCM-32	This provides authentication and encryption allowing flexibility by the selection of different MAC lengths: 32, 64, 128 bits

Table.1. IEEE 802.15.4 Security Suites

C. Hardware Encryption

Hardware encryption is been implemented in a WBAN with off-the-shelf ZigBee platform but Not all the sensor node hardware have hardware encryption support. Hardware encryption can be implemented utilizing the ChipCon 2420 ZigBee compliant RF Transceiver. The CC2420 is able to execute IEEE 802.15.4 operations with AES encryption using 128-bit keys for security. These security operations consist of the counter (CTR) mode encryption and decryption, CCM encryption plus authentication and CBC-MAC authentication.

D. Tiny Sec

Tiny Sec is very popular in the wireless sensor community and has even been implemented on a variety of custom hardware. It is a software based security architecture that implements link-layer encryption. It is a component of the official Tiny OS release. Tiny Sec encrypts the data packet with a group key common to the sensor nodes and computes a message authentication code (MAC) for the entire packet including the header. This group key is shared network-wide and manually programmed into the nodes prior to deployment. This network-wide key presents a single point of vulnerability. Tiny Sec does not protect against node capture.

E. ZigBee Security Services

ZigBee defines a new standard for ultra-low power wireless communication.The ZigBee network layer (NWK) is designed to operate on top of the IEEE 802.15.4 defined PHY and MAC layers. The ZigBee standard defines extra security services including processes for key exchange and authentication. ZigBee standard specifies a "Trust Center". which performs it functions by the ZigBee coordinator. The Zigbee coordinator is responsible for joining the network and the distribution of keys.

F. Biometrics

Biometrics presents itself as a useful mechanism to use in the key establishment and Authentication of body sensor nodes .This processes uses measurement of physiological Characteristics of the body itself as a parameter in a symmetric key management system. The necessary characteristics for a useful biometric physiological value are presented below:

- Invulnerable: difficult to compromise
- Acceptable: adoption by the public
- Time variance: changes over time
- Effective: able to implement a relatively secure biometric system within the constraints of processing, computing and power of the body sensor nodes
- Random: difficult to guess
- Collectable: easily measured and collected
- Universal: possessed by most patients
- Distinctive: sufficiently different in any two patients

G. Elliptic Curve Cryptography

Elliptic curve cryptography (ECC) presents itself as a viable option for public key cryptography in wireless sensor networks. The main reason for this is its small key size and compact signatures and its comparatively fast computation. Even though ECC has been successfully implemented in several variations it is still not a top choice for WBAN. This is mainly because of its energy requirements which are still significantly higher than symmetric systems. Because of this, many have proposed that ECC be implemented only for infrequent and security-sensitive operations such as key establishment during the initial setup of the network or code updates.

VII. FUTURE SCOPE AND CONCLUSION

Although wireless technology in the field of healthcare and medical applications is still nascent Wireless Body Area Network (WBAN) holds the promise to become a key infrastructure element in remotely supervised, home-based patient rehabilitation. As it has the potential to provide better and less expensive healthcare services and provides much benefit to patients, health care staffs, and the society. Already commercial products are being developed by several companies to solve wide range of health care problems. WBAN provides a continuous monitoring of the patient health it will improve the quality of life as it will allow patients to engage in normal activities of daily life, rather than staying at home or close to specialized medical services like hospital clinics etc. Some of the future applications of WBAN include Context-Sensitive Medicine, Patient Homecare and a Pre hospital Mobile Database for Emergency Medical Services.

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Physico-Chemical Characterization of farmland Soil used in some villages of Lunawada Taluka. Dist : Mahisagar (Gujarat) India

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Abstract- This Physco-Chemical study of soil is based on various parameter like PH, Electrical Conductivity(EC),Total Organic Carbon, Available Nitrogen (N), Available Phosphorus (P_2O_5) and available Potassium (K_2O). This study lead us to the conclusion of the nutrient's quanity of soil of Lunawada Taluka. Dist. Mahisagr, Gujarat State. Soil sampling is the most vital step for any soil Analysis. As a very small fraction of the huge soil mass is used for analysis. It becomes extremely important to get a truly representative soil sample of the field. Result show that overage all the villages of Lunawada taluka have various parameter like EC, PH, OC,N,P,K. This information will help farmers to decide the problems related to soil nutrients amount of fertilizers to be added to soil to make production economic.

Index Terms- Quality of soil, EC, PH,Total organik carban, Available P, N,K, Lunawada taluka

I. Introduction

Soil sampling is perhaps the most vital step for any soil analysis. As a very small fraction of the huge soil mass is used for analysis, it becomes extremely important to get a truly representative soil sample of the field. Soil test based nutrient management has emerged as a key issue in efforts to increase agricultural productivity and production since optimal use of nutrients, based on soil analysis can improve crop productivity and minimize wastage of these nutrients, thus minimizing impact on environmental leading to bias through optimal production. Deficiencies of primary, secondary and micronutrients have been observed in intensive cultivated areas.[1]

Several state including Andhra Pradesh, Gujarat, Haryana, Karnataka and Uttar Pradesh have made commendable progress in soil testing programme in various ways. . This compendium is and effort to put together existing status of soil testing facilities state wise and highlight main issues in soil testing programme compendium on soil health [2]. Soil is important everyone either directly or indirectly. It is natural body on which agricultural product grow and it has fragile ecosystem [3,4]. Soil are medium in which crop grow to food and cloth the world. Soil fertility vital to a productive soil. Certain external factors control plant growth, air, temperature, light mechanical support, nutrients and water. Plants had elements for their growth and completion of life cycle. They are carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, etc [5].

Soil samples of 10 different villages of tribal area surrounding Dahod. The physicochemical properties such as moisture content, specific gravity, PH measurement and estimations of Mg^{2+}, Na^+, K^+ and Cl^-, HCO_3^-, PO_4^{3-}, NO^{3-} %of soil were well studied. The fertility of the soil depends on the concentration of N,P,K organic and inorganic materials and water. Nitrogen is required for growth of plant and is a constituent of Chlorophyll, plant protein and nuclei acid. Phosphorous is most often limiting nutrients remains present in plant nuclei and act as energy storage. It helps in transfer of energy. Potassium is found in its mineral form and affect plants all division, carbohydrate formation, translocation of Sugar, various enzyme action and resistance to certain plant disease, over 60 enzymes are known to require potassium for activation. Amount of nutrients to be added to soil for crop production depend on their present amount in that soil. Fertilizer addition is recommended, now a day an STR (Soil Test Recommendation) basis in which contents of major nutrients (N, P, K) are determined following standard methods before sowing. Their values suggest quality of soil in terms of its nutrients contents i.e. high, medium, or low nutrients. These nutrients content are than deduced from required amount of nutrients for following crop and this much amount of nutrients is now recommended for addition to soil [6,7].

There is no intent with this system to make any interpretation as to the potential environment impact of sensitive nutrients, such as phosphorus. This interpretation system is meant strictly for the determination of current soil suitability for agronomic or horticulture crop production. While nutrient availability can be important in gauging the potential for adverse environment effects, it is only one factor in the overall picture. Slope, ground cover, incorporation of nutrient sources, timing of application and other considerations all affect the potential movement of nutrients off-site and their potential for adverse environment impact on surface and ground water [8,9]. In cold climate, rapid root development early in the season is important. To encourage this, a small amount of starter fertilizer may be recommended for some crops even though the available level in the soil may be rated optimum or even excessive. This applies primarily to phosphate (P_2O_5) recommendations, since on adequate available P level is critical in promoting early root growth. Starter fertilizer nutrient quantity is typically less than normal crop removal. Soil fertility testing is really the combination of three discrete but interrelated processes : analysis, interpretation, and recommendation [10]. Stefanic's definition [11] approaches the

most the fundamental biologic feature of soil fertility. Fertility is the fundamental feature of the soil that results from the vital activity of micro- population of plant roots of accumulated enzymes and chemical processes, generators of biomass, humus, mineral salts and active biologic substance. The fertility level is related with the potential level of bioaccumulation and mineralization processes, these depending on the programme and conditions of the ecological subsystem evolution and on anthropic influences". This definition has the quality to be analytical. Understanding the definition in detail, the analyses of soil samples can be used for quantifying the level of soil fertility.

Phosphate (P_2O_5) Requirement for different crops is calculated by the equation [12] P_2O_5 requirement= crop removal + (50- no.PX's) x multiplier = pounds per acre.

The number of PX's is taken form the phosphorus bar graph, which is derived form the pounds per acre P test level. Phosphate requirement are also rounded to the nearest 10 pounds per acre. Minimum and maximum limits are also imposed, as with potash requirement. Crop removal values are different for each crop. The multiplier is derived from two factors : (1) The conversion from elemental phosphorus (P) to fertilizer phosphate (P_2O_5) - [roughly a factor of 2] and (2). The average efficiency or effectiveness of added phosphate for each crop. Efficiency is the percentage of fertilizer applied which is actually taken up or which remains plants available in the soil. Phosphate efficiency is a function of several factors including soil PH, soil organic matter level, whether the fertilizer is banded or broadcast, and how thoroughly the crop rooting system exploits the plow layer. See individual crop sections for assumed efficiency and crop removal factors.

Present study is an attempt to find out the nutrient's quantity in soil Lunawada taluka Mahisagr, Gujarat. This information will help farmers to decide the amount of fertilizer to be added to soil to make the production economic. The objective of this paper was to analyze the trend in PH, EC,OC, N,P, K status of soils of Lunawada taluka of Gujarat State.

II. Experimental

The quality test survey of the soil was conducted in 2013. Fifteen villages from Lunawada Taluka covering North, South, East and West were selected for this study. A representative soil sample collected from each village which represent soils of 5 to 10 farm's depending upon area of village. Representative soil samples were collected following standard quadric procedure and taken in polythene bags. In laboratory these samples were analyzed for different chemical parameters following standard methods [13]. AR grade reagents and double distilled water were used for soil analysis. Results were compared with standard values [14] to find out low, medium or high nutrient's content essential for STR.

III. Physico - Chemical Analysis

The collected samples were analyzed for major Physical and Chemical soil quality parameter like PH, Electrical Conductivity (EC), Organic Carbon (OC), Nitrogen (N), [15,16]. Organic matter is oxidized with chromic acid (Potassium Di-chromate, + H_2So_4) . This method is widely used in Indian Laboratories. The K and P analysis by standard method.

PH was measured using PH meter(Model no. 361), EC was measured using a conductivity meter (Model no. 304), OC was measured using colourimeter (Model no. 112), Potassium was measured using Flame photometer (Model no. 130), Phosphorus was measured using Spectrophotometer (Model no. 166). All apparatus are Systronic make. Examination of soil done by Anand Agricultural University, Gujarat.

IV. Result and Discussion

Total 15 villages soil samples of Lunawada Taluka, Dist : Mahisagar were collected in clean polythene bags and brought to the Laboratory it is the permissible standard according to Anand Agricultural University. Air dry the soil samples in shade, crush the soil clods lightly and grind with the help of pestle and mortar, pass the entire quantity through 2mm stainless steal sieve, if the gravel content is substantial record as percent of the sample (w/w) as to pass it through 0.2 to 0.5 mm sieves, processing of the samples for analysis.

V. Determination of Soil

(1) Soil Temperature :-

Soil temperature is one of the most important soil properties that effect crop growth. The major source of heat is sun and heat generated by the chemical and biological activity of the soil is negligible.

(2) PH :-

The soil reaction or PH is meant to express the acidity or alkalinity of the soil. The PH is very important property of the soil is it determines the capacity. The PH values fluctuated less than 8.5(table-1) .The limit of PH value for soil Acidic. < 6.5, Normal 6.5-7.8, Alkaline 7.8- 8.5, Alkali > 8.5.

(3) EC :-

Total soluble salts are estimated from electrical conductivity (EC) of aqueous soil extracts. Standard value of EC in soil- Normal < 0.8 dsm^{-1}, critical for salt sensitive crops, critical for salt tolerant crops 1.6 -2.5 dsm^{-1}, Injurious to most crops > 2.5 dsm^{-1}. The EC value 04 to 1.8 (table no.1)

(4) OC and Nitrogen(N) :-

Soil organic carbon is the seat of nitrogen in soil and its determination is often carried out as an index of nitrogen availability. In the colorimeter method (Datta et al, 1962), Organic matter is oxidized with chromic acid. OC in Lunawada taluka 0.23 to 0.85 (table no.1) .Standard value of OC low < 0.50, medium 0.50- 0.75 and high > 0.75.

(5) Phosphorus :-

Phosphorus was found in the range of low, medium, high (table no.1) . Inorganic phosphorus as orthophosphate plays a dynamic role in aquatic ecosystem. Phosphorus , the most important micro nutrient, is utilized by plant in the form of $H_2PO_4^-$ & HPO_4^{2-} species.

(6) Potassium :-

Standard value of K as K_2O in soil low < 140 kg K_2O ha^{-1}, medium 140-280 kg K_2O ha^{-1}

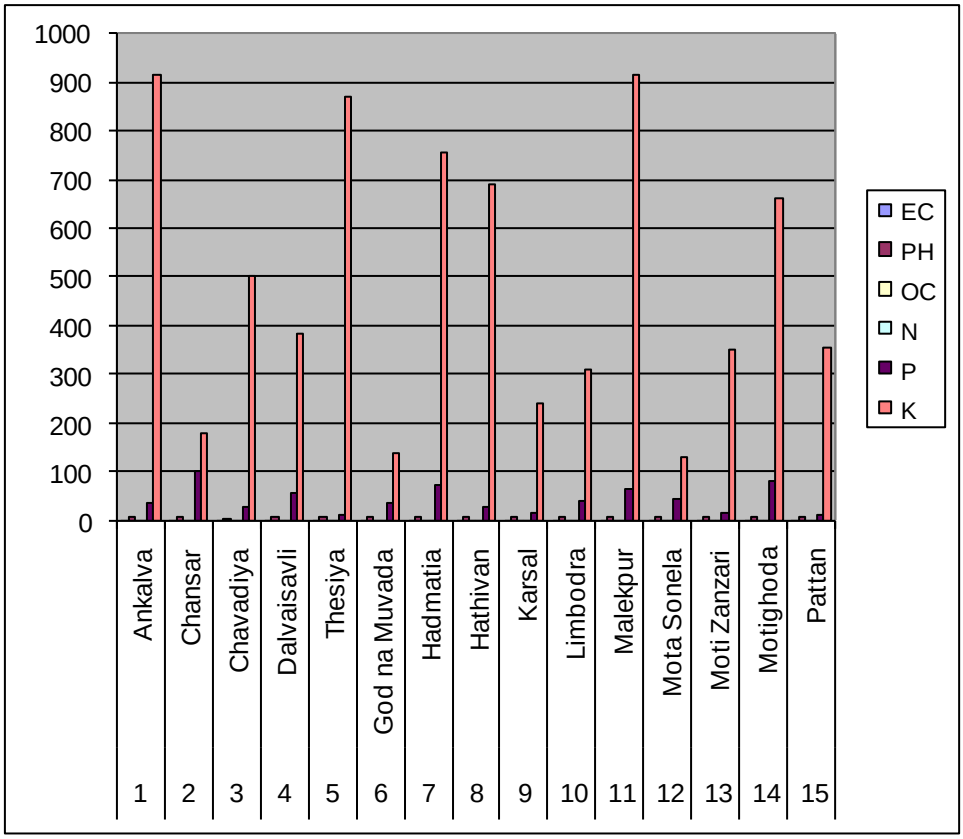
high > 280 kg K_2O ha^{-1} . Potassium was found in the range of low, medium , high (table no.1). K though present in small amount in soil sample, plays a vital role in the metabolism of fresh water and considered to be an important micronutrient. The K is relatively abundant in the earth's crust, most of it is not accessible to plant.

Experimental value of quality characteristic especially PH, EC, OC, N, P, K, of soil of Lunawada Taluka are present in the table no. 1. Result are in tune with farming practices followed by farmers of this region. Most of the farmer's are using chemical fertilizer, Urea and Nitrogen fertilizer only since last 25 to 30 years which contains concentrated amount of Nitrogen, OC & Phosphorus. On the basis of these results farmers are advised to use integrated nutrient management practice to maintain optimum concentration of all the essential nutrients for plants. Farmers are also advised to add bio-fertilizers containing organic carbon and nitrogen solubilising bacteria.

Table 1 : Study of Presence of EC, PH, OC, N, P, K, in the soil of Lunawada taluka territory District : Mahisagar

Sr.No.	Name of Villages	EC	PH	OC	N	P	K
1	Ankalva	0.5	7.1	0.5	0.04	37	914
2	Chansar	0.2	7.1	0.8	0.07	100	178
3	Chavadiya	1.3	6.1	0.5	0.04	30	503
4	Dalvaisavli	0.5	7.5	0.7	0.06	57	383
5	Thesiya	0.5	6.9	0.7	0.06	12	868
6	God na Muvada	0.3	6.5	0.5	0.04	38	137
7	Hadmatia	0.7	7.8	0.4	0.03	74	754
8	Hathivan	0.8	6.9	0.5	0.04	27	690
9	Karsal	0.7	6.9	0.5	0.04	16	242
10	Limbodra	0.4	7.8	0.5	0.04	42	310
11	Malekpur	0.6	7	0.7	0.05	66	914
12	Mota Sonela	0.4	6.8	0.8	0.06	46	132
13	Moti Zanzari	0.4	7	0.6	0.05	15	352
14	Motighoda	0.3	6.7	0.6	0.05	80	663
15	Pattan	0.4	6.9	0.3	0.03	13	355

Figure 1 : Number of samples of 15 villages Lunawada taluka lies in EC, PH, OC, N, P, K



VI. Conclusion

This can be concluded from this study that the available EC, PH, OC N, P, K, deficient soil is recommended rich fertilizer. To predict the probable crop response to applied nutrients. To identify the type and degree of soil related problems like salinity, alkalinity and acidity etc. and to suggest appropriate reclamation / amelioration measure. To find out suitability for growing crops and orchard. To find out suitability for irrigation. To study the soil genesis. The soil sample studied area of Lunawada Taluka. Dist : Mahisagar has been found to be fit for crop productivity.

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Spontaneous Pneumothorax in a Term Neonate – A case Report

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Abstract- Spontaneous pneumothorax is a recognised cause of respiratory distress in the neonatal period. Spontaneous pneumothorax occurring during the neonatal period in a term neonate is rare. We report a case of symptomatic spontaneous pneumothorax associated with congenital heart disease which needed intercostal drainage and mechanical ventilation in our NICU unit.

Index Terms- Spontaneous pneumothorax; Term Neonate

VII. Introduction

A spontaneous pneumothorax is present shortly after birth in 1% to 2% of all infants, and the pneumothorax is symptomatic in approximately half of these. The incidence of spontaneous neonatal pneumothorax is twice as high in male as in female infants. Affected infants are usually full- or post-term. Usually, the infant has a history of fetal distress requiring resuscitation or a difficult delivery with evidence of aspiration of meconium, blood, or mucus. There is a high incidence of pneumothorax in infants with neonatal respiratory distress syndrome. Here we report a case of spontaneous pneumothorax in a term neonate in our NICU unit.

I. Case report

A 2440 gm male neonate was referred to our NICU unit from a private hospital for respiratory distress. Baby was born at 40 weeks gestation by emergency LSCS for the indication of PROM of 4 hours duration to a primi mother out of non consanguineous marriage. Baby cried well immediately after birth. Apgar score was 8/10 and 9/10 at 1 min and 5 minutes respectively.

But Baby developed respiratory distress at 1 hour of life. Hence baby was shifted to our unit and was placed on hood Oxygen.

On admission to nicu, Baby had a respiratory rate of 70/min, SpO2 85% with oxygen 10 L/min flow through Hood. There were chest retractions and air entry was reduced over right hemithorax and there was fullness over right chest.

An urgent Chest X ray was ordered which revealed a right sided Pneumothorax with mediastinal shift to the opposite side (Fig 1). ABG revealed severe respiratory acidosis. (pH – 6.98, PCO2 – 123, PO2-37.7 mmHg). In view of impending respiratory failure and shock baby was intubated and was put on assisted ventilation with inotropic support. Baby was started on Cefotaxime and Amikacin.

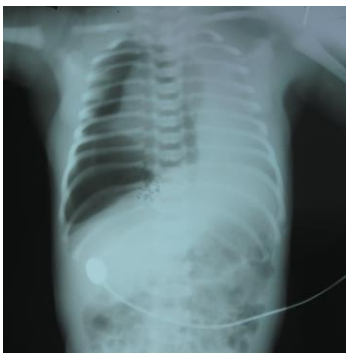

Fig 1. Showing Rt pneumothorax at 4 hrs of life.

We placed an emergency Intercostal drainage tube on the right chest. Check X ray showed ICD in position and the ICD was functioning well (Fig.2). Next day there was minimal turbid pleural fluid on right side of chest and was draining through the ICD tube. Hence the pleural fluid was sent for gram staining and culture. Antibiotic were stepped up to Piperacillin-tazobactum along with Amikacin.

After 48 hrs baby was weaned off from ventilator and inotropic support was gradually withdrawn. Pleural fluid culture showed gram negative bacilli (Burholderia cepacia) which was sensitive to Piperacillin. Hence same antibiotics were continued. Blood culture done twice showed no growth. Trophic feeds were started gradually and baby was tolerating feeds well.

USG cranium and abdomen KUB were found to be normal. 2D Echo showed ASD ostium secundum type 4mm in size. CT Thorax showed right sided pneumothorax with minimal basal right sided pleural effusion with collapse. No evidence of CCAM. (Fig. 3).

Baby improved with antibiotics and was on full feeds after 10 days of NICU admission. Antibiotics were stopped after 14 days and check X ray taken revealed a normal lung (Fig. 4). Now baby is on direct breast feeds with adequate weight gain and no respiratory distress.

Fig 2. Showing ICD in situ Rt chest

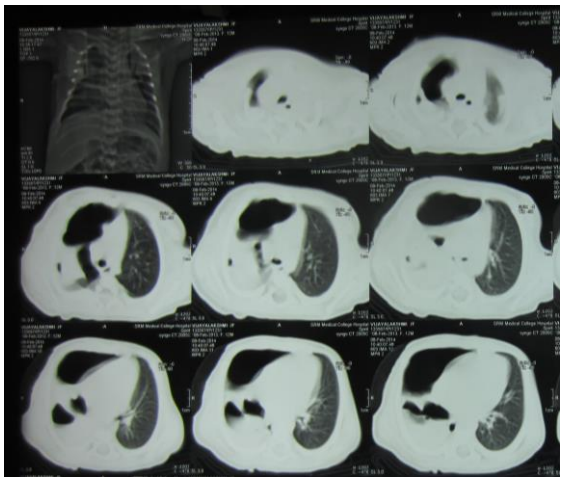

Fig 3. CT Thorax showing Right pneumothorax

Fig 4. Showing resolving pneumothorax with good lung expansion.

II. Discussion

Pneumothorax can occur due to resuscitation, Positive pressure ventilation, very commonly. Meconium aspiration, and respiratory distress syndrome may be associated with spontaneous pneumothorax in newborn. [3].

Pneumothorax may develop in term newborns without pulmonary pathology or positive pressure ventilation, and this is most probably due to high transpulmonary pressure generated with the onset of breathing [1]. Male gender and excessive birth weight are among the reported risk factors [4]

Co-existence of spontaneous pneumothorax and major congenital renal pathologies in term newborns has been reported in some studies [2, 4, 5]. Al Tawil et al. [2] found a urinary tract abnormality in 1.7% among 80 patients.

Our literature search has revealed a link between cardiac anomalies [9] and symptomatic spontaneous pneumothorax. Patients with less than 15–20% unilateral pneumothorax and no underlying pulmonary disease usually do not require treatment, as the condition usually resolves spontaneously.

However, if more than 20% of the lung field on one side is affected and/or if the patient'sclinical condition is deteriorating and causing respiratory insufficiency, underwater drainage is mandatory [6, 7].

In conclusion, although symptomatic spontaneous pneumothorax is a rare occurrence in term newborns, early recognition and treatment is life saving. Usual manifestation is progressive respiratory difficulty starting soon after birth.

As previous studies have shown [5, 6, 8, 9], association of cardiac and renal abnormalities, we did echocardiography in addition to renal ultrasonography. Echo revealed ASD where as Renal ultrasound was normal.

Hence in a case of spontaneous pneumothorax, the associated renal and cardiac abnormalities are to be screened for and timely intervention in the form of intercostal drainage is lifesaving.

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Emperical Analysis on Determinants of Non-Profitability Margins: A Case of Telkom Kenya in the Telecommunications Industry

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Abstract- The purpose of this study was to investigate factors contributing to the financial losses that have been incurred over time at Telkom Kenya. The study specifically sought to understand if the management style had an impact on the Telkom Kenya performance; to investigate the impact of competition on the company profit levels, to evaluate the impact of the labour cost on profitability level. The study adopted the survey research design because not much study had been carried out on Telkom Kenya. The study used desk research, secondary data evaluation and internet. The data was analyzed and presented through use of descriptive analysis, and content analysis. The findings of study concluded that there was positive relationship between the impact of competition and labour cost to Telkom Kenya Profitability that led to losses. The study recommended the need to search for stronger enhanced innovated products to broaden its profits.

Index Terms- Kenya Telkom, Profitability, Telecommunication losses, competition.

I. Introduction

Even before the declaration, many developing countries had started liberalizing their internal policies to enable efficiency as to attain affordability and reach ability of telecommunication system. By 1995, most of the low income developing countries of the world, made their economies global, by liberalizing the domestic licensing and important policies on the whole, to facilitate inflow of foreign capital into the infrastructure sector, especially in the telecommunication sector. This resulted in a telecom revaluation, with countries adopting liberalization initiates, experiencing a never-before‟ growth in the telephone network, including the penetration levels. Developing countries today account for 49% of the total telephone network in the world (Nasit, 2011).

The telecommunication sector enjoyed some of the highest growth rates during the bubble of the late 1990s, but since 2000 the sector has lost more in terms of dollars invested than what has been lost on Internet investments during the same time frame. MCI WorldCom, Deutsch Telekom, France Telecom, Telecom Italia, and many other stalwart telecommunications companies across the world are in financial trouble. Furthermore, the only sort of recovery that has been mentioned in the telecommunications industry has been a “jobless” one (Donald, 2003).Finally, recent financial adjustments by a large telecommunications company in the US to write down the value of long-term assets, such as plant, property and equipment, have put yet another damper on investment in the sector. (Donald, 2003)

II. Statement of the Problem

The process of the management of the company’s portfolio made a change of governance structure in terms of share holdings where by the Kenyan government had a share of 49% which accordingly has been diluted without proper notice given to the Communication Commission of Kenya (CCK) to reach 30% as a result the Treasury allowed France Telkom to write off Ksh 30 billion worth of loans that it owed the Telkom’s in Lieu to 19% drop in shareholding. This Move according to the parliamentary Committee resulted to the loss of billions of shillings by the taxpayers (Wahome, 2013).

The re-organisation of Telekom Kenya is billed as the most expensive in corporate Kenya having consumed nearly Sh130 billion in the past seven years. The process began with KSh85 billion clean-up of Telkom Kenya’s books in readiness for its sale to France Telecom in 2007 (Fayo, 2013). In the 2010 financial year, Telkom Kenya suffered a net loss amounting to Sh4.3b on a gross income for the same period of some ten billion shillings. Even as the Communications Commission of Kenya (CCK) painted a bleak picture of the network company controlling less than 1 percent of voice calls (Wahome, 2012).

Telkom Kenya had made a request to be given cash bail injection of up to Ksh 13 billion to be utilized as outlined; that is KSh4.5 billion to fund operations for the second quarter of the year, KSh2.5 billion to refinance a Kenya Commercial Bank loan and overdraft facilities maturing on May 31, 2013, KSh3.6 billion to refinance a Standard Chartered Bank loan, and Sh3.3 billion to refinance a bridge loan by the subsidiary of France Telecom, Orange East Africa, which was to be paid by June 28, 2013. In 2012, the government was forced to participate in an expensive restructuring in which, was a huge cost to the taxpayer, it not only pumped into the company Sh2.5 billion in fresh shareholder loans, but also wrote off more billions in past shareholder loans (Editor, 2013).

This latest request for shareholder support is the clearest sign so far that the highly touted balance sheet-cleaning exercise which was supposed to return the company to a profit-making path did not make even the slightest improvement in the company’s financial fortunes (Editor 2013). This study therefore investigates the determinants of non-profitability margins in Telekom Kenya.

III. General Objective

The broad objective of the study was to investigate the determinants of non-profitability margins in Telkom Kenya in the telecommunications Industry.

Specific Objectives

The specific objectives of this study were:

1. To examine the impact of competition on Telkom Kenya profitability level.
2. To examine the effect of labour cost on Telkom Kenya profits.

IV. Research Methodology

This study adopted the survey descriptive design to answer the research questions which were to analyze the factors determining non-profitability margins in Kenya in the telecommunications industry. Descriptive research design can be used in both quantitative and qualitative research projects. Descriptive survey research is used in exploratory studies to allow researchers to gather information and summarize, present and interpret data for the purpose of clarification (Orodho, 2003).

The study target population is the complete set of individual's cases or objectives with some common characteristics to which the research wants to generate the results of the study (Mugenda & Mugenda, 2003). The study was a desk survey, intended to analyze the available literature on the variables that explain the factors contributing to low profitability margins in Telkom Kenya. The appropriateness of this method to the study was the ability to review a wide variety of secondary literature that is relevant to the research topic.

The study comprised of Telkom Kenya as an industry and made use of only secondary data which was extracted from various published sources as well as the internet. These included books, journals or periodicals, newspapers or magazines, Telkom Kenya and Communication Commission of Kenya (CCK) websites. Content analysis method was used in view of the qualitative nature of much of the data collected. The method was quite appropriate in the analysis of the contents of documentary materials such as books, journals, newspapers, internet resources, and statistical reports.

V. Results and Discussions

Impact of Competition on Telkom Kenya

Three of the four local mobile operators gained new subscribers in the three months to December 2012, even as the overall sector growth rate slowed down. Data from the Communications Commission of Kenya shows that Safaricom Kenya limited, Essar Telecom Limited and Airtel Kenya netted more subscribers in three months to December2012, while Orange Telkom Kenya lost their customers. Safaricom Kenya Limited gained 593,036 new subscribers, representing a growth of 3.1 percent. Essar Telecom Limited gained 223,974 new subscribers while Airtel Networks Kenya Limited signed up 91,283 subscribers. On the other hand, Telkom Kenya (Orange) lost 609,321 subscribers, representing a decline of 19.7 percent. However, there was minimal change in terms of the market share with Safaricom gaining 1.3 percentage points to control 64.5 percent. Yu Mobile's market share grew to 10.5 percent from the 9.9 percent recorded during the previous period while Airtel Kenya stake increased by 0.1 percentage point's to16.9 percent. Telkom Kenya is the only operator that lost stake shedding 2.1 percentage points to control 8.1 percent of the market (Dyer and Blair, 2013).

There is a revelation of a beating in voice-driven business which relegates Telkom-Orange to the last position among the networks, having some 55, 593, 121 million voice minutes compared to the leader, Safaricom with almost 4.5 billion worth of voice minutes (wahome, 2013).

The mobile sector has emerged as a very competitive market for Telkom Kenya, which shows that it has a long way to meet its chief obligation of making returns out of its losses especially in its Orange-driven mobile sphere.

Labour Cost on Telkom Kenya

Nine hundred and ninety six former employees of Telekom Kenya, that were laid off in 2006, are bound each be paid a golden handshake of Sh150, 000, and a severance pay equivalent to two and half months' salary for each year worked. These is after the Court of Appeal upheld the High court ruling that had asked the operator to pay former employees Ksh 3.2 billion. This is a departure from the package provided by the firm that included a one month pay for every year remaining because the workers at above 50 years could immediately access their pensions. This had been challenged by the workers who felt discriminated on the basis of age given that younger employees were paid based on the number of years they had served Telekom Kenya. The court of Appeal agreed with the High Court that employees were entitled to equal and fair treatment with regard to the exit packages (Fayo, 2013).

Telekom Kenya shareholders had raised Ksh 7.6 billion against a target of Ksh 10 billion to fund its operations as well as settle debt owed to local banks like KCB and Standard Chartered Bank. It is estimated that each worker will now receive between Sh900, 000 to Sh3.5 million. But the awards are to be paid with a 14 per cent interest from the time the case was filed in 2007—pushing the total bill to Sh3.2 billion (Fayo, 2013). This cost on labour is bound to impact negatively on the profits of Telkom Kenya given that it relays on loans from banks and shareholders for its credit.

VI. Discussions

According to Ellis & Singh (2010), Substantial evidence now exists of the development benefits of mobile telephony. These include: improved connectivity that has enabled countries to leapfrog the need to develop fixed line infrastructure, providing connectivity to many people for the first time; its role in reducing transaction costs for both households and enterprises; facilitating job creation and private sector development; and enhancing access to financial services. The analysis of the introduction of competition in the mobiles market in each case study country finds that competition drives rollout of services, increased market

penetration, and falling prices. A competitive environment strengthens incentives to design services to meet the needs of customers, including price and product promotions for poor customers, and value added services with additional development benefits, such as money transfer services. Until recently, Kenya has had a relatively concentrated market compared to the other four countries, and prices were relatively high. However, competition in the market increased through the entry of two new players in 2008/09, and since then tariffs have fallen by as much 50%. It should be noted that the Vietnamese mobiles market is heavily dominated by state owned enterprises, but the operators do appear to compete fiercely with each other, and the sector is performing fairly well.

According to Brandt and Schulten (2008), The extent to which liberalization and privatization lead to competition on wages and labour costs with potentially negative effects on working and employment conditions depends basically on two factors. First, it depends on the degree of real market competition in the respective sectors. Liberalization and privatization have not always automatically led to more competition and in some sectors and countries competition is de facto still rather limited. However, companies in the affected sectors often already use the potential of higher competition to put pressure on wages and working conditions. The second factor, which strongly influences the degree of competition on labour costs, is nature of the national Labour relation regimes (LRRs) and their abilities to create a sector-wide regulation on working conditions in order to create a common level playing field (Brandt and Schulten 2008).

VII. Conclusion and Recommendation

The two independent variables from the study are thus evidential as factors that contribute to Kenya telkom profitability performance. From the above findings, competition was a factor that contributed to the low profits margins hence it had a direct impact on the losses incurred.

The effect of strong competition experienced from the regional mobile industry resulted to loss of subscribers to other mobile operators as result of tourism in general the reduction in number of subscribers who use the Kenya Telkom resulted to low revenues hence it is attributed that competition had a direct bearing as the cause of low profitability margins in Kenya Telkom.

The research recommended that on competition, there is need to search for new untapped emerging and segmented markets amongst different sectors who will form a subscription base that will be able to form a hedge and cushion against the competitive aspects in order to explore new ways of generating profits. There is need to extend and expand the broadband and internet services to schools, cities and towns across the country in order to capture the rising demand of data. More so the browsing tariff should be lowered to attract a larger market of subscribers. There is need to increase more value added services to clients inorder to attract new customers and retain existing customers on the mobile network.

On the issue of labour cost, there is need to for Kenya Telkom to strategically manage its costs to ensure profits are realized. The Kenya Telkom can adopt the use of the business process outsourcing (BPO) whereby other services that are not the core competences can be outsourced to other vendors hence this will prevent the cost associated with the labour, and industrial court penalties due to retrenchments and expensive labour cost.

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Personality Traits Influence on Usage of Health Informatics System: Kenya's Case

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Abstract- This paper presents the study concerning how the personality traits influence usage of health informatics systems in Kenya, especially Nyanza Region. The objectives of this study were, first to examine the personality traits exhibited by the health professionals' in Level 5 hospitals in Nyanza, Kenya. Second to analyze the health workers' usage of health informatics and third was to examine how the personality traits influenced usage of health informatics in Nyanza, Kenya. The questionnaire survey technique was purposefully adopted for this study to collect the data randomly from a sample population of 163 health workers in Level 5 Hospitals in Nyanza, Kenya. This study also used LisRel software and SPSS in analysing the big 5 personality traits (conscientiousness, openness, extraversion, neuroticism and agreeableness) of health workers. This study found out that the personality traits of Kenyan health workers have direct influence on acceptance of biometric based health informatics. But not all the Big 5 traits have positive influence. Using LisRel modelling software, only

Index Terms- Hospital, Biometrics, Health, Informatics and Traits

I. Introduction

This paer present an analysis of personality traits influence usage of health informatics in the selected level 5 hospitals in Nyanza region in Kenya. The main objective of this study was to assess the relationship between the health workers' personality traits and perceived ease of use of the patients' records in the selected level 5 hospitals in Kisii and New Nyanza hospitals. The paper begins with data presentation, variables result analysis, followed by descriptive statistics and then summarises the analysis.

II. DATA PRESENTATION

The health workers were then asked (Table 1) to state how satisfied they are with the provision of healthcare services. The majority (67.3%) said were satisfied, 9.7% were very satisfied and 19.4% were unsatisfied and meanwhile 1.8% said they don't know their satisfaction with the work they are doing.

Table 1 Health professionals' work satisfaction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Satisfied	16	9.7	9.8	9.8
	Satisfied	111	67.3	68.1	77.9
	Don't Know	3	1.8	1.8	79.8
	Unsatisfied	32	19.4	19.6	99.4
	Very unsatisfied	1	.6	.6	100.0
	Total	163	98.8	100.0	
Missing	System	2	1.2		
Total		165	100.0		

Most of the respondents (53.7%) are using paper-based health record in their station of work for carrying out their health care tasks while 46.3% have adopted the use health information systems as displayed in Table 2.

Table 2 Type of Health System Used

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paper-based	87	53.4	53.7	53.7
	HIS	75	46.0	46.3	100.0
	Total	162	99.4	100.0	
Missing	System	1	0.6		
Total		163	100.0		

The health workers were asked to rate the big five personality traits that best describe their personality traits. The individual big five personality traits (Table 3) with their means and deviation are presented.

Table 3 Individual Item with mean and deviation

Construct	Survey Item	Mean	Std. Deviation
Conscientiousness	Thorough Job	1.90	1.318
	Reliable worker	1.87	1.258
	Perseveres	1.60	.997
	Efficient	2.12	1.304
	Plans	1.91	1.229
Openness	Original	1.88	1.151
	Curious	1.36	.743
	Imaginative	1.34	.696
	Inventive	1.52	.740
	Reflect	1.64	.824
Extraversion	Talkative	2.26	1.342
	Energetic	1.72	1.074
	Enthusiasm	4.02	2.838
	Assertive	1.72	.760
	Outgoing	2.05	1.069
Neuroticism	Depressed	3.36	1.506
	Tense	2.58	1.473
	Worries	2.98	1.444
	Moody	2.91	1.547
	Nervous	2.55	1.445
Agreeableness	Helpful	1.95	.908
	Forgiving	1.75	.660
	Trusting	1.85	.780
	Considerate	1.85	.886
	Cooperate	1.82	.753

The Government of Kenya through the Ministry of Medical Services and/or Ministry of Public Health are in the process of implementing National Strategic Plan for Health Information System 2009-2014 and the National e-health strategies 2011-2014. These strategies require that the health institutions to adopt the health informatics in order to enhance performance. In relation to these policies the health workers were asked their opinion on the perceived change of task that may result from the adoption of health informatics, as displayed in Table 4.

Table 4 Healthcare perceived task changes

	Mean	Std. Deviation
Review Patients	2.36	1.323
Seek information	2.23	1.339
Track Test result	2.46	1.366
Get treatment procedure	2.44	1.447
Give referral	2.56	1.491
Order treatment	2.36	1.314
Prepare discharge	2.42	1.387
Obtain X-ray	2.66	1.316
Valid N (listwise)		

2.1. RELIABILITY ANALYSIS

The first characteristic that any good measure must possess is reliability. Reliability refers to the consistency or dependability of a measuring technique. The reliability test for conscientiousness (Table 4) shows the cronbach's alpha of 0.896. The inter item statistics are shown in Table 6.

Table 5 Cronbach Alpha for Conscientiousness

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.896	.891	5

Table 6 Conscientiousness item total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Thorough Job	7.51	16.363	.798	.813	.862
Reliable worker	7.53	16.473	.837	.809	.852
Perseveres	7.80	21.467	.448	.323	.928
Efficient	7.28	16.006	.852	.740	.848
Plans	7.49	17.017	.796	.669	.862

The openness component had 6 items whose cronbach's Alpha based on standardised item was 0.815 (Table 7 and Table 8).

Table 7 Openness Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.787	.815	5

Table 8 Openness Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Original	5.85	5.729	.479	.325	.806
Curious	6.36	6.519	.679	.623	.716
Imaginative	6.39	6.550	.736	.702	.705
Inventive	6.20	6.511	.686	.521	.714
Reflect	6.08	7.230	.394	.246	.800

The reliability test for extraversion (Table 8 and Table 9) item was 0.038.

Table 9 Extraversion Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.329	.264	5

Table 10 Extraversion Item-Total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Talkative	7.72	3.720	.396	.356	-.018[a]
Energetic	8.22	5.050	.274	.291	.174
Enthusiasm	7.73	5.976	.118	.103	.315
Assertive	8.22	7.260	-.075	.070	.420
Outgoing	7.86	6.122	.067	.032	.357
a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions.					

For neuroticism reliability test using cronbach's Alpha (Table 10 and Table 11) is 0.782

Table 11 Neuroticism reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.782	.778	5

Table 12 Neuroticism item-total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Depressed	11.01	21.451	.390	.154	.790
Tense	11.48	19.091	.515	.406	.755
Worries	11.09	17.504	.687	.507	.696
Moody	11.16	16.900	.676	.504	.698
Nervous	11.53	19.177	.523	.431	.752

The agreeableness item reliability statistics are presented in Table 12 and Table 13.

Table 13 Agreeableness Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.690	.702	5

All internal consistency reliabilities based on Cronbach's alphas for measurement items (all interval scales) are fair. Some of them are considered to be good (greater than 0.80), only a few are just acceptable (in 0.7 ranges). Due to the fact that most reliability tests are quite high (0.80 up), they indicate the items in each set (concept) are positively correlated to one another [4]. This is to argue that the items in each set are independent measures of the same concept, and therefore, indicate accuracy in measurement in the main survey.

2.0. VALIDITY ANALYSIS

Validity refers to the extent to which a measurement procedure actually measures what it is intended to measure rather than measuring something else (or nothing at all) [3]. Validity is the degree to which variability in participants' scores on a particular measure reflects variability in the characteristic one want to measure. The big five personality traits and the technology items were correlated to test their validity as shown in Table 13.

Table 14 Personality traits and technology moderators inter-item correlation

	Conscientiousness	Neuroticism	Openness	Extraversion	Agreeableness	Pduseful ness	Pdeaseofuse	Actualusage	Behavioural
Conscientiousness	1.000	-.159	.513	.517	-.040	.482	.165	.241	-.150
Neuroticism	-.159	1.000	-.098	.035	-.217	-.386	-.081	.118	.278
Openness	.513	-.098	1.000	.291	.092	.244	.074	.002	.186
Extraversion	.517	.035	.291	1.000	-.006	.206	.126	-.005	-.199
Agreeableness	-.040	-.217	.092	-.006	1.000	.128	.094	-.144	-.236

Pdusefulness	.482	-.386	.244	.206	.128	1.000	.371	-.154	-.002
Pdeaseofuse	.165	-.081	.074	.126	.094	.371	1.000	.013	-.040
Actualusage	.241	.118	.002	-.005	-.144	-.154	.013	1.000	.282
Behavioural	-.150	.278	.186	-.199	-.236	-.002	-.040	.282	1.000

2.1 PRINCIPAL COMPONENT ANALYSIS

The main aim of this analysis was to identify patterns of personality traits effect on attitude and ease of use of health informatics by health professionals in Kisii and New Nyanza level 5 hospitals, but to achieve that, it is prudent to start by generating simple descriptive summaries for each of the trait variables. The researcher opted to analyse the Correlation matrix (table 14) since the variances of rates for different types of personality traits differ considerably. Working with the correlation matrix amounts to using the personality rates after standardizing each to have unit standard deviation. This seems sensible since without standardization the derived components are likely to be dominated by single variables with large variances.

Table 15 Personality Traits Correlation Matrix

		Positive attitude	Pdeaseofuse	ScaleExtraversion	ScaleOpenness	ScaleConscientiousne	ScaleNeuroticism	ScaleAgreableness
Correlation	Positive attitude	1.000	-.092	.119	.051	-.061	.001	-.125
	Pdeaseofuse	-.092	1.000	.030	.192	.323	-.138	.134
	ScaleExtraversion	.119	.030	1.000	.273	-.005	.337	.028
	ScaleOpenness	.051	.192	.273	1.000	.581	-.156	.109
	ScaleConscientiousne	-.061	.323	-.005	.581	1.000	-.320	-.001
	ScaleNeuroticism	.001	-.138	.337	-.156	-.320	1.000	-.205
	ScaleAgreableness	-.125	.134	.028	.109	-.001	-.205	1.000
a. Determinant = .351								

The coefficients in the component matrix (Table 15) specify the linear function of the observed variables that defined each component.

Table 16 Component Matrix

	Component						
	1	2	3	4	5	6	7
Positive attitude	-.104	.357	-.630	.561	.362	.134	.049
Pdeaseofuse	.563	-.017	.256	-.230	.745	-.020	-.091
ScaleExtraversion	.033	.841	.309	.134	-.027	-.406	.116
ScaleOpenness	.746	.433	-.080	.049	-.295	.156	-.368
ScaleConscientiousne	.833	.085	-.227	-.240	-.138	.128	.394
ScaleNeuroticism	-.536	.576	.288	-.293	.062	.453	.056
ScaleAgreableness	.293	-.228	.623	.649	-.044	.201	.100
Extraction Method: Principal Component Analysis.							
a. 7 components extracted.							

Total Variance Explained (Table 17) shows how much of the total variance of the observed variables is explained by each of the principal components. The first principal component (scaled eigenvector), by definition the one that explains the largest part of the total variance, has a variance (eigenvalue) of 1.9; this amounts to 27.8% of the total variance. The second principal component has a variance of 1.4 and accounts for a further 20% of the variance while the seventh principal components have variance of 0.3 and accounts for 4.6% of the variance.

Table 176 Traits Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.952	27.889	27.889	1.952	27.889	27.889
2	1.413	20.188	48.077	1.413	20.188	48.077
3	1.086	15.521	63.598	1.086	15.521	63.598
4	.952	13.595	77.193	.952	13.595	77.193
5	.799	11.413	88.606	.799	11.413	88.606
6	.470	6.714	95.320	.470	6.714	95.320
7	.328	4.680	100.000	.328	4.680	100.000
Extraction Method: Principal Component Analysis.						

III. DISCUSSION

3.2 Effects of Big Five Personality Traits on Ease of Use and Attitude towards Health informatics

Although the "Big Five" model has been discussed a lot in behavioural fields, there has been little research on the impact of personality traits with regards to biometric-based health informatics. In reference to Technology Acceptance Model it is hypothesised that external factors such as personality traits may influence a user's perceptions of health informatics' ease of use and usefulness. In turn, a user's perceived ease of use and perceived usefulness determine the user's attitude toward using the system. The user's attitude determines behavioural usage and actual usage of health informatics. Individual health worker's personality traits were studied to determine if certain user groups might be more accepting or resistant to adoption of technology than others. The main research question in this study related individual health workers' big five personality traits to the perceived ease of use of patients' records.

Research Question: Is the current usage of patients' records related health workers' personality traits mediated by perceived ease of use in the selected level 5 hospitals in Nyanza, Kenya?

Table 18 Type of Current System Used

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Paper-based	87	53.4	53.7	53.7
	HIS	75	46.0	46.3	100.0
	Total	162	99.4	100.0	
Missing	System	1	.6		
Total		163	100.0		

The majority of the respondents (53.7%) are currently using paper-based health system while 46.3% have adopted the use of health informatics.

Table 19 Big Five personality and Technology Descriptive statistics

	Mean	Std. Deviation
Behavioural	1.48	.752
ScaleOpenness	1.55	.622
Pdusefulness	1.78	.864

ScaleAgreableness	1.86	.529
Actualusage	1.88	.499
ScaleConscientiousne	1.88	1.032
Pdeaseofuse	1.96	.727
ScaleExtraversion	1.99	.549
ScaleNeuroticism	2.81	1.056
Valid N (listwise)		

The factors in the Big Five model are meant to measure the underlying traits of extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience by using personality markers to identify the degree of each of these factors that an individual possesses. Extraversion represents a preference to be around others. It is the trait that deals with a person's social behaviours, willingness to express opinions and leadership. Agreeableness describes how we relate to others including tolerance and acceptance. In addition, agreeableness represents an eagerness for communion. Conscientiousness refers to a tendency to push toward goals and act dutifully. It encompasses self-discipline and dependability. Neuroticism is the tendency to experience unpleasant emotions and often is referred to as the anxiety factor. Openness to experience describes the willingness to enjoy new experiences and ideas. It includes creativity, preference for the complex and willingness to accept change [5].

Extraversion can be defined as social, fun looking, and affectionate. The respondents were asked to the characteristics that best describe their personalities; this is displayed in Table 28. The extraversion personality trait had the mean of 1.99 which is a high score. It can be argued that individuals high in extraversion, who are enjoyable when interacting with others, will be more likely to accept biometric based health informatics. The [6] study found that extraversion moderated the relationship between subjective norms and intentions to use technology such that the relationship is stronger for individuals with higher extraversion. This indicates that extraverted individuals spent more time texting.

Neuroticism with the mean 2.8 of is characterized by emotional instability, pessimism, and distrust. People high in neuroticism often think negatively and have less perceived control. People scoring high in openness 1.55 are more likely to make open-minded decisions and are willing to accept new technology. Neurotic personalities are likely to view technological advances in their work as threatening and stressful, and to have generally negative thought processes when considering technological advances [7]. This found that neurotic individuals spent more time text messaging and reported stronger mobile phone addictive tendencies.

3.2. Perceived Changes on Health Task Performance

The respondents were asked to compare the paper-based with the health informatics in relation to the performance of health tasks (Table 20). This frequency Table shows that the mean for all the variables is below 3 hence the tasks will be perceived to be difficult if health informatics is adopted.

Table 20 Perceived Health tasks Changes

	Review Patients	Seek information	Track Test result	Get treatment procedure	Give referral	Order treatment	Prepare discharge	Obtain X-ray
Mean	2.36	2.23	2.46	2.43	2.56	2.36	2.42	2.66
Std. Error of Mean	.104	.105	.107	.115	.117	.103	.109	.103
Std. Deviation	1.323	1.339	1.366	1.442	1.491	1.314	1.387	1.316

The unsuccessful implementation of health informatics in health centres was likely due to various factors. According to a study by [1] health personnel's intentions to use it are an important factor for successful implementation, together with support, time, cost, and technology. Based on the Theory of Reasoned Action (TRA), an individual's behavioural intention is determined by the individual's attitude towards this behaviour and subjective norms with regard to the performance of this behaviour.

According to the study by [7] used the means, standard deviations, minimum and maximum values, and the skew for the independent variable. An inspection of the independent variables [7] revealed that agreeableness and conscientiousness were negatively skewed. Consequently, these scales were inverted by subtracting them from their maximum value plus one before transformation, this contradict this study. A square root transformation was then used on the inverted scales.

IV. CONCLUSION

The shift of human interactions, socialisation and communication activities towards technology acceptance means managing the impression of one on the technologies are important. According to [2] technologies are tools used by individuals in carrying out their tasks. In the context of health informatics, technology refers to computer systems (hardware, software and data) and user support services (training, help lines etc.) provided to assist users in their tasks Although most institutions are adopting information technology in their day to day operation there are a number of hindrances one being personality trails. Literature review reveals that this adoption is hindered by user characteristics. This study examined the relationship between big five personality trail and the TAM (ease of use and usefulness) elements.

The majority of the respondents were male 58.9%. This showed that most of the health workers in the Nyanza level 5 hospitals are male. This finding may be attributed to a number of factors such as need for career progression, need to pursue higher studies, family responsibility and self-motivation.

From this study 39.1% of the respondents were aged between 30-39 years and probably the reason why have the desire for technology. The acceptance may also be affected by the level of education. This study found out that 50.9% have or are pursuing first degree while 41.1% have diploma qualifications. This result shows that the respondent are literate hence the reason why majority are willing to accept the introduction of new technology.

It was also found that 43.6% had worked or are working in the health sector are for a period of 1-5years. These are probably the newly employed health workers in the health professions, hence feeling much pressure to adopt the new technology in their day to day operation. However 77.9% of the respondents felt satisfied with the work they are doing in the health institution.

The respondents' opinion was sought about view of their tasks in relation to the introduction of health informatics compared with the paper-based patients record currently in used in the health institution. The 5 point likert scale was used with 1being very difficult and 5 being very ease. Task according to [2] is the action carried out by the institution in turning input into outputs. Task characteristics of interest include those that might move a user to rely more heavily on certain aspects of health informatics. On the review of patients' problems, the respondents felt that the process will be difficult. Similar response was expressed on seeking specific information, following patients' particular test, obtaining information on treatment procedure, referring a patient to the specialist, getting order treatment, getting patients information for discharge. Ironically these are regular tasked performed by health professionals and are expected to be made ease with the introduction of health informatics.

This finding contradicts the pursued benefits attributed to the introduction to the information in the health institutions. However this doesn't mean that the adoption of health informatics is an exercise in futility. These findings may be attributed to the nature of the profession and personality traits of the individual health workers, fear of technology, fear of the unknown and getting used with the paper-based what can be called working comfort zone. Another reason may be According to [5] myopic policies result in systems with little patient usefulness. Policies driven by techno centric bias & enacted in entrenched power structures responsible for system failure. This was based on evidence on patients' perception and critical examination of the social realities of healthcare.

The remedy to this is user training and awareness campaign amongst the health professional in the level 5 hospitals in Nyanza Kenya. This will neutralise the stigma associated with the introduction with the adoption of health information. From the findings, most of the respondents are using paper-based patients' records. This may be attributed to the pursued difficult in using health informatics.

Personality research, like any science, relies on quantifiable concrete data which can be used to examine what people are like and why people behave as they do. The correlation matrix of the personality traits and TAM element (attitude and ease of use) shows that attitude is negatively correlated with perceived ease of use, conscientiousness and agreeableness. Attitude is also positively correlated with extraversions, openness and neuroticism personality traits. Individuals high in openness are more likely to hold positive attitudes and cognitions toward accepting job-related technology in part because of their predisposition to embrace new approaches to work; they are less threatened by change implied in adopting technology [7].

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ANALYSIS AND DETECTION OF HAEMORRHAGES AND EXUDATES IN RETINAL IMAGES

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Abstract- Diabetic Retinopathy [DR] is an eye disorder caused by changes in the blood vessels of the retina. It is one of the major problems that lead to blindness in adults around the world today. Early detection of the disease is absolutely essential in preventing unnecessary blindness. So, we have proposed an automated system to detect diabetic retinopathy from retinal images. In this approach after pre-processing, texture features are extracted from retinal images to detect abnormal images. Then the abnormal images are processed to localize and identify the problem of exudates and haemorrhages.

Index Terms- Diabetic Retinopathy, Exudates, Fundus Images, Haemorrhages.

I. INTRODUCTION

In recent times, all over the world have been faced with an increase in age and society related diseases like diabetes. According to recent survey, 4% of the world population has been diagnosed of diabetes disease alone. It have been recognized and accepted as one of the major cause of blindness in the country when the diabetic disease is not properly treated and managed. Early detection and diagnosis have been identified as one of the way to achieve a reduction in the percentage of visual impairment. Diabetes is the major reason for visual loss. More emphasis on routine medical check with the use of special facilities for detection and monitoring of the diabetics diseases such as diabetic retinopathy which occur on the retinal part of the eye. By increasing the work pressure which loads on the personnel that may lead to increase the diabetes screening activities. A lot of approaches have been suggested and identified for reducing the stress caused by the constant checkup. Screening related activities which use of medical digital image signal processing for diagnosis of diabetes related diseases like DR by using images of the retina [1]. Diabetic Retinopathy is a major disease which may occur to a patient who having diabetic mellitus. Haemorrhages and exudates are the problem of Diabetic Retinopathy which occurs on the retina. Diabetes is nothing but a disorder of metabolism. The energy required for the body which is generated from glucose that produces a result of food digestion. Digested food enters the body stream with the aid of a hormone called "insulin" which is produced by the pancreas. It is an organ that lies near the stomach. During eating, the pancreas automatically produces the correct amount of insulin. It allows glucose absorption from the blood into the cells. In individuals with diabetes, pancreas either produces too little or no insulin or the cells do not react properly to the insulin that is produced. The build up of glucose in the blood, overflows into the urine and then passes out of the body. Therefore, the body loses its main source of fuel even though the blood contains large amounts of glucose [2]. DR is shown in Figure1and in Figure2.

Figure 1: Person Without Diabetic Retinopathy

Figure 2: Same Image Viewed by Affected Person

Diabetes may occur when the body does not have enough "insulin" [2]. This is mainly to regulate the body based on the food that had been taken. If the problem of diabetic mellitus occurs, then the body cannot balance in the usual way with sugar and other carbohydrates. Nearly one person in 25 in the world has diabetes mellitus. Some children have diabetes but developing diabetes is much more common later in life. Diabetes may cause more complications that result in different parts of the body. It may lead to produce an effect of the eyes. There are two types of diabetic mellitus are Type 1 and Type 2 diabetes. In type 1 diabetic is commonly occurring before the age of 30 and that produces the result does the body producing little or no insulin. These are primarily controlled by insulin an injection that is specified as "insulin dependent diabetes". Type 2 diabetes occurs after the age of 40 that affects the body has produce some insulin but the amount is either not sufficient or the body is not able to make proper use of it. It is controlled by diet, exercise and tablets. Although

some people in this category will use the insulin injections are called as non-insulin dependant diabetes. In general, the Diabetic Retinopathy falls under the three categories namely Background Diabetic Retinopathy (BDR), Proliferative Diabetic Retinopathy (PDR) and Severe Diabetic Retinopathy (SDR).

In BDR phase, the arteries in the retina become weakened and leak forming small dot as haemorrhages. This leaking vessel often leads to swelling in the retina and cause decreased vision.

In the PDR phase, circulation problems cause areas of the retina to become oxygen-deprived or ischemic. New fragile is generated on vessels that develop as the circulatory system. This attempts to maintain adequate oxygen levels with in the retina. Hence, this phenomenon is called neovascularisation. Blood can leak into the retina and vitreous region. This leads to spot or floaters of decreased vision.

In the SDR phase, this disease generates the abnormal blood vessel growth and scar tissue. It may cause serious problems such as retinal detachment, glaucoma and gradual loss of vision.

Haemorrhages are one of the diabetic retinopathy diseases which affect the retinal part. It Occurs in the deeper layers of the retina and are often called 'blot' haemorrhages because of their round shape. Abnormal new blood vessels (neovascularisation) form at the back of the eye as a part of Proliferative Diabetic Retinopathy (PDR). It can burst and bleed (i.e., vitreous haemorrhage). Hence the new blood vessels are weak that causes blur vision. A retinal hemorrhage can be caused hypertension, retinal vein occlusion (a blockage of a retinal vein), or diabetes mellitus (which causes small fragile in blood vessels which are easily damaged).

Exudates are also a diabetic disease which affects the retina. There consist of a tiny swellings in the blood vessel walls. These blebs (micro aneurysms) appear as small red dots on the retina [3]. There are tiny yellow patches of hard exudates (fats from the blood) on the retina. Exudates are classified into two types Hard Exudates and Soft Exudates. Hard Exudates are appearing as bright yellow regions. Soft Exudates or cotton-wool spots which looks like gray - white fuzzy appearance. The haemorrhages and exudates are shown in Figure 3 and Figure 4.

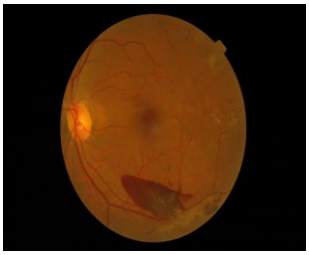


Figure 3: Haemorrhages

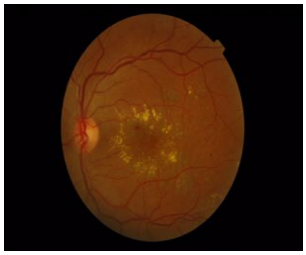


Figure 4: Exudates

In this paper, we analyze and detect the diseases of retina which is come under the category of diabetic retinopathy that are haemorrhages and exudates. In Section I describe the brief introduction about the diabetics and its diseases. Proposed System detail is shown in Section II, Modules of my automated system are presented in Section III, In Section IV specify the experimental results, Performance measures are shown in Section V and Section VI gives a brief conclusion of this paper.

II. PROPOSED SYSTEM

We have proposed an automated system for classifying the type of retinal diseases by using KNN classifier technique. The main goal of the proposed system is to automatically classify haemorrhages and exudates diseases. The input retinal images are taken from MESSIDOR database which is given as input to the pre-processing. After pre-processing, the features are extracted. K Nearest Neighbour classifier is used to classify the retinal images are normal or abnormal. Then the normal images are taken out and only concentrate on the abnormal images. Once again to extract the features from the abnormal images and then KNN classifier is used to classify these retinal images does contain haemorrhages or exudates problem. Block diagram of the proposed system is shown in Figure 5.

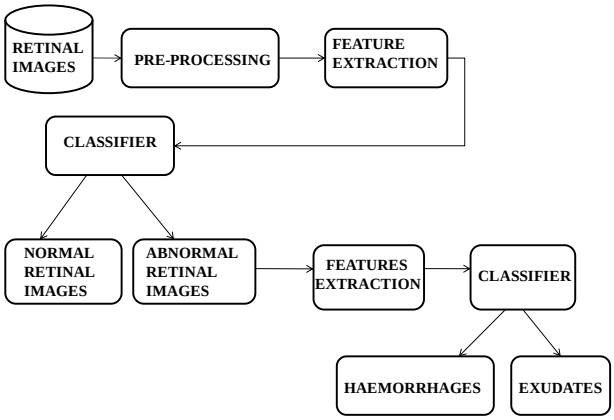


Figure 5: Block Diagram of the Proposed System

III. MODULES

Our proposed system consists of three modules which are A) Pre-processing the retinal image, B) Feature Extraction and C) Classify the output by KNN classifier technique.

A. Pre-processing

The input of the automated system is color fundus retinal image which is taken from MESSIDOR database. This stage corrects the problem of illumination variation during the pictures are taken [4] and [5]. The following pre-processing steps in my automated system consist of are:

i) Resizing the retinal gray images

The input retinal images are resized into small images. It is mainly to avoid overloading and time consumption.

ii) Color to gray scale conversion

To convert RGB colour fundus images into gray conversion. **iii) Median Filter**

The median filter is a nonlinear filter, which can reduce impulsive distortions in an image and without too much distortion to the edges of such an image. It is an effective method that of suppressing isolated noise without blurring sharp edges.

Median filtering operation replaces a pixel by the median of all pixels in the neighborhood of small sliding window. The advantage of a median filter is that it is very robust and has the capability to filter only outliers. Noisy pixels are appeared with the background information. Hence we need to remove noisy pixels before contrast enhancement by using a median filter.

iii) Adaptive histogram technique

After gray-level conversion, adaptive histogram is used to enhance the “contrast” and to improve the quality of retinal image. One of the problems associated with fundus images is uneven illumination. Some areas of the fundus images are appear as brighter than the other. At the centre of the image are always well illuminated. Hence, it appears very bright while they far away from the poorly illuminated region and also appear as very dark. If the illumination decreases then the distance form the centre of the images are also increases. Many methods were tried to resolving this problem of un-even illumination, among which is the use of Adaptive Histogram Equalization Method (AHEM). AHEM gives better performance, higher processing speed and work well for all images are of different sizes, hence the reason for it being used as method of correcting un-even illumination. A variant of adaptive histogram equalization called Contrast Limited Adaptive Histogram Equalization (CLAHE). Images processed with CLAHE are of more natural appearance and facilitate the comparison of different areas of an image. To enhances the contrast of the grey scale images by transforming the values using contrast-limited adaptive histogram equalization (CLAHE). The main objective of this method is to define a point transformation within a local fairly large window. By assuming the assumption of intensity value within it is a stoical representation of local distribution of intensity value of the whole image. The local window is assumed to be unaffected by the gradual variation of intensity between the image centers and edges. The point transformation distribution is localized around the mean intensity of the window and it covers the entire intensity range of the image. Consider a running sub image W of N X N pixels centered on a pixel P (i,j) , the image is filtered to produced another sub image P of (N X N) pixels according to the equation below,

$$P_n = 255\left(\frac{[\emptyset_W(P) - \emptyset_W(min)]}{[\emptyset_W(max) - \emptyset_W(min)]}\right) \qquad (1)$$

where max and min are the maximum and minimum intensity in the whole image and P_n specifies the number of pixels.

B) Feature Extraction

In feature extraction, Texture analysis used to extract feature values from the input images. These features are used to attempts quantify intuitive qualities that are described in terms of rough, smooth and silky as a function of spatial variation are shown in pixel intensities [6]. Texture analysis can be helpful when objects in an image are more characterized by texture than by intensity. It consists of entropy, entropy filter, gray level co-occurrence matrix, range filter and standard deviation filter. The sample feature values are shown in table 1.

i) Entropy

Entropy is a statistical one which measures the randomness. It is used to characterize the texture of the input image. Syntax and formula for the entropy is shown below, the entropy formula is shown in equation 2.

$$H = -\sum_{k=0}^{M-1} P_k \log_2(P_k) \qquad (2)$$

Where M is the number of grey levels and p_k is the probability associated with grey level k.

ii) Entropy Filter

Entropy filter specifies the local entropy of the gray scale images. It performs entropy filtering function for all the input images. This `filter` is used to create a texture for an image. The `entropy filter` returns an array where each output pixel contains the entropy value of the 9-by-9 neighborhood around the corresponding pixel in the input image.

iii) Range Filter

Range Filter is found out the local range of the gray scale images. `Mat lab function of range filter is used to generate ranges for the input images. It` returns each output pixel that contains the range value which is greater value – smaller value find for every 3-by-3 neighborhood around the corresponding pixel in the input image.

iv) Standard Deviation Filter

Standard Deviation Filter calculates the local standard deviation for the input images. `Standard Deviation Filter function is used` from mat lab which returns each output pixel contains the standard deviation of the 3-by-3 neighborhood around the corresponding pixel in the input image.

Table 1: Features Extracted

s.no	Entropy	Entropy filter	Range filter	Standard deviation filter
1	4.6221	2.6765	13.4905	4.9812
2	5.1892	2.7745	16.5111	6.0997
3	5.1502	2.7475	16.8775	6.2220
4	4.4395	2.4714	13.6801	5.0616
5	4.6133	2.6296	17.6331	6.5250

C) KNN Classifier

KNN stands for “K-Nearest Neighbour algorithm”. It is one of the simplest but widely using machine learning algorithms. An object is classified by the “distance” from its neighbours, with the object being assigned to the class which is most common among its k distance-nearest neighbours [7]. If k = 1, the algorithm simply becomes nearest neighbour algorithm and the object is classified to the class of its nearest neighbour.We are also given a single number "k”. This number decides how many neighbors (where neighbor are defined based on the distance metric) influence the classification. This is usually an odd number if the number of classes is 2. Distance is a key word in this algorithm, each object in the space is represented by position vectors in a multidimensional feature space. It is

usual to use the Euclidean distance to calculate distance between two vector positions in the multidimensional space. Each of the training data consists of a set of vectors and class label associated with each vector. In the simplest case, it will be either + or – (for positive or negative classes). But KNN, can work equally well with arbitrary number of classes [8]. The advantages of KNN classifier are analytically tractable, simple implementation, nearly optimal in the large sample limit (N→∞), lends itself very easily to parallel implementations and uses local information, which can yield highly adaptive behaviour and the disadvantages of KNN classifier are large storage requirements and computationally intensive recall. The KNN classifier example is shown in Figure 6.

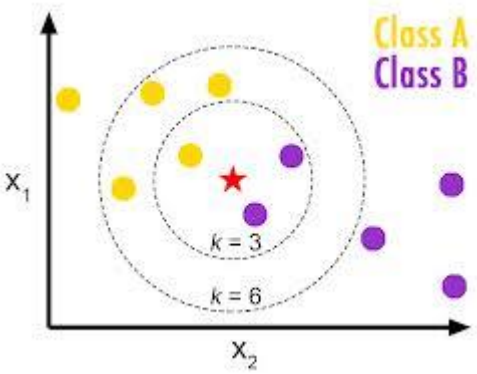
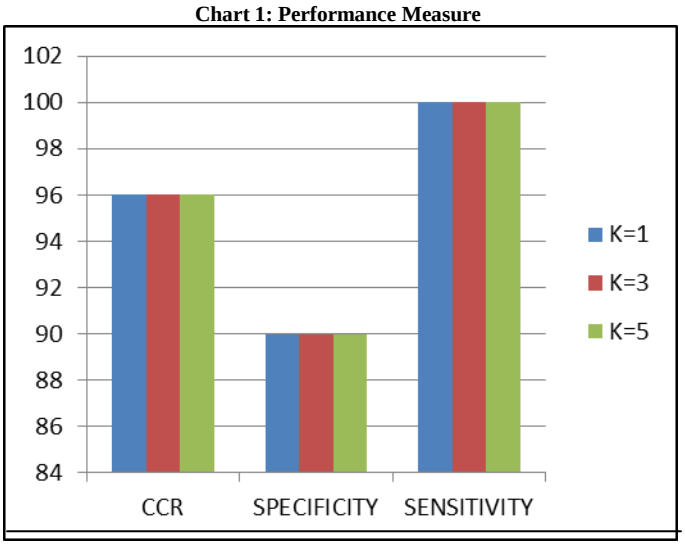


Figure 6: KNN Classifier Example

The test samples are taken as (red star) that should be classified either to the first class of yellow circle or to the second class of purple circle. If *k = 3* (solid line circle) which is assigned to the second class because there are 2 purple circles and only 1yellow circle inside the inner circle. If *k = 5* (dashed line circle) it is assigned to the first class (3 yellow circle vs. 2 purple circle inside the outer circle).

The training process for KNN consists only of storing the feature vectors and class labels of the training samples. One major problem to using this technique is the class with the more frequent training samples would dominate the prediction of the new vector, since them more likely to come up as the neighbour of the new vector due to their large number. Choosing an appropriate K is essential to make the classification more successful. For performance comparison by using KNN nearest neighbour class variation, we have calculated CCR, Specificity and Sensitivity. Chart 1 specifies the overall performance measures of three classes of KNN are K=1, K=3 and K=5. The accuracy of all classes is showing same result.

Chart 1: Performance Measure



IV. EXPERIMENTAL RESULT & ANALYSIS

The grey colour fundus images were used in this experiment to detect the retinal images having Diabetic Retinopathy problem or not. We have taken 100 retinal images (70 normal images and 30 abnormal images) from MESSIDOR database for evaluating the proposed approach. We have trained KNN classifier by using 50 normal and 25 abnormal images. These images are classified by KNN classifier as normal or abnormal. After classify, to separate abnormal images for further process and then once again to extract the features for

abnormal images. After feature extraction, KNN classifier is applied to classify the abnormal retinal images as haemorrhages or exudates. The experimental results are shown in Figure 7, Figure 8, Figure 9 and Figure 10.

Figure 7: RGB Retinal Image

Figure 8: Gray Image

Figure 9: Median Filter

Figure 10: Adaptive Histogram Technique

i) Correct Classification Rate (CCR)

CCR is the most obvious accuracy measure to evaluate performance of a classification system.It can be calculated by using equation 3.

$$CCR = \frac{\text{CORRECTLY CLASSIFIED TEST}}{\text{TOTAL NUMBER OF TEST DATA}} \quad (3)$$

ii) Specificity

Specificity measures the proportion of negatives which are correctly identified as such (e.g. the percentage of normal healthy people who are correctly identified as not having the condition, sometimes called the *true negative rate*). Specificity formula is shown in equation 4.

Formula: Specificity = TN/ (TN+FP) (4)

TN – True negative and
FP – False Positive

iii) Sensitivity

Sensitivity also called the *true positive rate* or the *recall rate* in some fields. It measures the proportion of actual positives which are correctly identified as such (e.g. the percentage of DR people who are correctly identified as having the condition). Sensitivity is shown in equation 5.

Formula: Sensitivity = TP/ (TP+FN) (5)

TP – True Positive and
FN –False Negative

V. CONCLUSION

We have proposed an automated system to identify patients having diabetic retinopathy using fundus images from MESSIDOR database. After pre-processing we have extracted texture features and used KNN to classify normal and abnormal fundus images. Then from the abnormal images we have extracted standard deviation of the texture features and apply classifier to classify and detect diabetic retinopathy diseases such as haemorrhages (red patches) or exudates (yellowish dots) which falls between Back ground Diabetic Retinopathy (BDR) and Proliferative Diabetic Retinopathy (PDR) stages of the disease. In performance comparison, we have achieved specificity as 90%, sensitivity as 100% and CCR as 96%.

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Pectinase enzyme producing Microorganisms

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Abstract- Pectinase producing microorganisms were isolated from pectin rich sites using selective isolation technique. These studies deal with screening the pectinase enzyme producing microorganisms. Best pectinolytic activity, as indicated by the diameter of clear, hydrolyzed zones on the medium plates containing commercial citrus pectin as sole carbon source. The strains of *Penicillium* spp and *Aspergillus* sps have good prospect for Pectinase production microorganisms based on the zone formation.

Index Terms- pectinase, pectinolytic activity, *Penicillium* spp, *Aspergillus* spp, isolation.

I. Introduction

Biotechnology is application of living organism and their components to industrial products and processes that requires less energy and are based on renewable raw materials (Awan, 1993; Rolin, 1993; Ridley, 2001). Microorganism can live in everywhere, in the air, water and soil, and in the body of human beings and other creatures. Society benefits from microorganisms in many ways. They are necessary for the production of bread, cheese, bear, antibiotics, vaccines, vitamins, enzymes, and another important product. Microorganisms are indispensable components of our ecosystem (Han *et al*., 2005).

Microbial enzymes are routinely used in many environmentally friendly and economic industrial sectors. Environmental pollution is no longer accepted inevitable in technological societies. Over the past century there has been a tremendous increase in awareness of the effects of pollution, and public pressure has influenced both industry and government. There is increasing demand to replace some traditional chemical processes with biotechnological processes involving microorganisms and enzymes such as Pectinase (Bajpai, 1999; Bruhlmann *et al*., 2000).

Pectinase is a well known term for commercial enzyme preparation that break down pectin; a polysaccharide substrate, found in the cell wall of plants. Pectinase (E.C.3.2.1.15) constitutes a complex enzymatic system responsible for the degradation of pectic substances (Farooqahamed, *et al*., 2003). Pectinase is an enzyme that breaks down pectin. Pectic substances are glycosidic macromolecules with high molecular weight. They form the major components of the middle lamella and primary plant cell wall. Pectic substances consists of protopectins, pectinic acids, pectins and pectic acids. The main chain of pectin is partially methyl esterified 1,4 – D-glacturonan. Demethylated pectin is known as pectic acid (pectate) or polygalacturonic acid. This enzyme splits polygalacturonic acid into monogalacturonic acid by opening glycosidic linkages. The two major sources of the enzyme pectinase are plant and microorganism. But for both technical and economic point of view microbial source of pectinase has become increasingly important (Puangsri *et al*., 2005).

Today, the enzymes are commonly used in many industrial applications, and the demand for more stable, highly active and specific enzymes is growing rapidly. It was estimated that in 1995, the world sale of industrial enzymes would be 1.0 billion US dollars, while the world market for industrial enzymes is expected to be in the range between 1.7 and 2.0 billion US dollars by the year 2005 (Godfrey, 1996). According to a recent publications the industrial enzymes have already reached a market of 1.6 billion US Dollars (Demain, 2000). Interestingly, 60% of the total world supply of industrial enzymes is produced in Europe, and the remaining 40% from USA and Japan. Also approximately 75% of the industrial enzymes are hydrolases, with carbohydralases being the second largest group. In the present study, pectinase producing microorganisms were isolated from pectin rich sites.

II. Materials and Methods

Selection of microorganisms

Various parameters were studied during the work. Fungal species have an ability of using any kind of nutrient source for its growth.

Preparation of Raw Materials

Fresh orange and Mosambi peel and pulp waste was collected from nearby fruit shop. The “Starter culture” was prepared using different namely orange peel, orange pulp, mosambi peel and mosambi pulp. Each 25g of fruit waste were mixed with soil in a pot.

Soil samples

The following soil samples were used in this study.

1. Trial 1 : Orange peel + orange pulp + soil
2. Trial 2 : Mosambi peel + Mosambi pulp + soil

Every day water could be sprinkled. After two months, the soil degraded with fruit waste, which was used as an inoculum “Precursor”. This can be used for screening the pectinolytic fungal isolation.

Strian

More than thirty different strains of fungi have been isolated from pectin rich sites for these studies. Out of thirty microorganisms, only ten strains were pectinase producing microorganisms.

Isolation of Fungi

The fungi were isolated from pectin rich sites. The isolated fungi were inoculated on Potato Dextrose Agar (PDA) medium. The solid medium contained (g/l): potato extract - 200ml, dextrose - 20g, agar -20g. A supplement of 0.1% ampicillin was added to avoid the contamination. p^H value was adjusted to 5.6 before autoclaving at 121˚C for 15 min. Inoculated plates were incubated at incubated at 30˚C for 5-7 days. Pure cultures were obtained by repeated sub-culturing on PDA plates and maintained at 4˚C on PDA slants.

Sub-cultured and Maintenance of Microorganism

The strains were sub-cultured on Potato Dextrose Agar slants and incubated for 72 h at 30˚C. The sub cultured strains were maintained in a refrigerator at 4˚C and sub cultured at monthly intervals. Sporulated cultures on PDA slants were obtained after 5 days of incubation at 30˚C.

Identification of Fungi

Ten isolates were isolated from the precursor and the isolates were examined and identified at the Centre for Advanced studies in Botany, Madras University, Chennai. The microscopic structures of the isolates were studied using a Trinocular Microscope with Digital System make "Biolex - CX" with the help of Books described in Kenneth and *et al* (1968), Kenneth and *et al* (1965) and Domsch and *et al* (1980).

Preparation of Inoculum

50ml of PDB in an Erlenmeyer flask of 250 ml capacity was inoculated with fungal spores maintained on PDA slants and incubated at 30˚C for 4 days, under stationary conditions for development of fungal spores. After 4 days, the content of the flask was decanted off carefully. 50 ml of sterilized 0.9% isotonic NaCl solution (saline solution) was poured on the fungal spores in the flask and shaken vigorously to facilitate the release of spores into the saline solution. This spore suspension was used as inoculums for the further use. After 4 days of incubation, the number of spores as counted by Haemocytometer was found to be 5 x 10^{-7} spores/ml.

Screening of fungal isolates for pectinolytic activity

Plate assay Method

Thirty isolates were cultivated on modified Czapek-Dox agar medium. They contained(g/l): $NaNo_3$-3.0g, K_2HPO_4-1.0g, $MgSo_4.H_2O$-0.50g, Kcl-0.50g, $FeSo_4$-0.01g, Sucrose-30g, agar-15.0g with 1.5% as the sole carbon pectin was added. Agar medium was amended with 0.1% of ampicillin to restrict bacterial growth. p^H value was adjusted to 5.6 before autoclaving at 121˚C for 15 min. 2% of fungal spore suspension was centrally inoculated and plates were incubated at incubated at 28±2˚C for 3-5 days. Pectin utilization was detected by flooding the culture plates with freshly prepared Iodine-Potassium iodide solution (Iodine-1.0g,Potassium iodide-5.0g in 330ml distilled water) (Hankin, *et al*.,1971).This solution gives color to the medium containing pectin resulting in a translucent halo region where pectin is degraded, which indicated the pectinolytic activity. From ten pectinase producing isolates, three was identified for best pectinase producing isolates based on the zone diameter of the clearing zone.

III. Results

Pectinolytic activity

Out of Thirty isolates, ten isolates were pectinase enzyme producing isolates. Ten isolates showed plate assay method of which three isolates was producing best result.

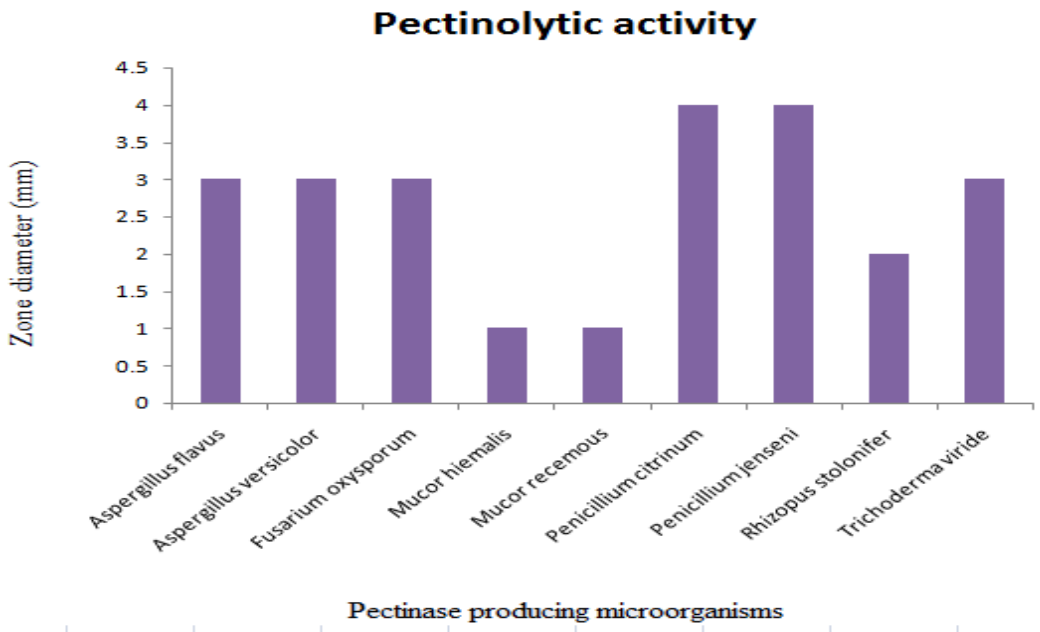
Table 1: Pectinase producing isolates

S.No.	Microorganisms	Zone Diameter (mm)
01.	*Aspergillus niger*	4
02.	*Aspergillus versicolor*	3
03.	*Aspergillus flavus*	3
04.	*Fusarium oxysporum*	3
05.	*Rhizopus stolonifer*	2
06.	*Mucor racemous*	1
07.	*Mucor hiemalis*	1
08.	*Penicillium jenseni*	4
09.	*Penicillium citrinum*	4
10.	*Trichoderma viride*	3

Fig 1: Maximal Pectinolytic activity producing microorganisms

Aspergillus niger *Penicillium jenseni* *Penicillium citrinum*

Fig 2: Pectinolytic activity showed in different isolated strains



IV. Discussion

In this study, 10 fungal strains possessing pectinolytic activity were identified. Based on plate assay method, maximal pectinolytic activity shown by was given by *Aspergillus niger*, *Penicillium jenseni* and closely followed by *Penicillium citrinum* . The plate assay approach that was used in this study has been employed for isolating and screening many enzyme producers(Hankin , *et al*.,1971) .Cellulosic component of urban refuse appear to be good sources of fungi with plant cell wall hydrolyzing activity (Nwodo-Chinedu, *et al*., 2005).

V. Conclusion

It can be summarized that of the three isolates gave better results when compared other isolates. Further studies, we can be followed optimization and fermentation studies. It can be used for various industrial applications including extraction and clarification of juices, processing of fibers, bleaching of paper, removal of pectic waste and maceration of tea leaves.

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Factors Influencing Employee centric performance in Industries: Lessons in Human Resource Management

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Abstract- Sustaining high performance among employees and driving their behavior towards change, resilience, commitment, proactiveness and work engagement have been identified as major challenges facing leaders and human resource management personnel in organizations. An important factor influencing such behavioural attitudes and inclinations is employee engagement. This study was carried out to determine factors influencing employee engagement and employee centric performance among 185 personnel working in various organizations, at various positions. The study identified the major factors underlined as employee commitment, readiness for change, proactiveness, behavior of resilience and employee engagement through a generation of excitement and self inspiration. The study recommends that leaders at various levels and human resource personnel should work towards facilitation of an environment and work conditions to generate drivers for work engagement.

I. Introduction and Review of Literature

The spectre of globalization, everywhere today, has driven organizations to change according to the needs and requirements of the environment. Research studies have shown how efficient organizations can be generated by successfully engaging and securing employee commitment. These factors have proven to result in higher levels of organizational performance as well as higher levels of job satisfaction, both of which are indispensable in organizations today. More and more organizations are experimenting with engaging their employees in everyday decision making and change to drive performance. A research study undertaken by Mckinsey and Co, to determine the meaning and value of employee engagement among 59 organizations and understand the primary drivers, underlined the appetite and ability of leaders at every level to engage their subordinates in every day decision making and change. Most scholars agree that job resources are the most important drivers of work engagement. Research has confirmed that career growth opportunities, supportive relationships with coworkers, performance feedback, and employee skill development facilitate engagement particularly when the job is challenging.

Given these findings, one may argue that the organization plays an important role in fostering engagement, through the provision of resourceful and challenging jobs.Zurch Edge, a consultant and researcher was known to invite 430 of its top people to Walt Disney World for a conference designed to generate ideas and help senior managers identify ideas from outside usual challenges. The key points about employee engagement were predominantly underlined in the form of change, commitment, resilience and proactiveness. Several organizations use organizational commitment and employee engagement as a model for creation of an organization to be more effective and efficient. When an organization makes fundamental changes, they become the most important element for the success of organizational change (Echols, 2005; Crabtree, 2005; Gubman, 2004). Employee engagement has been widely used as a popular term (Robinson et al, 2004). However, most of what has been written about employee engagement can be found in practitioner journals where it has its basis in practice rather than theory and empirical research. Employee engagement has been defined in different ways and definitions and measures often sound like better known and established constructs like organizational commitment and organizational citizenship behavior.(Robinson et al, 2004). emotional and intellectual commitment to the organization (Baumik, 2004; Richman, 2006; Shaw, 2005) or amount of discretionary effort exhibited by employees in their jobs (Frank et al, 2004).

Commitment

Organizational commitment is considered to be an individual's way of thinking how much of his/her value and goals are in line with the organization, how to overcome the conflicts and develop an attachment to the organization. Organization Commitment is the degree of affective or emotional attachment of an employee to the organization. Halaby (1986) view commitment as an emotionally neutral "intent to stay" that is the immediate precursor to leaving or staying. Commitment has its origins in sociology (Kanter, 1968). It is considered to be a potential predictor of employee turnover. Commitment is considered as a force that binds an individual to a course of action that is of relevance to a particular target (Meyer, 2001). Meyer and Allen, (1991), argued that commitment binds an individual to an organization and thereby reduces the likelihood of turnover. The mindset presumed to characterize commitment is the affective attachment to the organization, implying an obligation to remain and the perceived cost of learning. Affective commitment has been proved to have the strongest positive correlation with job performance, organization citizenship behavior and attendance, followed by normative commitment and continuance commitment.

Change

Change is considered commonplace in organizations. In order to strive for a competitive edge in a global marketplace, organizations may change strategy and processes, undergo mergers and acquisitions restructure or downsize or implement new technology. These changes have profound implications for

employees. They are expected to cope with uncertainty and stress associated with the changing work context and increased work demands. (Border, Hobman, Lones, Callan, 2004). Employees are the vital agents for the successful implementation of any change program.(Kotter, 1995). Axtell et al (2005) found that employees' exposure to similar changes in the past increased their knowledge and familiarity with the changed work systems and made them more open to future changes. An employee openness to change is vital for the success of most change efforts in organizations. Openness to change has two elements: willingness to support the change and a positive effect about the consequences of the change (Wanberg and Banasm, 2010, p 132) Armenakis et al, 1993, discuss how an individual readiness to change is reflected in the beliefs, attitude and intention of the member organization in relation with how much the change is needed and how much the capacity of the organization to make the successful change. Individual readiness for change is the comprehensive attitude that simultaneously was influenced by the content, process, context, and the characteristics of the individuals who are involved in the process of change. In which the total of it, reflecting the individual trend or a group of individuals that cognitively and emotionally adopted to plan to change the condition in a certain time and with specific objectives.

Proactiveness

Bateman and Crant (1993) identified proactive behavior as a personal disposition, or a relatively stable behavioural tendency. This concept of proactive personality was shown to be distinct from other personality concepts (such as need for achievement and locus of control), to be able to differentiate among individuals and to be significantly associated with an array of criterion variables (such as transformational leadership). They described the concept in the following way: The prototypic proactive personality as we conceive it, is one who is relatively unconstrained by situational forces, and who affects environmental change. Proactive people scan for opportunities, show initiative, take action and persevere until they reach closure by bringing about change. People who are not proactive exhibit the opposite patterns, they fail to identify, let alone seize opportunities to change things. They passively adapt to and even endure their circumstances. (p 105)

Bateman and Crant (1993) proposed that proactive people use problem focused strategies for coping with stressful demands (reactive coping) rather than emotion focused strategies. Work tasks and interactions that compose the days, the jobs, and ultimately, the lives of employees are the raw materials employees use to construct their jobs. Job boundaries, the meaning of work and work identities are not fully determined by formal job requirements. Individuals have the latitude to define and enact the job acting as "job crafters". Researchers define job crafting as the physical and cognitive changes individuals make in the task or regional boundaries of their work.

Resilience

Career resilience represents an ability to adapt to changes in work circumstances, including an openness to change, a willingness to take risks and confidence in handling problems. (London, 1985). Employees high in career resilience are more willing and able to accept job transitions that entail the possibility of failure.(Latack, Knicki and Prussia, 1995) Career resilient people are likely to engage in self development activities that will enable them to take advantage of opportunities (London and Smither, 1999). Moreover, retrospective rationality, that behaviours and decisions influence perceptions about personal characteristics (resilience). (London, 1983), suggests that developing personal resources that help to cope with job changes will reinforce career resilience. Grotberg (2003: 3-4) has developed a 3 category framework for grouping the protective factors: external supports (good role models, trusted family and non family members), inner strengths (likability, optimism, empathy, a sense of purpose) and inter personal and problem solving skills like staying with the task until its finished, reaching out for help when needed and generating new ideas on how to do things. While these predictors and others were typically identified in studies of children, these predictors do offer some intriguing possibilities in applying resilience to employees and their leaders.

In this study I sought to determine the factors influencing work engagement of employees among manufacturing and service organizations in and around the industrial town of Pimpri and Chinchwad. Specifically the study aimed to find out factors that determine worker engagement , determine the extent to which the employees are satisfied through their willingness to accept change, take on new tasks when needed, take initiative to help their colleagues, proactively identify future challenges and opportunities, to keep going when the going is tough, adapt to situations, focus on job duties, give their best effort at work each day, involvement in work, get excited about going to work, and have self inspiration about meeting goals at work.

The study will identify the possible correlations among these variables related to worker engagement. It will also highlight the distinct factors related to employee engagement. The findings will be of immense value and benefit to human resource personnel and leadership in organizations to facilitate features in the work environment leading to the adoption of such measures by employees at all levels.

II. Study Methodology

A cross sectional design was used for the study. The target population for the study consisted of personnel working for 2 years and above at various manufacturing and service industries in the industrial township of Pune.The total numerical strength of the judgemental sample was 185 at the time of the study.

In this research, a structured questionnaire, adapted from the SHRM template, a body of Human Resource Management, consisting of 12 items was used as an instrument to collect data. The questions were in sections relating to personal details of respondents, factors influencing worker engagement. The questionnaire was personally administered to respondents for the sake of speed in response. In order to answer research questions related to work engagement, the following items were presented; to which the respondents were guided by a six point Likert Scale (strongly agree to strongly disagree):

Employees in my organization accept change
Employees are willing to take on new tasks
Employees take initiative to help colleagues

Employees proactively identify future changes and opportunities
Employees keep going when the going gets tough
Employees quickly adapt to difficult situations
I am focussed on my job duties
I give my best effort
I am totally involved in my work
I get excited about going to work
I am involved in my work
I am inspired to meet my goals at work

The questionnaire was coded in 5 point Likert scale before the administration to facilitate easy tabulation and analysis.

III. Data Collection and Analysis

The researcher assured all respondents of confidentiality. All the questionnaires administered were returned after being fully completed. Initially the item analyses for the 12 items of the employee engagement scale were carried out. The item remainder correlations for all items were satisfactory and statistically significant. The Cronbach Alpha too was quite high at 0.660, which implies the internal consistency of items.

IV. Factor Analysis of the Employee Engagement Scale

In order to understand the structure of the Employee Engagement scale, the factor analysis of this scale was carried out. The correlation matrix was visually scrutinized for its suitability for factor analyses. Bartlett's test of sphericity was also computed which yielded a test statistic of (chi square 280.279,) indicating that the obtained correlation matrix significantly departs from the identity matrix, thus indicating its suitability for factor analysis. Kaiser Meyer Olkin measure of sampling adequacy has also been calculated which turned out to be 0.667

The correlation matrix was subjected to Principal Component Analysis (PCA) and a varimax rotated five factor solution was obtained. The five factor solution was found to be more interpretable and the same is reported in the following Table No 2. Table 1 reports the correlations among the various scales.

TABLE 1: Correlations

Correlations

		chnge	opnns	ini	chlng	red	adapt
chnge	Pearson Correlation	1	.146*	.112	.137	.068	.201**
	Sig. (2-tailed)		.048	.130	.062	.358	.006
	N	185	185	185	185	185	185
opnns	Pearson Correlation	.146*	1	.182*	.173*	-.067	.309**
	Sig. (2-tailed)	.048		.013	.019	.366	.000
	N	185	185	185	185	185	185
ini	Pearson Correlation	.112	.182*	1	.047	.025	.222**
	Sig. (2-tailed)	.130	.013		.521	.740	.002
	N	185	185	185	185	185	185
chlng	Pearson Correlation	.137	.173*	.047	1	.128	-.051
	Sig. (2-tailed)	.062	.019	.521		.082	.488
	N	185	185	185	185	185	185
red	Pearson Correlation	.068	-.067	.025	.128	1	.083
	Sig. (2-tailed)	.358	.366	.740	.082		.261
	N	185	185	185	185	185	185
adapt	Pearson Correlation	.201**	.309**	.222**	-.051	.083	1
	Sig. (2-tailed)	.006	.000	.002	.488	.261	
	N	185	185	185	185	185	185
foc	Pearson Correlation	.059	.166*	.093	.155*	-.050	.056
	Sig. (2-tailed)	.423	.024	.210	.035	.497	.449
	N	185	185	185	185	185	185
opt	Pearson Correlation	-.078	.098	.068	-.080	.075	.209**
	Sig. (2-tailed)	.294	.185	.356	.278	.313	.004
	N	185	185	185	185	185	185
inv	Pearson Correlation	.142	.145*	.142	-.015	.057	.238**
	Sig. (2-tailed)	.053	.049	.053	.843	.441	.001
	N	185	185	185	185	185	185
exct	Pearson Correlation	.139	.176*	.304**	.008	.104	.244**
	Sig. (2-tailed)	.059	.017	.000	.918	.158	.001

	N	185	185	185	185	185	185
stinv	Pearson Correlation	-.021	.106	.290**	.082	.059	.149*
	Sig. (2-tailed)	.777	.151	.000	.266	.421	.044
	N	185	185	185	185	185	185
slfin	Pearson Correlation	.085	.137	.106	.072	.116	.113
	Sig. (2-tailed)	.248	.063	.152	.328	.117	.126
	N	185	185	185	185	185	185

Correlations

		foc	opt	inv	exct	stinv	slfin
chnge	Pearson Correlation	.059	-.078	.142	.139	-.021	.085
	Sig. (2-tailed)	.423	.294	.053	.059	.777	.248
	N	185	185	185	185	185	185
opnns	Pearson Correlation	.166*	.098	.145*	.176*	.106	.137
	Sig. (2-tailed)	.024	.185	.049	.017	.151	.063
	N	185	185	185	185	185	185
ini	Pearson Correlation	.093	.068	.142	.304**	.290**	.106
	Sig. (2-tailed)	.210	.356	.053	.000	.000	.152
	N	185	185	185	185	185	185
chlng	Pearson Correlation	.155*	-.080	-.015	.008	.082	.072
	Sig. (2-tailed)	.035	.278	.843	.918	.266	.328
	N	185	185	185	185	185	185
red	Pearson Correlation	-.050	.075	.057	.104	.059	.116
	Sig. (2-tailed)	.497	.313	.441	.158	.421	.117
	N	185	185	185	185	185	185
adapt	Pearson Correlation	.056	.209**	.238**	.244**	.149*	.113
	Sig. (2-tailed)	.449	.004	.001	.001	.044	.126
	N	185	185	185	185	185	185
foc	Pearson Correlation	1	.291**	.251**	.205**	.278**	.143
	Sig. (2-tailed)		.000	.001	.005	.000	.052
	N	185	185	185	185	185	185
opt	Pearson Correlation	.291**	1	.378**	.247**	.181*	.100
	Sig. (2-tailed)	.000		.000	.001	.014	.177
	N	185	185	185	185	185	185
inv	Pearson Correlation	.251**	.378**	1	.166*	.177*	.290**
	Sig. (2-tailed)	.001	.000		.024	.016	.000
	N	185	185	185	185	185	185
exct	Pearson Correlation	.205**	.247**	.166*	1	.391**	.199**
	Sig. (2-tailed)	.005	.001	.024		.000	.007
	N	185	185	185	185	185	185
stinv	Pearson Correlation	.278**	.181*	.177*	.391**	1	.415**
	Sig. (2-tailed)	.000	.014	.016	.000		.000
	N	185	185	185	185	185	185
slfin	Pearson Correlation	.143	.100	.290**	.199**	.415**	1
	Sig. (2-tailed)	.052	.177	.000	.007	.000	
	N	185	185	185	185	185	185

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

TABLE 2
Factor Analysis

	Component				
	1	2	3	4	5
stinv	.808	.169	-.145	.158	
exct	.665	.163	.208		
ini	.638	-.124	.325	-.104	-.125
slfin	.504	.241		.246	.285
opt	.107	.797		-.163	
inv		.720	.228		.131
foc	.204	.555		.457	-.288
chnge			.672	.227	.204
adapt	.212	.247	.671	-.280	
opnns	.156	.135	.589	.252	-.346
chlng		-.110	.142	.831	

V. Factor Analysis

Using 0.35 as cut off point, it is noted that each of the Factors is defined by the following items:

Factor 1: Employee Engagement
11.I feel completely involved in my work(0.80)
10. I get excited about going to work (0.665)
3. Employees in my organization take the initiative to help other employees (0.638)
12. I am inspired to meet my goals at work (0.504)

Factor 2: Commitment
8 I am determined to give my best effort at work each day (0.797)
9. I am so involved in my work that the day goes of very quickly (0. 720)
7. When at work, I am completely focused on my job duties (0.555)

Factor 3: Change
1. Employees in my organization willingly accept change (0.672)
6. In my organization, employees adapt to difficult situations (0.671)
8. I am determined to give my best effort at work (0.589)

Factor 4: Proactiveness
7 When at work, I am completely focused on my job duties (0.457)
1. Employees in my organization willingly accept change (0.831)

Factor 5: Resilience
5. Employees here keep going when the going gets tough (0.863)

VI. Discussion

The research shows that there is a positive correlation between organizational commitment, employee engagement and individual readiness to change. This finding is partly in line with other research that has been done which shows that commitment, identification with an organization loyalty, and employee involvement has positively correlated with individual readiness for change. (Madsen, 2011). The correlations among all the elements related to employee engagement show a positive trend. The factors determined relating to employee engagement distinctly show engagement, commitment, change and readiness to do so, proactiveness and resilience. The above mentioned research studies support the findings of this analysis. These elements are considered commonplace in organizations today, as various research studies indicate. The study has shown that getting higher productivity from the workforce in organizations is possible only with the facilitation of the work environment where the employees feel engaged and treat their organizations as their own. Moreover, these will help to garner their sense of commitment, create a character of openness to change, make them proactive to help and assist colleagues through team work and sharing expertise and ultimately these will build a sense of resilience among the workforce to cope with the volatile changes and complexity so rampant in organizations today.

VII. Conclusion

This study will conclude by making some recommendations to the leaders and human resource personnel of organizations working towards people centric environments for building and developing employee engagement, commitment, change and resilience. The policy designers and human resource personnel should create policies and systems to foster s spirit of freedom

and innovation among the workforce, build the culture of team working from cross functional areas to encourage proactive behavior, train members to be open to change in these volatile times and ultimately steel employees for the uncertainty in the future and build their spirit of resilience.

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Two New Additions of Peristylus BL. to the Orchid Flora of Manipur, India

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Abstract- Two species of *Peristylus* viz. *P. parishii* Rchb. f. and *P. richardianus* Wt. reported as new additions to the orchid flora of Manipur.

I. Introduction

The genus *Peristylus* Bl. (Orchidaceae) comprises of *ca.* 110 species distributed widely in South East Asia (Govaerts *et al.* 2013). The genus is characterised by small to medium terrestrial or rarely epiphytic herbs having 1 or 2 underground tubers, thin, linear to broadly elliptic leaves; terminal, racemose, laxly to densely few to many flowered inflorescence; simple to 3 lobed lip, connate at base with the margins of the column; short, pouch shaped spur and two shortly clavate pollinia.

The genus *Peristylus* is represented by *c*a. 29 species and 4 varieties in India (Misra 2007), of which *ca.* 6 species are reported so far from Manipur (Sathish Kumar & Suresh Kumar 2005).

During the field exploration in various parts of Manipur, two species of *Peristylus* were collected in vegetative condition from Hengbung of Senapati District and maintained in the orchidarium of Centre for Orchid Gene Conservation for Eastern Himalayan Region, (COGCEHR), Hengbung, where they flowered during June and August 2013. Based on the available literature (King & Pantl. 1898; Nageswara Rao 1995, 2010; Joseph & Nageswara Rao 1980; Pearce & Cribb 2002; Manilal & Sathish Kumar 2004; Lucksom 2007; Govaerts *et al.* 2013), the taxa were identified as *Peristylus parishii* Rchb. f. and *P. richardianus* Wight. The species are enumerated below with description and colour illustration.

Peristylus parishii Rchb.f. Trans. Linn. Soca. London 30: 139 (1874); Type: Myanmar (Burma) Moulmein, *Parish* 216 (holo K); Kataki et al. in Plants Cons. Bull. 5: 28 (1984); A. N. Rao, J. Econ. Tax. Bot. 14 (3): 638. 1995; A. N. Rao, Bull. Arunachal For. Res. 26 (1-2): 1-28 (2010). *Habenaria parishii* (Rchb. f.) Hook. f. Fl. Brit. India 6(1): 161 (1890); King and Pantl. Ann. Roy Bot. Gard. Calcutta 8: 323. T. 426 (1898). (Fig. 1.)

Plant erect, *ca.* 55 cm tall. Tubers 2, unequal, ellipsoid, 3.5-4.5 × 1.5-2.2 cm. Stem 21-30 cm tall. Leaves 2 - 3, 7 - 9 × 2.9 - 3.6 cm, ovate-elliptic, acute, clustered on the middle of the stem, undulate at margin, sheathing at base; petiole 0.5-1.5 cm long, channelled. Inflorescence 7-19 cm long, laxly many flowered; floral bracts 10 -12 × 2.5 mm, lanceolate, acuminate, green. Pedicellate ovary 5-7 mm long. Flower *ca.* 1 cm across, green, Sepals sub-equal, green; dorsal sepal 5 - 6 × 1.6 - 1.8 mm, oblong-lanceolate, obtuse, apiculate, 1-veined; lateral sepals 6 - 7 × 1.6 - 1.8 mm, narrowly-oblong to lanceolate, acute, curved inside at margins. Petal 6 - 7 × 2 mm, oblong, obtuse, curved outside. Lip 6 - 7 × 2.3 - 2.5 cm, 3-lobed, spurred, broadly clawed at base, lateral lobes *ca.* 2 × 0.5 mm, shorter than midlobe, oblong, obtuse; mid lobe *ca.* 3.5 × 1.5 mm, triangular-oblong, sub-acute, longer than side lobes. Column 0.6 - 0.7 mm long, green. Pollinia 2, sectile, pyriform, with short caudiles.

Flowering: June.
Locality: Hengbung.

Specimen examined: Manipur, Senapati district, Hengbung 1298m, 25°13.71' N and 94°00.12' E, *Chowlu-00957*.

Distribution: India (Arunachal Pradesh, Sikkim, Andaman & Nicobar Islands), China, Myanmar, Nepal, Thailand and Vietnam.

Habitat Ecology: Found on sun exposed grassy hill slopes in humid climate of sub tropical zone at 1298 m elevation in association with *Anthogonium gracile* and unidentified grasses.

Peristylus richardianus Wight, Icon. Pl. Ind. Orient. 5(1): 12, t. 1697 (1851); Type: India, Nilgiri Hills, Richard s. n. (holo P); Joseph & Rao in *Bull. Bot. Surv. India* 22: 180-182 (1980); Manilal & Sathish Kumar in Orchid Memories A tribute to Gunnar Seidenfaden 90-212 (2004); Rao in Bull. Arunachal For. Res. 26: 82-110 (2010). *Habenaria bicornuta* Hook. f., Fl. Brit. India 6 (1): 156 (1890). (Fig. 2.)

Plant height 45 cm long, erect. Tubers 2, unequal, 1.5-3.3 cm long, ovoid- globular. Leaves 3 - 4, 5 - 14 × 1 - 1.5 cm, oblong-lanceolate, acute-acuminate, alternate, sheathing at base, down the stem. Inflorescence 10 - 15 cm long, laxly many flowered, erect; floral bract 6 - 7 × 2 - 2.5 mm, lanceolate, acute, green, shorter than ovary; pedicellate ovary 8 - 10 mm long, green. Flower 3-4 mm across, green, sessile. Sepals sub-equal, oblong-lanceolate, obtuse, green; dorsal sepal 4.0 - 4.5 × 1.5 - 1.6 mm, lateral sepals 4.0 - 4.5 × 1.4 - 1.5 mm, apiculate, falcate. Petals 4.5-5.0 × 2 mm, oblanceolate, acute, pale green. Lip 3 lobed, lateral lobes 6 mm long, filiform, curved in horn shape; mid lobe 3 mm long, conical, obtuse, reflexed, spur *ca.* 3 mm long, clavate green. Column 0.5 - 0.7 mm long, green. Pollinia 2, *ca.* 0.4 mm long.

Flowering: August-September.
Locality: Hengbung.

Specimen examined: Manipur, Senapati district, Hengbung 1168m, 25°13.82' N & 94°00.21' E, *Chowlu-00954*.

Distribution: India (Arunachal Pradesh, Meghalaya, Kerala, Tamil Nadu), China, Myanmar and Thailand.

Habitat Ecology: Rarely found growing on sun exposed grasslands in humid climate of sub tropical forest at 1168 m altitude.

II. ACKNOWLEDGEMENTS

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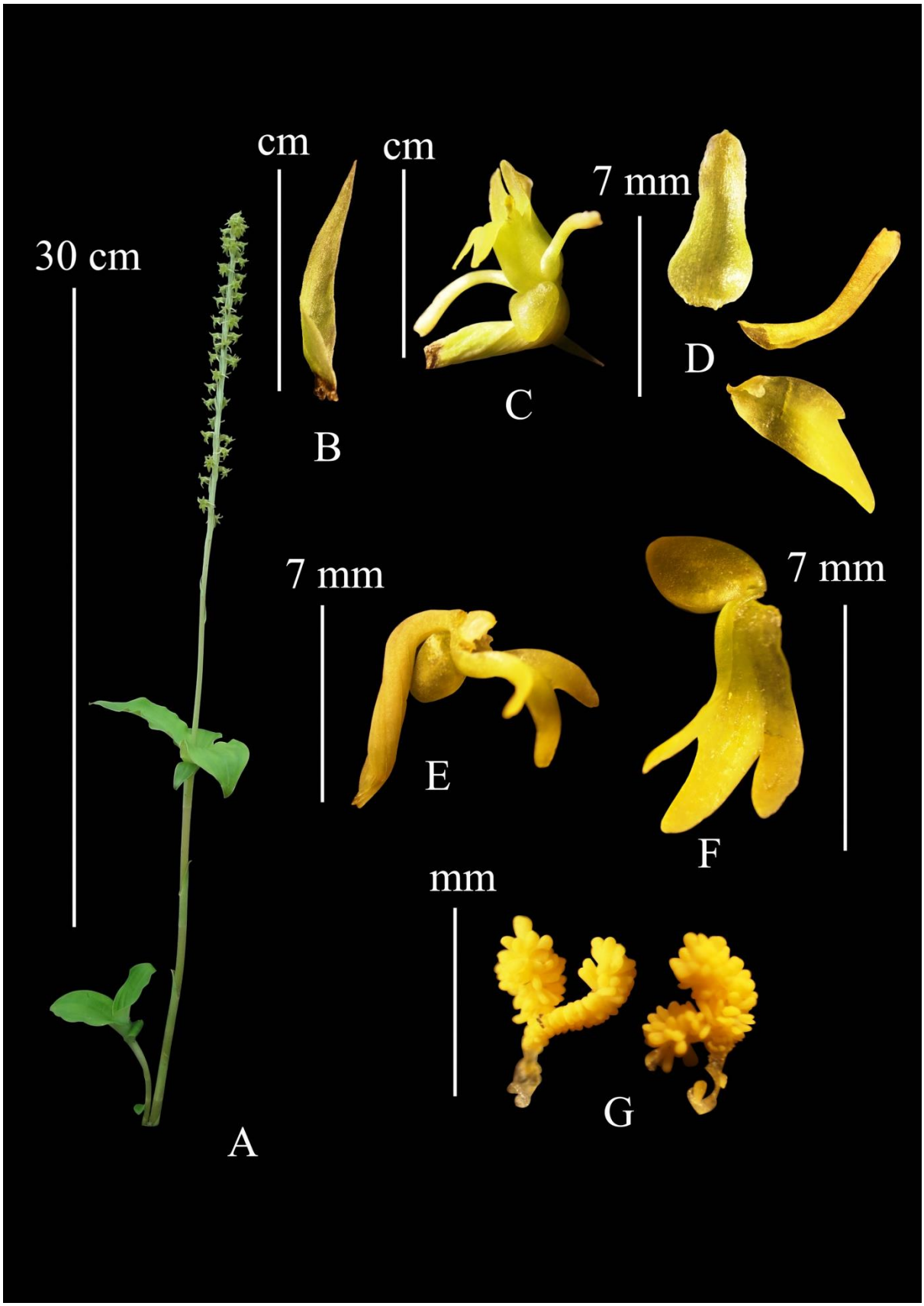

Fig. 1. ***Peristylus parishii*** **Rchb. f. A. Habit. B. Bract. CA. Flower. D. Dissected parts. E. Lip with the column. F. Lip. G. Pollinia**

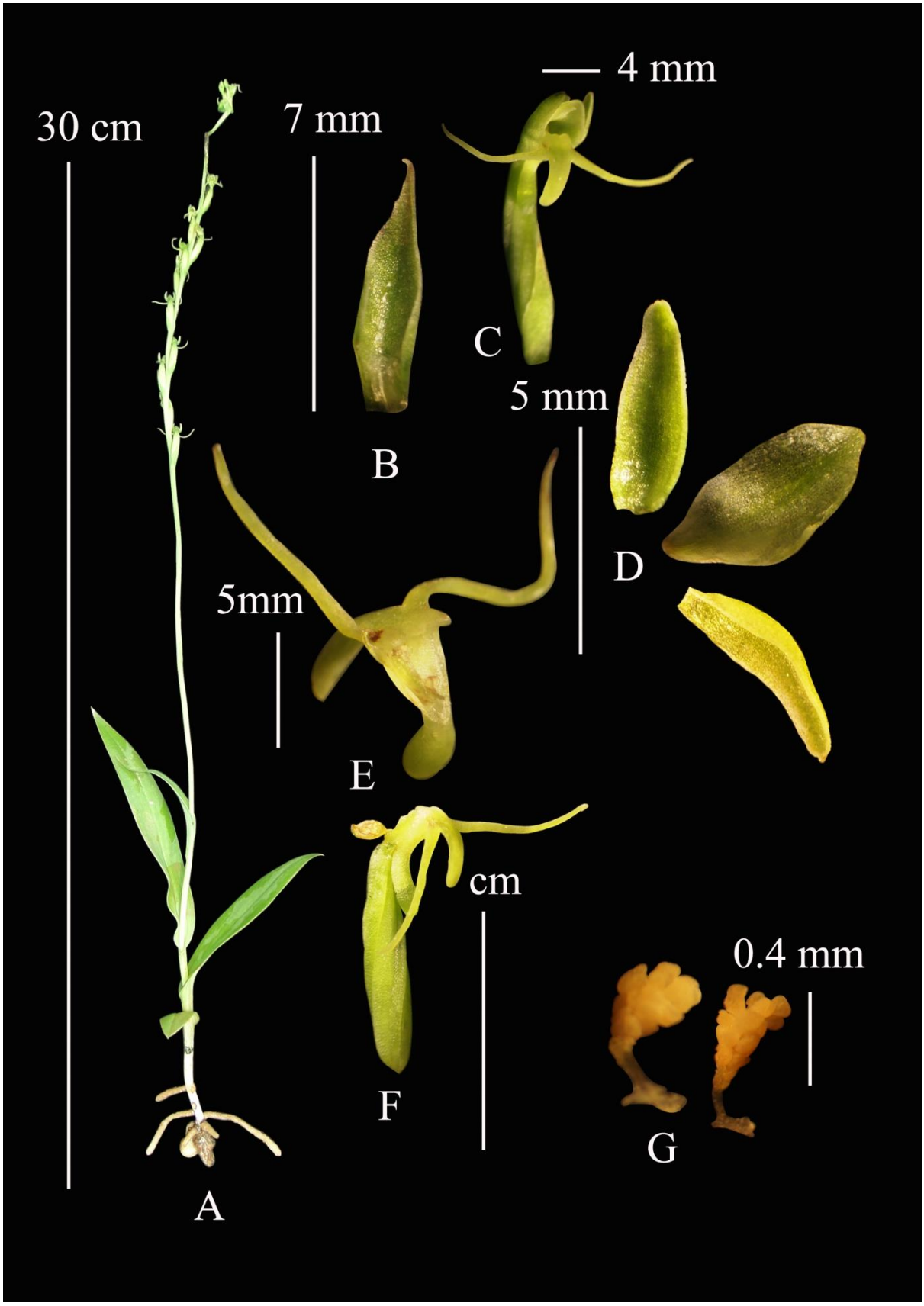

Fig. 2. ***Peristylus richardianus*** **Wight A. Habit. B. Bract. CA. Flower. D. Dissected parts. E. Lip with spur. F. Lip with column. G. Pollinia.**

Automation of Material Handling with Bucket Elevator and Belt Conveyor

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Abstract- Belt conveyor & Bucket elevator are the media of transportation of material from one location to another in a commercial space. Belt conveyor has huge load carrying capacity, large covering area simplified design, easy maintenance and high reliability of operation. Belt Conveyor system is also used in material transport in foundry shop like supply and distribution of molding sand, molds and removal of waste. On the other hand Bucket elevator can be of great use during bulk material handling. This paper is mainly based on the combination of Belt & Bucket Conveyers to perform complex task within a short time and successfully in a cost effective way. On account of this, a machine and its physical description is covered here with some basic calculation.

Index Term- Belt Conveyor, Bucket Elevator, Weight sensor, Bulk material.

I. INTRODUCTION

Initial stage is to form a pre project plan. During the project design stage for the transport of raw materials or finished products, the choice of the method must favor the most cost effective solution for the volume of material moved; the plant and its maintenance; its flexibility for adaptation and its ability to carry a variety of loads and even be overloaded at times. Again a rough sketch of the proposed machine is evaluated so that the basic parts can be easily understood. More importantly a development team was formed to monitor the design to be robust and accelerate the work.

II. WHY THIS MACHINE

The conveyor belt changed the face of the industrial economy around the world. Today, it has applicable uses in countless industries, such as transportation and food services. A bucket elevator or conveyer is a mechanism for hauling flow able bulk materials by following an assembly line in horizontal, vertical or inclined direction. According to the survey performed 85% industrial units face difficulties in handling bulk material packaging. The difficulties mainly arises when it is necessary to convey a bulk material through a linear distance as well as a certain height. Conventional ways are responsible for material wasting, time wasting & above all a poor management. In order to overcome those draw backs not only Belt & Bucket conveyers are combined but also artificial intelligence brought in use. Efficiency & accuracy of the system were ensured using the sensor.

III. PROJECT PLANNING

Our project is based on the handling of bulk material and its packaging process. It is a combination of bucket elevator and belt conveyor and the packaging process is controlled automatically by using microcontroller. A weight sensor is attached with the microcontroller which helps to package the bulk material at proper amount.

At first we thought about the design of this machine. Though we build a prototype we had to be careful about the design and dimension. After surveying on various industries we cleared our concept and designed our machine with proper dimension. To build this project we distributed our work in two parts which included the mechanical part and the electrical part. First we decided to build the mechanical part which included bucket elevator and the belt conveyor. We built the bucket elevator and the belt conveyor separately and then combined it in a single frame. All the works had done in our departmental workshop. After completing the mechanical part we worked on the electrical part. We set up the weight sensor on the discharge which connected through the microcontroller so that it could measure the amount of bulk material. For building this project completely necessary work had done on the workshop.

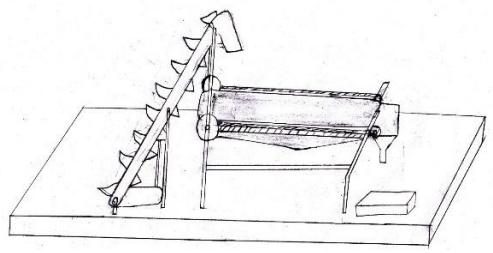


Figure1: Primary sketch of the machine.

III.A. BUCKET ELEVATORS

A bucket elevator consists of a series of uniformly fed buckets mounted on an endless chain or belt which operates over head and foot wheels. The buckets are used to elevate (usually vertically) pulverized, granular, or lumpy materials. The material is received at the

boot, raised and then discharged by passing over the head wheel at the top, into a discharge chute. Generally this mechanism is enclosed in a casing, especially the head and foot sections. Some elevators are self-supporting, but more often they are supported by, or at least braced against a structural steel frame. Inclined elevators, which are seldom enclosed, are popular for handling.

Which type of bucket and bucket elevator was selected?

An **inclined twin chain bucket elevator** was selected for this project. The angle of inclination was 45° from the vertical. And the selected bucket was **Deep type bucket**. The front edge of buckets is sheared off at an angle of 65° making them deep.

Charge and Discharge of Buckets: (Scooping charge and centrifugal discharge)

The material is either scooped up by the buckets in the elevator boot or is fed directly into the buckets. Here bulk material, cement, sand, saw dust, crushed coal, sugar, rice, wheat will be conveyed. So, spaced buckets of belt-and-chain elevator was selected which works on the principle of scooping material.

Centrifugal discharge type bucket elevator was selected. In centrifugal-discharge bucket elevators, the material to be elevated is dug out of the boot and discharged by centrifugal force developed when the bucket is taken around the head pulley (or sprocket) and falls directly into the discharge spout of the upper casing. Before reaching the pulley, the buckets moves uniformly along a rectangular path and only the force of gravity $P = mg$ acts on the load; when the bucket begins to turn around the pulley (or sprocket), the centrifugal force

$$F = m\frac{v^2}{r}$$

is added to the gravity. In the above equation

$m =$ Mass of the load contained on the bucket;

$v =$Speed of the center of gravity of the load in the bucket, m/sec;

$r =$ Radius of rotation, mm;

$g =$ Acceleration of the force of gravity, m/sec^2

The resultant of these two forces changes its magnitude and direction as the bucket turns. The particle ejected from the bucket follows a parabola within the upper part of the elevator casing and falls on the chute of the discharge spout.

III.B. BELT CONVEYOR

A **conveyor belt** (or **belt conveyor**) consists of two or more pulleys, with a continuous loop of material - the conveyor belt - that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler. There are two main industrial classes of belt conveyors; Those in general material handling such as those moving boxes along inside a factory and bulk material handling such as those used to transport industrial and agricultural materials, such as grain, coal, ores, fines and lumps material. Conveyors are durable and reliable components used in automated distribution and warehousing. In combination with computer controlled pallet handling equipment this allows for more efficient retail, wholesale, and manufacturing distribution. It is considered a labor saving system that allows large volumes to move rapidly through a process, allowing companies to ship or receive higher volumes with smaller storage space and with less labor expense.

III.C. ELECTRONIC COMPONENTS

1. Weight sensor:

It is one of the main purposes of machine is to reduce the packaging time of bulk material. The weight sensor is used so that the machine is capable of packaging the specific amount of material with in a very short limit of time.

Figure 2: Pictorial view of weight sensor

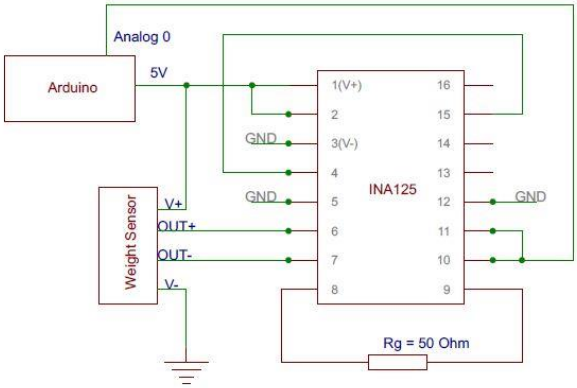
2. Specifications:

- Capacity g 500g
- Output sensitivity mv/v 0.5±0.1
- Nonlinearity %.F.S 0.05

- Hysteresis %F.S 0.05
- Repeatability %F.S 0.05
- Creep(30min) %.F.S 0.05
- Temperature effect on sensitivity %F.S/10℃ 0.05
- Temperature effect on zero %F.S/10℃ 0.05
- Zero balance %F.S ±0.5
- Input resistance Ω(ohms) 1120±10
- Output resistance Ω(ohms) 1000±10
- Insulation resistance MΩ(ohms) ≥2000
- Recommended excitation voltage v 5v
- Method of connecting wire red： Exc + black： Exc – green： Sig + white：Sig -
- Dimension(mm): 45 x 9 x 6

3. Hardware install:

Weight sensor output 0V when the load less than 150g, so we cannot directly measure the load. My method is using a 200g local avoid measure blind spot .We read the analog data of 200g weight as no-load(0g),read the analog data of 700g weight as full load(500g).



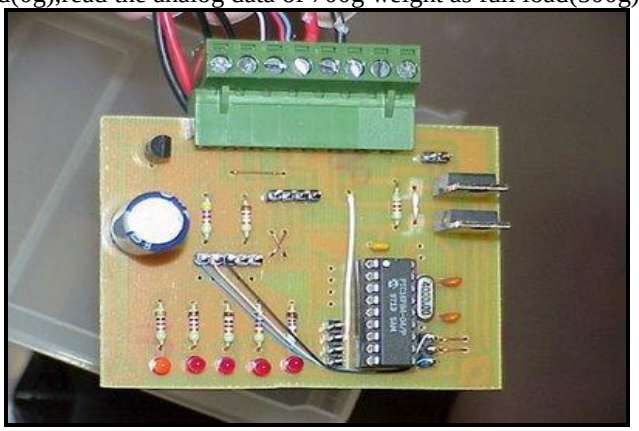


Figure 3: Circuit diagram of Weight Sensor

4. *Programming:*

```
void setup()
{
  Serial.begin(9600);
}

void loop()
{
  int value;
  value = analogRead(0);
  Serial.println(value);
}
```

IV. WORKING PROCEDURE

Some sequential steps are adopted while building up this machine. Some machining process (such as metal cutting, soldering, welding, facing, turning, grinding, boring and drilling) were identified and incorporated to construct the parts. The main purpose of our working procedure was to build up a functional prototype.

IV.A. MACHINE COMPONENTS

The main components of our machine are given below-

Table I – Parts of our machine.

Bucket Elevator	Belt Conveyor	Electronic components
Casing	Belts	Weight sensor
Buckets	Idlers	Microcontroller
Chains	Centering device	24 volt dc motor
Sprockets	Drive units	Adapter
Take-ups	Take-ups	Capacitor

Boot section	Bending the belt	Register
Drive units	Loading and discharging device	Circuit board
Elevator Frame	Belt cleaner	
	Conveyor Frame	

IV. B. MACHINING PROCESSES

The various machining processes those were used in making The Bucket Conveyor and The Belt Conveyor are described below:

1. Metal Cutting:

Various metal cutting tools were used here such as-

i Sniping tool: To cut the thin metal sheet to form the shape of bucket
ii Hack Saw: To cut the shaft into desired length.
iii Grinder cutting: To cut the thick metal bar into required length for making frame.

Figure 4: Cutting Sheet metal with sniping tool (left), shaft with Grinding Cutter (right).

2. Soldering:

The buckets were made from thin metal sheet. So in spite of welding soldering was used to join the outer edges of the bucket to make the bucket strong enough during operation.

Figure 5: Soldering buckets.

3. Welding:

In this process welding was widely used. As the project was to make a small prototype and there was a small budget for it, welding was used here for most of the joining process. Welding was used to:

i Attach the sprocket to the shaft.
ii Attach the bearing to the shaft.
iii Hold the bearing in the bearing holder.
iv Attach the bearing holder to the frame.
v Form the frame of both bucket and belt conveyor.
vi Join the bucket conveyor's driving shaft and belt conveyor's driving shaft to the electric motors.
vii And to join many other parts to the frame.

Figure 6: Welding process.

4. Boring:

The sprocket was bought from the market. As the hole of the sprockets was smaller than the outer diameter of the shaft, these holes were enlarged by boring method with the help of lathe machine.

Figure 7: Boring with Lathe Machine.

5. Drilling:

Drilling process was also used here for different purposes such as:

i The shaft of the pulley of the belt conveyor on loading portion is stationary while the pulley is rotatable with the help of bearing. This shaft is held by two metal bars and these bars were drilled to hold the shaft.

ii In this project two wooden pulleys were used. Both these pulleys were drilled along its central axis to make a path of shaft.

iii The bottom portion of the frame was drilled in different points to make hole to screw the whole frame to a wooden board.

Figure 8: Drilling operation.

6. Grinding:

It has been already mentioned that the welding process was widely used here. So, grinding process was also used here to grind the various parts after cutting to get a plane surface for welding. The welded parts were also grinded for fine surface.

Figure 9: Grinding operation.

7. Facing and Turning:

Turning process was adopted for two purposes:

i To match the outer diameter of the shaft to the inner diameter of the bearing.

ii To convert rectangular wooden bar into cylindrical pulley.

And where there is used turning process there is also used facing process for centering in the lathe machine.

Figure 10: Facing operation (left), turning operation (right) with Lathe Machine.

V. PARTS OF MACHINE

Brief description of Automation of Material Handling with Bucket Elevator and Belt Conveyor is given below:

V.A. PARTS OF BUCKET ELEVATOR

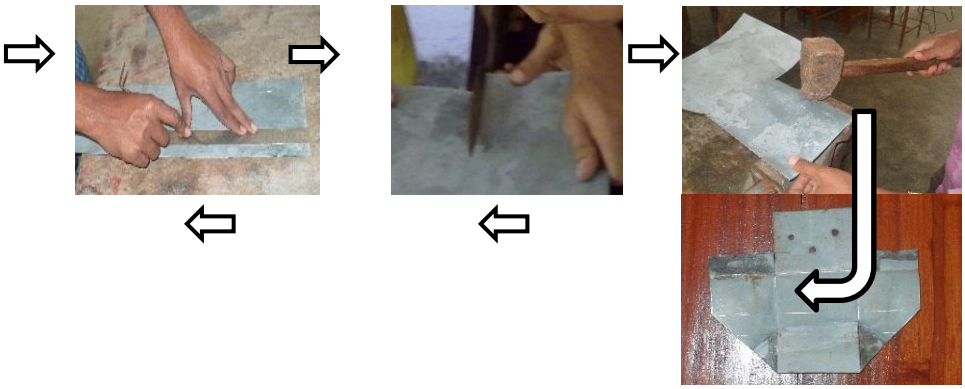
1. Casing:

The elevator is usually enclosed in a steel casing, to provide a means of support and as a matter of safety and dust retention. A casing can be made dust-tight, either by using a sealing medium, or continuously welding the comer angles to the plate. The upper casing of the elevator contains manholes providing access for inspections and repairs. As it was a small project work casing was avoided here.

2. Buckets:

It is the essential part of this conveyor. It carries the bulk material to the required place. It was made with a 5mm thin plain steel sheet by folding the sheet at a certain dimension.

Formation of bucket:



3.

A chai ckets. The power

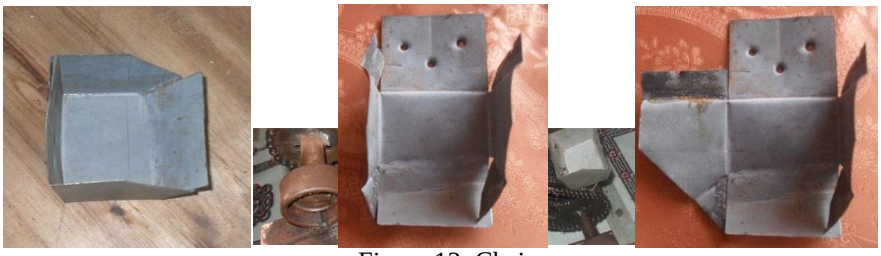


Figure 12: Chains.

4. Sprockets:

It serves as driving unit. It holds the chains of the conveyor which hold the bucket. With the help of sprockets the power of motor is transmitted from one side to the other side of the conveyor. The number of teeth of the sprocket was 32. The sprockets were attached to the shafts rigidly and the shafts were attached to the frame with the help of bearings and bearing holders.

Figure 12: Sprocket with shaft.

5. Take-ups:

Normally, elevators have the screw-type take-up on the foot or boot shaft unless space does not permit. If it is necessary to place the screw-type take-up on head shaft, the centers of the bucket elevator should not exceed 90 feet, because the total weight of chain (or belt) plus buckets and load in buckets on up or carry side, is hanging on the take-up screw in tension. Wherever a head take-up is used, the next larger sized head shaft from that recommended should be used, as the vibration is transferred to the head shaft through the pickup in the boot. Gravity take-ups are used on many elevators, particularly on powdery or aerated material such as cement, lime, and gypsum. A softening effect is encountered at the pickup which must be absorbed by this floating take- up. The frame supporting the shaft and wheel simply rides up and down in angle or channel guides, attached to the inside of the casing. This mechanism was also avoided here.

6. Boot Section:

The elevator boot holds the feed hopper. When moist slow-flowing materials are transported, the hopper is located comparatively high and its bottom is inclined at an angle of 60°; it is located at a low height and its bottom is inclined by 45° when dry free-flowing materials are handled. The side walls of the lower casing contain covered manholes for maintenance and repair.

7. Drive units:

In the bucket elevator motive power is transmitted to the elevator by friction as it wraps around the driving shaft rotated by an electric motor. A 24 volt dc motor is used to run this elevator. The drive comprises the following parts: two sprockets, motor.

V.B. PARTS OF BELT CONVEYOR

1. Belts:

Camel hair, cotton (woven and sewed), duck cotton and also rubberized textile belts of various types are employed in belt conveyors. Our project was to build a prototype of belt conveyor. So we used a piece of raxine and it is connected by sewing with sewing machine.

Figure 13: Polymer Belt.

2. Idlers:

Generally the belt is supported by idler rollers, in rear cases by solid wood or sheet steal runway or a combination support comprising sections of a runway with idler rollers. According to their location on the conveyor, idlers are classified as upper (supporting the loaded strand on the belt) and lower (supporting the idle return strand of the belt). In our project we used steal sheet instead of idlers. These are used mainly in conveyors handling bulk loads, less frequently unit loads etc.

Figure 14: Sheet metal idler.

3. Centering device:

A number of reasons, such as eccentric loading, soiling, sticking of the material to the pulleys and rollers etc., may cause the belt to run crooked. To prevent the belt from running off the rollers, special "belt training idlers" of various designs are used. These idlers automatically maintain belt alignment. For self-aligning the belt we use two rollers acting like pulley and steel sheet made idler which aligned the belt at the right position.

Figure 15: Centering device

4. Drive units:

In the belt conveyor motive power is transmitted to the belt by friction as it wraps around the driving pulley rotated by an electric motor. A 24 volt dc motor is used to run this conveyor. The drive comprises the following parts: two pulleys, motor and the transmission gear between the motor and the pulley. For inclined conveyors a breaking device is included which prevents slipping back of the loaded belt under the weight of material. Ours is a horizontal conveyor that's why we don't need to use the breaking device.

5. Take ups:

A belt conveyor may have screw or counterweighted take up. The latter may in turn be divided into horizontal and vertical type. In our conveyor we don't use take up system. We simply connect the belt with the pulleys which rotates by the motor.

6. Bending the belt:

The belt is bent by means of terminal or intermediate turning pulleys. We use two wooden pulleys, one is in the loading side and another one in the discharging side that is connected by the motor.

7. Loading and discharging device:

The design of loading devices depends on the nature and characteristics of the load conveyed and the method of loading. Our conveyor is made to convey the bulk material which is loaded by the bucket conveyor into the hopper which is called the feed hopper that helps to load the material into belt at the proper position. The discharge for the bulk materials used a discharge plough board placed at a certain angle 31^0 to the longitudinal axis of the belt and fastened on the frame. This is installed slightly inclined section 10^0 of the conveyor.

Figure 16: Discharged material holder.

8. Belt cleaners:

Wipers or scrapers serve to clean the outer belt surface of dry particles cleaning to it. For wet and sticky material revolving brushes are used. Our conveyor conveys dry bulk material so we use a wiper just below the discharge plough board.

9. Conveyor frame:

The supporting structure of the conveyor intermediate section is usually electric welded of profiled rolled stock, angle iron or channel bar, and consists of longitudinal beams, uprights and cross-pieces. The height of the frame is usually 7", the spacing between the uprights is 4" to 5".

Figure 17: Conveyor frame.

VI. CALCULATION

VI.A. CALCULATION OF BUCKET ELEVATOR

- The handling capacity of a bucket elevator, Q tons per hour is

$$\boldsymbol{Q} = 3.6*v*\Upsilon*\Psi\ (i_o/a)$$
$$=3.6*0.6*1.5*0.85*8$$
$$=22\ \textbf{\textit{tons per hour}}$$

Where,
i_o= capacity of the bucket
a= bucket spacing in meter
v= chain speed, m/sec
Υ= bulk weight of the load, tons / m^3 (dry sand)
Ψ= bucket loading efficiency

- The maximum static tension of the driving member S_{max} is

$$\boldsymbol{S_{max}} \approx 1.15H\ (q+K_1q_o)$$
$$\approx 1.15*1\ (10.19+ 1.5*\ 26.4)$$
$$\approx 171.76\ \textbf{\textit{Kg}}$$

Where,
H= height to which the load is elevated, m
q= weight of the load per meter of elevator length, (kg/m) = $Q/\ 3.6v$
q_o= weight per meter of chain with bucket, (kg/m) $\approx K_2Q$
K_1, K_2, K_3= factor allowing for the resistance to motion and bending of the driving member and the buckets

- Required motor power on the drive shaft (not including losses in the driving gear), N_o is

$$\boldsymbol{N_o} = (QH/367)*(1.15+K_2K_3v)\quad \boldsymbol{W}$$
$$= 375\ \boldsymbol{W}$$

VI.B. CALCULATION OF BELT CONVEYOR

The basics of the Calculations of Conveyor Belt Design Parameters:

Input data:

Conveyor capacity (Cc) = 1500 t/h = 416.67 Kg/sec
Belt speed (V) = 1.5 m/sec
Conveyor height (H) = 20 m
Conveyor length (L) = 250 m
Mass of a set of idlers (mi) = 20 Kg
Idler spacing (l) = 1.2 m
Load due to belt (mb) = 25 Kg/m
Inclination angle of the conveyor (δ) = 5^{0}
Coefficient of friction (f) = 0.02
Start-up factor (Ks) = 1.5
Drive efficiency (Kd) = 0.9
Friction factor (Cr) = 15
Breaking strength loss factor (Cv) = 0.75

- **Load due to idlers (mi): T**his can be calculated as below:

mi = (mass of a set of idlers) / (idlers spacing)
mi = (20/1.2) = 16.67 **Kg/m**

- **Belt tension:** The belt of the conveyor always experience a tensile load due to the rotation of the electric drive, weight of the conveyed materials, and due to the idlers. The belt tension at steady state can be calculated as:

$$\boldsymbol{Tb} = 1.37*f*L*g*[2*mi+ (2*mb + mm)*\cos(\delta)] + (H*g*mm)$$

Tb = 1.37*0.02*250*9.81*[16.67+ {2*25+ (416.67/1.5)}*cos (5)] + (20*9.81* (416.67/1.5)) = 77556.88 **N.**

- **Belt tension while starting the system:** Initially during the start of the conveyor system, the tension in the belt will be much higher than the tension in steady state. The belt tension while starting can be calculated as:

$$\mathbf{Tbs} = Tb*Ks$$
$$\mathbf{Tbs} = 1.5 * 77556.88 = 116335.32\ \mathbf{N}$$

Where,
Tbs is in **N.**
Tb = the steady state belt tension in **N.**
Ks = the start-up factor

- **Power at drive pulley:** The power required at the drive pulley can be calculated from the belt tension value as below:

$$\mathbf{Pp} = (Tb*V)/1000$$
$$\mathbf{Pp} = (77556.88*1.5)/ 1000 = 116.335\ \mathbf{Kw}$$

Where,
Pp is in **KW.**
Tb = steady state belt tension in **N.**
v = belt speed in **m/sec.**

- **Sizing of the motor:** The minimum motor power can be calculated as:

$$\mathbf{Pm} = Pp/Kd$$
$$\mathbf{Pm} = 116.35/0.9 = 129.261\ \mathbf{Kw}$$

Where,
Pm is in **Kw.**
Pp = the power at drive pulley in Kw
Kd = Drive efficiency.

- **Acceleration :** The acceleration of the conveyor belt can be calculated as:

$$\mathbf{A} = (Tbs - Tb)/ [L*(2*mi + 2*mb+mm)]$$
$$\mathbf{A} = (116335.32 - 77556.88)/ [250*\{(2*16.67) + (2*25) + (416.67/1.5)\}]$$
$$= 0.429\ \mathbf{m/sec2}$$

Where,
A is in **m/sec2**
Tbs = the belt tension while starting in **N.**
Tb = the belt tension in steady state in **N.**
L = the length of the conveyor in **meters.**
mi = Load due to the idlers in **Kg/m**.
mb = Load due to belt in **Kg/m.**
mm = Load due to the conveyed materials in **Kg/m.**

- **Belt breaking strength:** This parameter decides the selection of the conveyor belt. The belt breaking strength can be calculated as:

$$\mathbf{Bs} = (Cr*Pp)/ (Cv*V)$$
$$\mathbf{Bs} = (15*116.35) / (0.75*1.5) = 1551.33\ \mathbf{N/mm}$$

Where,
Bs is in Newton.
Cr = friction factor
Cv = Breaking strength loss factor
Pp = Power at drive pulley in **Newton**.
V = belt speed in **m/sec.**
This **Bs** value is used to select the conveyor belt from the manufacturer's catalogue.

The bucket elevator and belt conveyor calculations methodology discussed in the article is to be used only for the guidance on calculating the initial conveyor design parameters; the final design must be validated by using the similar tools before building the prototype.

VII. SYNCHRONIZATION OF BUCKET ELEVATOR AND BELT CONVEYOR

The final out-look of the machine after synchronizing the Bucket Elevator and Belt Conveyor:

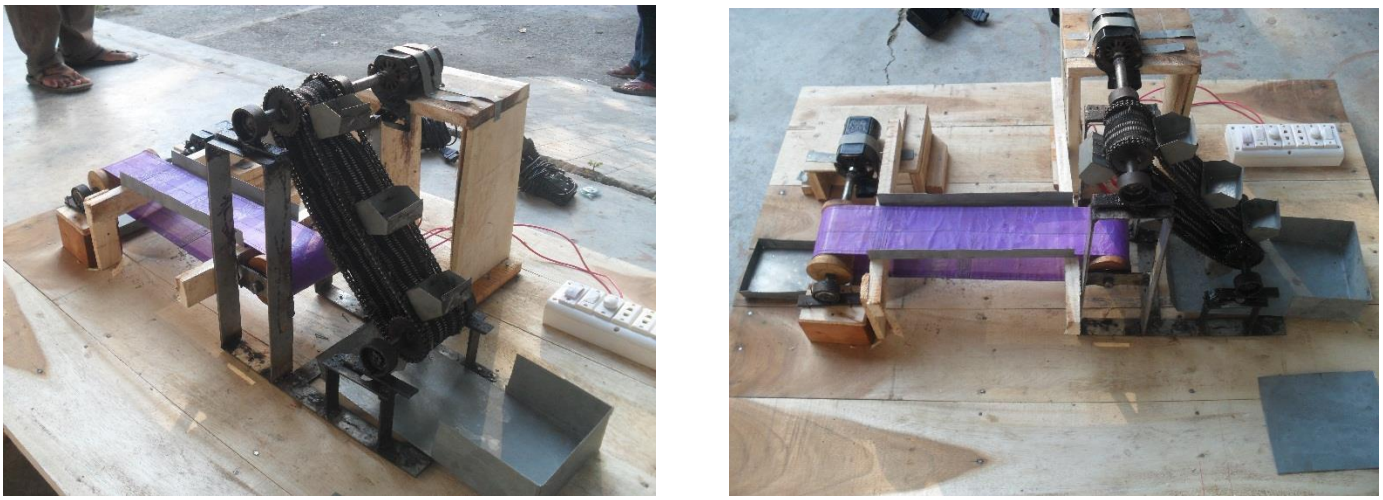


Figure 18: Synchronization of bucket elevator and belt conveyor.

VIII. CONCLUSION

The main purpose for building this machine is to automate the handling of bulk material and its packaging. We are trying to build a prototype for expressing our motive on this project. Though we have some mistakes caused by human error but we believe that we can clear our concept by our work. The total process is controlled by a control system automatically. We mainly focus on the packaging system. The control system helps to package the right amount of material in several packet. It stops the machine for a certain time between two packaging process. So once it is set the requirement of skilled operator is also reduced as compared to a manual system.

ACKNOWLEDGMENT

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A Review on Food and Beverages Advertisements on Television aimed at Children

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***Abstract* - F**ood advertisements on television aimed at children is a public health issue for many countries because it directly affects the healthy behavior of the children. This is a narrative review of published articles. Due to the lack of information on food advertisements on television in the Asian countries, there is an urgent priority for researchers to evaluate the food and beverages related advertisements on television aimed at children in countries in Asia will help the policy makers formulate policies for better restrictions.

Index Terms- Advertisements, Children, Food, Television.

INTRODUCTION

Childhood Obesity is a serious public health problem, as it is known that it increases morbidity, mortality and has long term economic and social implications, not only for the individual but also for the family and the society. Worldwide incidence of childhood obesity is about 10%[1]. The marketing of energy dense nutrient poor foods to children is considered to contribute to the overweight or obesity of children. Food marketing is one of the main factors that have found to be responsible for the increase in childhood obesity. It targets children who are too young to perceive the truth in advertising. Thus it strongly influences children's food preferences, requests which is known as “pester power” and consumption [2].

The first television advertisement was broadcasted in America in 1941. Since then, a strong influx of advertisements has been promoting food and beverages specially aimed at children. Animated kids characters like “The Flintstones” were even used to promote cigarettes. Since 1960, advertisers promoted unhealthy or “junk foods” targeting children. Television advertisements even have a history of producing a series of advertisements such as the “Pepsi Vs Cola War”. Few countries have decided that the evidence on the influence of advertisements on children is strong enough to take policy actions. Sweden is one of such countries, which has banned advertisements on television and radio programmes targeted at children less than 12 years of age, whereas Australia too has banned food and beverages advertisements for preschool children. Belgium has also prohibited advertisements during peak hours and in children’s programmes. Quebec, a province in Canada also banned fast food advertisements on television. A study which assessed the impact of this ban in Quebec, estimated a US$ 88 million reduction per year in fast food consumption [3].

This, it is very obvious that television continues to be the main channel used by food marketers to reach children. Therefore, advertising food for children needs closer scrutiny than as being done at present. Many advertisers are able to get away after engaging in unfair practices despite laws being enacted to curb such practices.

I. METHODS

Search strategy

A review of the published literature was performed. This involved searching databases using the search terms advertisements, television, food and beverages and children. The published year was not an exclusion criteria. Restrictions on language were imposed during the search strategy to English.

Inclusion and exclusion criteria

Any study that assessed the advertisements advertised on Television targeting children was included. Studies which focused solely on smoking and alcohol were excluded.

II. FINDINGS

A. Food items promoted on television

The review by Hasting concludes that the big fives of food promotion; pre-sugared breakfast cereals, soft-drinks, confectionary, savory snacks and fast food outlets are most commonly advertised in television [2]. Half of the food advertisements broadcast during children’s viewing hours were for high-fat or high-sugar foods, with the most advertised food categories being confectionery and fast food restaurants, and the least advertised being fruit and vegetables [4].

A case study from the Galle district in Sri Lanka showed that beverages and Noodles were the most common advertisements on television. However, there are methodological issues in this study as the number of advertisements recorded, hours of recording, television

channels and the ways of selecting the food items are not mentioned [5].

The study by Batada et al, was the first study from America which assessed the nutritional quality of foods advertised on television using quantitative, nutrient-based standards. These standards were based on guidelines for responsible food marketing to children and on the dietary guidelines for Americans [6].

One of the very first studies, which used television ratings data to describe the nutritional content of foods that were advertised on television, describes that nearly 98% of all food products that were advertised were high in fat, sugar or salt. The bias was other languages, such as Spanish programmes were not included in the analysis, which could either decrease or increase the results of the study [7].

A study by Jenkin et al, used the UK nutrition profile to analyse the advertisements in New Zealand. It clearly showed that 53% of advertisements were ruled by the major food franchises which promoted mixed meals high in both fats and salt. Other foods such as cereals, confectionery and carbonated beverages were also promoted frequently. The methodological limitations in this study was that the mixed meals could have been divided into different components in analysis and the study was limited to one particular channel [8].

Kelly et al, compared the channels in Australia with the advertising regulations in the Children's Television Standards. The Study reports that advertisements for high fat/ high-sugar foods during popular children's programmes, contribute to 65.9% of all food advertisements [9].

Against all these advertisements, Barroso et al, studied the advertisements aired only on Saturday mornings between 7 am to 10.30 am, along the Texas Mexican border, in which he reports that 82.7% were non-food related (82.7%,) while only 17.3% were food related [10].

B. Time spent on food and beverages advertisements on television

A study in Singapore showed that the food related advertisements per hour was higher during the afternoon on weekdays and in the morning on weekends, when the kids were at home [11]. However the time that the advertisements were recorded coincided with one of the most popular circus shows shown at that time. This could have either reduced the number of advertisements as the show was heavily advertised or it the advertisements targeted at children could have increased if this circus was sponsored by one of them. Another limitation that was noted in the study was that only the children's programmes were recorded and not the adult programmes, and the criteria for differentiating the programmes were not laid down.

It was also pointed out by Chestnutt et al, that if an Australian child would be exposed to 11 advertisements, if the child watches 2.5 hours of television per day, and also showed that these advertisements were fast food ads which were high in fats or sugar [12].

A study from Australia showed the trend of the of food advertisements in consecutive years. The mean hours of food related advertisements increased by 0.3 per hour in a year. The increase was seen on fast food related advertisements, while a decrease was seen on beverages and confectionaries. The mean hours of advertisements excluded holidays and special events, which would lead to a bias in the mean number of advertisements, as it has been shown that such advertisements are promoted more during such seasons [13].

One of the few studies from Asia shows that on an average 10% of children in India and 30% of children from Malaysia watch more than 8 hours of television per day. Further in the same countries more than 15 minutes of advertisements are advertised in an hour, which were targeted at commercials on soft drink, fast foods, chocolates and noodles [13].

The Mexican advertisements had a different point of view. The promotion not only targeted the children, but also targeted the adults on children related foods. Four hours of food related advertisements were shown for a day, of which 2 hours were dedicated for the children, of which 50% (one hour) was for the big fives. This recording was only from one channel, which was a bias in the study, as it is shown on studies that children switch channels when they watch television [14].

Promotion of the big fives have been targeted during children's programmes rather than the prime time television programmes. Among a total of 3236 advertisements, 72.4% of these were advertised during children's programmes. Further, within these advertisements, 62.5% were targeting the big fives [2]. Another study from Australia emphasis on this issue and shows clearly shows that children's television programmes were targeted nearly three times more than the adult television programmes [4].

The first study performed in UK after it introduced statutory scheduling restrictions of food advertisements in 2007 to children, showed that after full implementation of the scheduling restrictions, 55.7% of television food

advertising seen by children was for high fats and salt foods. One of the few limitations in the study was, using the manufacturers' data to estimate the nutritional content of advertised foods. As such foods are constantly reformulated this could have underestimated the proportion specially with the restriction of advertisements [15].

An interesting fact by Kelly et al, was that although the food advertisements viewed on Australian television occurred in similar proportions during children's viewing hours and adult's viewing hours, higher rate of high-fat/high-sugar food advertisements were viewed during children's viewing hours which was found to be statistically significant [9].

C. Strategies used for promotion of food and beverages on television

The Hasting's review points out that Health and nutrition were never the main themes, but rather the provision of free gifts with the purchase is used to promote the products on television to children [2]. Television strategy in Singapore also uses this technique widely, of which one advertisement goes to the extent of offering a free soft drink with the purchase of raw rice. Such advertisements not only confuse the children's perception on healthy and unhealthy foods but also always make the child associate rice with soft drink. Some advertisements use toys to promote the fast food [7].

The study in 2008 from America, should that there was an improvement in the advertisements and that 42% of them had a health or nutrition message [6]. It should be noted that the study had recorded all advertisements on a Saturday morning, which covers most of the advertisements but the hours of recorded advertisements were 27 hours, which is much less than the hours of recording in other studies.

Content analysis on advertisements advertised in Britain were coded into 14 categories; Health benefits, Disclaimers, Scientific information, Price, Reality versus fantasy, Use of cartoons, Presence of celebrities, Setting, Food type, Voice, Central figure, Parent–child interactions, Voice and Central figure. The bias in this study was that the advertisements were recorded during Christmas time in one channel in Britain. Further the advertisements that were advertised before 9.30am and the weekend advertisements were not considered. Among the advertisements recorded in 45 hours, most were repeated, which led to a small sample of advertisements to be analyzed [16].

Another study from Australia overcame the above said limitations. The researchers recorded advertisements from three commercial stations from seven to nine pm on weekends and weekdays. The advertisements were categorized into health and unhealthy according to Australian Guide to Healthy Eating [17].

In America television media, Connor reports that among all child oriented food advertisements 55% contained spokes characters [18]

Kelly et al in 2008, studied the cartoon and competition strategy used in television of which 21.4% of food advertisements contained promotional characters and another 7.3% used premiums offers. Further, these promotional characters were viewed during the children's peak viewing periods. To supplement this the non-core foods were also found to be higher in the advertisements with the promotional characters [19].

D. Promotion channels for food and beverages advertisements

The most common promotion channel in many studies was the children's channels or programmes. Some of the promotion channels not only targeted the children's programmes but also targeted the more effluent population. Research shows that in Australia's metropolitan area the advertisements were advertised in significantly higher proportions than in the other areas [14].

III.CONCLUSION

The major issue that was found was that the studies from the Asian and more specifically from the South East Asian countries were meager. We need more research to go forth with what other developed countries like Sweden and Quebec have achieved. Due to the paucity of information on food advertisements on television, there is a urgent priority need to evaluate the food and beverages related advertisements aimed at children in Asia, which will help all Asian countries. Filling these gaps in research, will help the policy makers formulate policies.

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An Appraisal to Overhaul Database Security Configurations

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Abstract- Security engineering isa vital aspect in the Database Management Systems, since databaseis being targeted incessantly for vulnerability to invade sensitive data. Cherishing the database from security threats necessitates maintaining secure practices. The proposed model is intended to serve as benchmark for the DBAs,for overhauling the database configurations to withstand against threat waves.This paper enunciates different security configurations, independent of the proprietary DBMS engines that can serve as anassessment tool.

Index Terms- Database, configuration, Security system, security policy.

I. Introduction

It is reckoned that amount of information is rapidly increasing and engendering magnitude of database to be increased further. Augmented information triggers vulnerabilities to be exploited further to invade database.

The following figure depicts the activity of genuine user vs. Intruderin interacting with database. The vulnerability can be an inefficient software design, which could be exploited by an intruder, (since he/she can't triumph over authentication system). Hence secure coding should be mandatory in practice, during application or interface development.

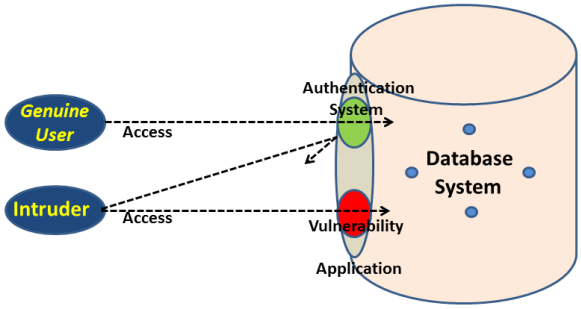

Figure1: Invading Database with exploited vulnerability

The security policy would comprise entities such as Authentication, Discretionary Access Control, Mandatory Access Control, and Administration. On the other hand comprehensive secure Database comprisesecure relational database, secure object database, secure distributed database and secure concurrency control.

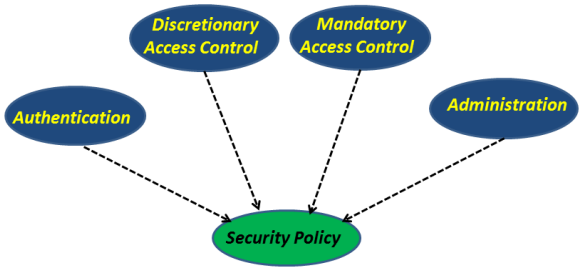

Figure2: Security policy and its entities

This paper lists all the security configurations that the DBA or the security expert should glean at. Rest of the paper is organized as follows. Section 2 deals with the associated background and related work. Section 3 deals with proposed benchmark. Section 4 demonstrates experimental setup. Section 5 is concerned with Comparative analysis and finally section 6 concludes the paper.

II. BACKGROUND AND RELATED WORK

Defense information systems Agency specified set of criteria with security implementation guide. Red Team strategy [11] entails a group of engineers, and they strive to hack the computer systems to quest vulnerabilities. Department of Defense forwarded Trusted System Evaluation Criteria which is referred as Orange book.

DBMS THREATS:

In contemporary practice DBMS is prone to following odious threats.

SQL Injection: It is the prevailing case where applications use Dynamic SQL. Dynamic SQL is the SQL compiled on fly when the application is running.

SQL Worms: They can be prevented by applying service packs and patches.

Genuine escalated privilege: The case where misfeasor misuses his privileges.

Authentication weakness: system vulnerabilities are exploited for authentication.

*Side channel exposure:*The case in which files are exposed physically. Ex: Stolen backup files.

Audit Trail feebleness: This case designates that sound audit plan is not implemented.

III. DATABASE ACCESS POINTS

Database security encompasses the access points User, Application, Network, Operating System, DBMS, Data files or

Data. The security risk increases as the hierarchy drives up. Correspondingly the number of access points to database reduces as the hierarchy drives down.The gap between each layer indicates missing security and thus engendering vulnerability. This is depicted in following portrait.

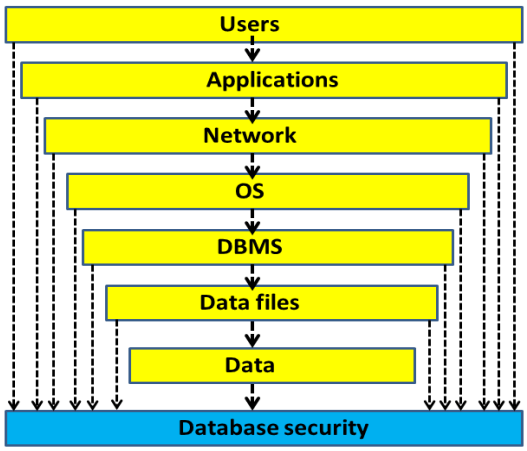

Figure3: Access points of Database security

IV. PROPOSED SYSTEM

The proposed benchmark is ramified into following categories Technological, managerial, Cultural practices each possessing their own criticality at different circumstances.

3.1. Technological: The technological facet deals with selecting, installing, configuring and monitoring DBM Sengine engendering effective access, security and data storage. In abroad manner Technological aspect is scattered into Environment, Installation setup, System level configuration, and Application level configuration and usage.

Environment:

1. Thwarting direct DBMS login onto user account
2. Granting only required resources for the user.
3. Deploying particular user to run daemons of DBMS.
4. Obliterating all unauthorized network protocols.
5. Making sure that unauthorized people can't physical access DBMS machine.
6. Implementing firewalls for network border and on machine.
7. Preventing machines that run critical network procedures such as authentication, naming etc.
8. Dedicating a separate machine for the Database.

Installation Setup:

1. Assign password to listener & lockdown access to it, according to database security policy.
2. Configure execute or read permissions only to genuine users.
3. Proper configuration of file owners.
4. Dedicating separate network sections for development and production servers.
5. Production server shouldn't be accessed by any of the developer.
6. Development and production servers should split physically.
7. Default SSL certificate usage must be deterred.
8. Mutating TCP and UDP ports.
9. Nomenclature for remote identification should be different.
10. Obliterate example databases.
11. Isolating OS files from DBMS software.
12. Data partitions can be read/write only by DBMS user.
13. Making partition for Database data.
14. Log partitions can be read or write only by DBA.
15. Log information is written onto a separate partition.
16. Change or remove default user names and passwords.

System Level Configuration:

17. Don't leak network data to allow connection attempts.
18. Use valid node checking to protect Database.
19. Generate strong cryptographic hashes of executables and other static files on host.
20. Self-signed certificated should not be used.
21. Remote authentications should be deterred.
22. Don't dump shared memory.
23. Restrict access to host as much as possible. Monitor everything that user does, if host access is granted.
24. Create processes and policies to ensure secure data going forward.
25. Limit access to executables.
26. Error and Trace logs should only be accessible to DBAs.
27. Turn off access to OS resources.
28. Access to OS level commands and information should be exterminated.
29. Unwanted access to additional functionalities and libraries should be dropped.
30. Don't allow network operations such as socket opening etc.
31. Read or write operations from DBMS on file system should be denied.
32. Preventing side channel leak of data from backup and configuration files.
33. Preventing side channel leak of data from trace files or core dump.
34. Preventing side channel leak of data from system variables.
35. Preventing side channel leak of data from configuration files.
36. Replicating the audit files, ensuring that they can't be lost.
37. Replicating the log files, ensuring that they can't be lost.
38. Implement proper logging system.
39. Access to sensitive data must be audited.
40. Enforcing sound encryption in storing passwords.
41. Passwords should be changed frequently.
42. Enforce password expiry after a predefined time.
43. Enforce locking after specified number of login failures.

44. Implement sound password policy.
45. Thwarting authentication based on host.
46. Making sure that remote parameters are not used for authentication.
47. Terminating idle connections.
48. Implementing sound user level authentication.
49. Configure access permissions to use IPs instead of host names, in order to prevent DNS spoofing.
50. Encouraging the use of server side certificates.
51. Strong encryption algorithm usage for remote communication.
52. Random ports shouldn't be used for connections of client.

Application Level Configuration and Usage:

1. Remove default schemas that are not required.
2. Review privileges and access to key data.
3. Lock and expire default user accounts.
4. Database schema creation SQL files should not be maintained in database server.
5. Encrypt the columns for sensitive data at table level. (Transparent Data Encryption)[9].
6. Turn off XML Databases.
7. Implement Single Sign On (SSO). (Helps to detect real user behind connection).
8. Encrypt or protect the code of application.
9. Turn off external procedures.
10. Restrict access to individual records within tables.
11. High privileged roles must be set a password.
12. Default connect role should be limited in order to restrict access to external procedures and Database links.
13. Securing batch jobs.
14. Roles or groups should be granted privileges instead to users.
15. System properties or configurations shouldn't be changed by any user.
16. Right assignments should not be delegated.
17. Direct table access should be deterred against stored procedures.
18. Should not use ANY or ALL during assigning rights.
19. Enable database link login encryption, in order to cherish privacy credentials.
20. Enforce Attribute-Based Encryption forFine-Grained Access Control of Encrypted Data.
21. Enforce the policy of least privilege in assigning rights.
22. Deny user quota(s) on system area.
23. User rights on system tables should be removed.
24. Restrict default roles.
25. Restricting public privileges as much as possible.
26. Alert or block abnormal access requests, in real time.
27. If a procedure of a restricted package is to be given access to a user, then create aprocedure and grant access on this procedure, to access procedure from restricted package, instead of granting rights on the whole restricted package.
28. Deny general application users to connectdirectly to the schema that owns the objects.

3.2. Managerial: The managerial aspect is concerned withadministrative functions. Efficient management leads to high quality information system.

1. Enforcing time to time backups.
2. Testing the backups.
3. Updating DBMS software.
4. Create a monitoring process at both system and database levels- this can be a policy, set of scripts, or a commercial tool.
5. Enable Data Dictionary protection.
6. Apply security patches, to reduce window of exposure.
7. Create Virtual Private Databases (VPD), which ensures abstraction [9].
8. Build your best practice auditing which discovers suspicious activity, access to sensitive data & access to auditing tool.
9. Review error logs regularly.
10. Encrypting database online and offline backups, thwarting backup data exposure or side channel exposure.
11. Configuration files and DBMS application should be examined for modifications.
12. If internal auditing is not possible (for some DBMS engines like MySQL) achieve this by creating triggers.
13. Periodically checking password hashes.

Compliance:

14. Measure and track configuration compliance over time.
15. Enforce accessibility to archived data in real time, if necessary to comply with an audit.

3.3. Cultural: The Cultural aspect deals with corporate resistance to adverse situations and change.

16. System administrator and Database administrator should not be the same individual.
17. Hire hackers to try to break into our systems, so that we can overhaul the vulnerabilities.
18. Production data should not be copied for testing purposes or sharing it with business partners.
19. Enforce separation of duties at IT level.

The following table depicts the criticality of each perspective specified above.The practice numbers which are quantified in the table are considered as very important, when compared to other secure practices.

Importance	Practice #
Critical	5, 6, 14, 59, 75, 100
Vital	3, 7, 8, 23, 24, 48, 52, 83, 89, 91, 98, 104
Suggested	1,10,13,15,20,22,34,36,45, 47,50,51,54,55,56,58,71,81

Table: Criticality of each practice

V. EXPERIMENTAL SETUP

Since it is not possible to demonstrate each practice, the following critical practice is explained via queries that serve as an exemplary.

#100. Create table *login*(name varchar2(30), userid number(3), intime timestamp);

Create table *logout*(name varchar2(30), userid number(3),outtime timestamp);

Create trigger *logintrigger*
After login to schema
Begin
insert into *login* values
(user,uid,systimestamp);
end;

Create trigger *logouttrigger*
before logoff on schema
begin
insert into *logout*
values(user,uid,systimestamp);
end;

Now the login and logout tables would entail login and logout details respectively for all users.

VI. COMPARATIVE STUDY

The benchmark assists the DBA, in each and every perspective, with the quantified criticality for each practice. The trust worthiness of the entire system can be determined by examining the system against the proposed benchmark, there by reckoning anticipated security impact. The database environment exhibits more secure form, since all the access points are secured against the threats.

VII. CLOSING COMMENTS

This paper proposed an appraisal to overhaul database security configurations and gazes at uplifting existing security engineering methodologies. In order to tackle the database security threat waves, more secure and innovative challenges should be instigated.

FUTURE WORK: I extend this work by bringing out more appraisals and methodologies by testing and discussing with several DBAs and experts.

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Profitability and Health Risk Estimation of Rice Cultivation under Wastewater Irrigation from Natural Drainage

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Abstract- The paper reports the results of an empirical study on the profitability of rice cultivation in the rural areas of Allahabad by wastewater irrigation from natural drainage. The results show that plots using wastewater containing organic nutrients earn higher profits than those using groundwater. However, we also find the profitability of plots using wastewater negatively affected by the presence of heavy metals such as Fe, Mn, Cu, Zn, Pb and Ni that are found in the water and soil. Of the two opposing effects of wastewater irrigation, the positive effects of organic nutrients outweigh the negative effects of heavy metal toxicity. The soil along the sides of the wastewater channel shows higher productivity and concentration of heavy metals than the crops away to it but lies within the safe limits of WHO/ FAO. The order of metal contents was found to Fe > Zn > Mn > Ni > Cu > Pb in contaminated irrigation water, and the average abundance order of heavy metal contents in soil are: Fe>Mn>Zn>Cu>Pb>Ni. Very strong positive correlation observed for Cu (r^2 = 0.984; P<0.01) and strong positive correlation for Mn (r^2 = 0.698; P<0.01) while other heavy metals show moderate positive correlation (r^2, 0.36 to 0.67; P<0.05) between the concentration in wastewater and their availability in the soil of the study area.

The Study reveals that there is significant relation between the concentrations of the metals in soil to the concentration of metals in water used for irrigation, but no significant relationship for its transfer to the rice. The low concentration of metals in the soil may be ascribed to its continuous removal by rice grown in the study areas. Daily intake values of heavy metals through consumption of wastewater fed rice are below the recommended oral dose of metal for adult. Consumption of food crops contaminated with heavy metals are a major food chain route for human exposure, but it can safe to state that irrigation of agricultural land of rural areas of Allahabad with wastewater has not led any contamination of food crops with heavy metals. This study regarding DIM (Daily intake of metals) suggest no potential health risk for adults and children with respect to amount of daily intake of heavy metals through ingestion of wastewater irrigated rice crops. However, the concentrations of heavy metals in soil and rice grains were still below the maximal levels, as stipulated by Indian Prevention of Food Adulteration Act (PFA, 1954) and World Health Organization (WHO, 1993) guidelines. IFFCO Phulpur is not discharging its effluent outside the company premises but chances of heavy metals contaminations of crops may occur if the rural drainage system get link to any industrial discharge or any other source of contamination. These results support both efforts to conserve the natural drainage, which will generate a number of ecological benefits, as well as to regulate the discharge of wastewater into the water from households and runoff that are located upstream.

Index Terms- Contamination, Heavy Metal, Daily Intake of Metal, Health Risk, Wastewater Irrigation, Natural Drainage, Bairagiya drain, Allahabad.

I. Introduction

Use of wastewater in agriculture undoubtedly helps to recycle useful nutrients through the food chain. But it also poses risks simultaneously for human health and for the profitability of the cultivated crop because of the possible presence of toxic elements in the irrigation water. Though the presence of heavy metals in small quantities is 'natural' in the water and soil, their elevated concentrations kill micro-organisms that are beneficial to plant growth. As Alloway points out (1995), Chromium (Cr), Zinc (Zn), Cobalt (Co), Copper (Cu) and Manganese (Mn) in small quantities are good for plant growth but the presence of metals like Lead (Pb), Cadmium (Cd) and Mercury (Hg) are always a cause of concern above a certain level. Of these, Pb and Cd, being heavier metals, work at the root and stem of the plant to destroy them while Hg being lighter gets easily transported to the grains. The metal mobilization and plant uptake would be restricted by the alkaline pH of the soil.

A recent study by Nawaz et al. (2006) studied the effect of water containing heavy metals on yield, yield components and heavy metal contents in paddy and straw. They looked at three varieties of rice and soil at three different sites in the district of Sheikhupura near the bank of Nallah Daik where the crop is irrigated with water from Nallah Daik in Pakistan. This study showed contamination by the two heavy metals Cu and Cd to be within safe limits in the soil. Moreover, although they observed a minor

accumulation of these metals in the plant parts, they found it to remain within the permissible limit. A study by Fazeli et al. (1998), who investigated the degree of accumulation of seven heavy metals (Cu, Zn, Pb, Co, Cd, Cr and Ni) in the soil and in different plant parts of paddy irrigated by paper mill effluents near Nanjangud, Mysore district, Karnataka in India, also found remarkably low concentrations of heavy metals (except Zn) in the seeds of paddy although this was not the case for the roots and leaves. Further, the crop seemed able to tolerate the presence of the heavy metals in the polluted water without suffering much damage. A study by Wang et al. (2003), on the other hand, has estimated the status of trace elements in paddy soil and sediments in the Taihu Lake region in China. It showed Zn, Cu and Pb to be the main pollutants in the experiment sites and the rapid development of village/township industries to be the primary cause of severe environmental pollution in the Taihu Lake region, especially of irrigation river sediments. Markandya and Murthy (2000), in their study of the Kanpur-Varanasi region in India, found that though the mean levels of Cd, Cr, Ni and Pb in the soils were above their respective tolerable limits for agricultural crops, since the pH of the receiving soil was alkaline, their effects were less harmful than expected. They also noted the positive effect on agricultural yield of nutrients present in partially treated wastewater when compared with crops grown using groundwater.

In contrast with the studies discussed above, the primary objective of our study taking the Bairagiya drain as its study site is to investigate the effect of wastewater toxicity on the livelihood options of farmers involved in rice cultivation in the region. Therefore, we study whether wastewater cultivation has had a negative impact on the profitability of rice cultivation in this region rather than the impact of heavy metals on yield and the plant body. We consider this important as farmers may adopt a number of measures like pollutant-resistant varieties of seeds, fertilizers and pesticides in order to cope with the negative externality posed by toxicity so that higher yield is achieved at lower profits. But if this indeed happens, the livelihood support provided by the Wetlands will be reduced and the pressure for its conversion into more economically beneficial projects will build up. In the case of the Bairagiya drain, some studies have already noted the presence of heavy metals in the vegetables produced in the region. Our study estimate the effects of the toxicity of wastewater on the profitability of rice cultivated in the region.

II. RESEARCH METHODOLOGY

Study area

The study was carried out around Bairagiya drain, north side of the River Ganga and 30 kilometers east of Allahabad city of Uttar Pradesh, State of India from December 2012-June 2013. Bairagiya drain flows from Phulpur (25°32'31.90"N 82°02'24.05"E) to Rasulpur (25°18'58.48"N 82°05'00.43"E). Six sampling sites in downstream and one control site were considered for the study shown in the map (Fig. 1). Bairagiya drain is a natural drainage which drains the runoff and wastewater from different villages in downstream till it joins the river Ganga. It originates from a village pond of Phulpur and not linked to any industrial discharge in its course. IFFCO fertilizer manufacturing plant is located 7 kilometer downstream from the origin of the drain and no evidence of effluent discharge from the manufacturing plant was found during this period. The rice samples grown in the area are considered for study, most of the Crop samples cultivated in these sites are supplied to the wholesale Crop sample markets in Allahabad city and rest of enter the local markets. Kajipur Fatuha (25°25'19.38"N 82° 3'23.53"E) a Crop sample cultivating agricultural land 3.2 km from sampling site 4 with no history of wastewater use was chosen as the control site.

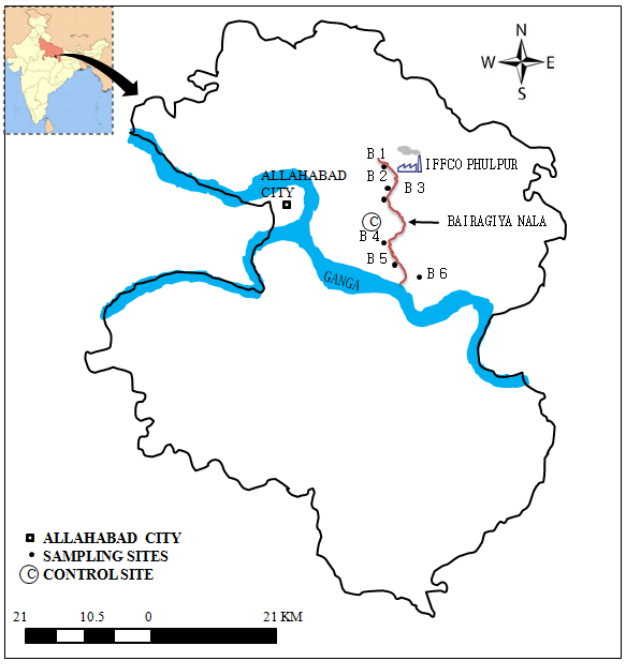

Figure 1: Map of Allahabad District showing sampling sites along the Bairagiya

Method of Study

Crop samples are collected randomly in triplicate from six sites of wastewater irrigated agricultural land of Iffco Phoolpur industry area and five sites downstream of the Bairagiya drain, along with the control site during the months from December 2012-June 2013. For metal analysis only the edible parts of Crop samples were used. All samples were collected and put in clean polythene bags according to their type and brought to the laboratory for preparation and treatment as soon as possible. In each plant sample 6-8 Crop sample plants of the same species were collected at random from the fields of the sampling sites by hand using vinyl gloves carefully packed into polyethylene bags and the whole plants body was brought to the laboratory. The cleaning (removal of soil) of Crop samples was performed by shaking and also by means of a dry pre-cleaned vinyl brush. Then the whole plant bodies were divided into different parts and non-edible portions were removed.

The edible parts of the Crop sample were washed with tap water several times and subsequently dipped in 0.01N HCl acid, for 5 minutes followed by thorough washing in distilled water to remove airborne pollutants. Then the samples were cut into 2 cm pieces and dried in a hot air oven at 70-80°C till the constant weight was achieved. The dried samples were grounded in a stainless still blender and then passed through a 2-mm size sieve. Soil samples from the surface soil to a depth of 12cm around each plant root zone were collected simultaneously from the field with the plants. The soil samples were air dried at room temperature finally powdered, and sieved through a 2-mm nylon mesh to remove large debris, stones and pebbles. Then the samples (500 gm of soil) were dried at 105°C for 2 hour to remove all the moisture content and homogenized for analysis. The dried samples were wet digested according to standard protocols. For water sampling, three replicate polythene bottles (acid washed) of capacity 100 ml were immersed one by one at an interval of 15 seconds into the water of Bairagiya drain that was being used for irrigation purpose, and immediately after filling, 1ml of concentrated HNO3 was added to the water and the bottles were brought back to the laboratory and digestion was completed within a week.

For heavy metal analysis fifty milliliters of contaminated water sample was digested with 10 ml of concentrated HNO_3 at 80°C until the solution became transparent (APHA 1985). The solution was filtered through Whatman no. 42 filter paper and the filtrate was diluted to 50 ml with distilled and dehumanized water. One gram each of soil and Crop sample samples were digested (wet acid digestion) with 15 ml of concentrated HNO_3, H_2SO_4, and $HClO_4$ in 5:1:1 ratio at 80◦C until a transparent solution was obtained (Allen et al. 1986). The digested samples of water, soil, and Crop samples were filtered through Whatman no. 42 filter paper and the filtrates were diluted to 50 ml with distilled water. All samples were stored at ambient temperature before analysis. All reagents used were Merck, analytical grade (AR), including standard stock solutions of known concentrations of different heavy metals. Trace elements concentrations in water, soil, and in Crop sample samples were estimated by an atomic absorption spectrophotometer (Perkin Elmer AAnalyst 300). Blank samples were analyzed after six samples. Concentrations were calculated on a dry weight basis. All analyses were replicated three times. The precision and analytical accuracy were checked by analysis of standard reference material, NIST-SRM 2709 for soil, NIST-SRM 1570 for water, and NBS-SRM 1573 for plant samples. The results were found to be within 2% of certified values for every heavy metal. Statistical summary and correlation analysis was performed using Microsoft Excel (version 2007).

III. RESULT AND DISCUSSION

1. Heavy metal concentrations in irrigation water

The heavy metal content in Bairagiya drain is below the recommended maximum concentration specified by FAO for irrigation and also below the limits of drinking water quality for livestock which makes it fit for use in irrigation and animal husbandry. Out of six elements examined in the wastewater used for irrigation in the study area, concentration of Fe was highest (0.4858 mg/l, SD: 0.00160) while Pb was lowest (0.0041 mg/l, SD: 0.00044) and mean concentration of other metals are; Cu (0.00737 mg/l, SD: 0.00025), Mn (0.48584 mg/l, SD: 0.00047), Zn (0.09239 mg/l, SD: 0.00051) and Ni (0.01692 mg/l, SD: 0.00379). The mean metal concentrations of wastewater irrigation in Bairagiya drain region are less than from different parts of India where wastewater irrigation is a practice. Such as suburban areas of Varanasi, Uttar Pradesh (Sharma et al. 2007, 2006), Titagarh, West Bengal (Gupta et al. 2008), Ramgarh Lake, Gorakhpur, Uttar Pradesh (Singh et al. 2011) Nagpur, Maharashtra (Singh et al. 2012) and in urban area of Naini Allahabad Uttar Pradesh (Yadav et al. 2013).

2. Heavy metal concentrations in Soil

The concentration of heavy metals (mg/Kg dry soil) in agricultural soils of study area in (Table 2) ranged from 0.83-1.36 for Cu, 11.02-16.12 for Fe, 5.97-14.88 for Mn, 1.26-1.93 for Zn, 0.032-0.043 for Pb and 0.004-0.014 for Ni. Fe has the highest mean concentration recorded in soil fallowed by Mn Cu, Zn, Pb, and Ni. The extent of metals observed in agricultural soil of the fields in the present investigation is below the permissible levels and lower than those reported by different authors like Kabata-Pendias and Pendias (1992) Temmerman et al. (1984), Gupta et al. (2008), Singh et al. (2012) and by Sharma et al. (2007) of use of urban wastewater for irrigation in fields. However, Cu concentration in soil was also lower than the previous result obtained by Thandi et al. (2004) (2.5-133.3 mg/Kg) and of Mapanda et al. (2005) (7.00-145 mg/Kg) in Zimbabwe and those of Wong et al. (2002) in agricultural soil of China. This variation of result might probably be due to the variations of heavy metal concentrations in irrigation water and other agronomic practices of the respective area. The concentration of heavy metals in the soil is far low to the

recommended maximum concentration of WHO, this may be ascribed to its continuous removal by vegetables grown in the designated areas.

Table 1: Heavy metal concentrations (mg/l) in wastewater of Bairagiya drain (n=36)

Metals	Mean	Minimum	Maximum	Stn.dev	Recommended maximum concentration[a]	Livestock Drinking Water
Cu	0.00737	0.00706	0.0078	0.00025	0.2	0.5
Fe	0.48584	0.4835	0.4885	0.00160	5	NA
Mn	0.02402	0.0232	0.0245	0.00047	0.2	0.05[b]
Zn	0.09239	0.09186	0.0932	0.00051	2	24
Pb	0.00416	0.00366	0.0048	0.00044	5	0.1[c]
Ni	0.01692	0.011	0.023	0.00379	0.2	NA

Source: National Academy of Sciences (1972), Pratt (1972) and FAO

a. The maximum concentration is based on a water application rate which is consistent with good irrigation practices (10 000 m^3 per hectare per year). If the water application rate greatly exceeds this, the maximum concentrations should be adjusted downward accordingly. No adjustment should be made for application rates less than 10 000 m^3 per hectare per year. The values given are for water used on a continuous basis at one site.

b. Insufficient data for livestock. Value for human drinking water used.

c. Lead is accumulative and problems may begin at a threshold value of 0.05 mg/l.

Table 2: Concentration of heavy metals in soil (mg/Kg dry soil) irrigated with wastewater of Bairagiya drain in rural area, Allahabad (n=36).

Metals	Mean	Minimum	Maximum	Stn.dev	Recommended maximum concentration[a]	Limits of MoEF[b]
Cu	1.0716	0.83	1.36	0.1904	140	200
Fe	14.0033	11.02	16.12	2.2583	NA	NA
Mn	9.9416	5.97	14.88	3.8456	NA	1800
Zn	1.62	1.26	1.93	0.2422	300	150
Pb	0.0386	0.032	0.043	0.0039	300	200
Ni	0.011	0.004	0.014	0.0041	75	100

a WHO (2007).

b The Environmental Management Act (Soil Quality Standards) Regulations, 2007.

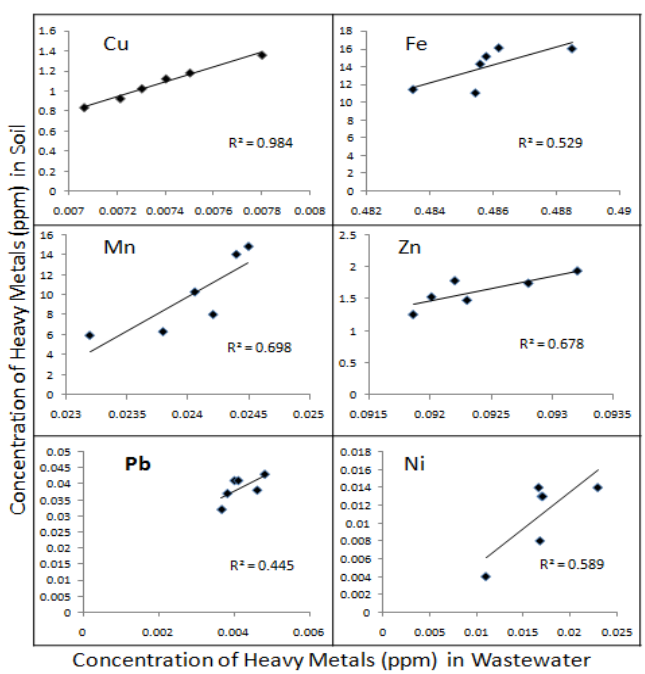

Figure 2: Relationships between heavy metal concentrations in wastewater and soil

Very strong positive correlation observed for Cu (r^2 = 0.984; P<0.01) and Strong positive correlation for Mn (r^2 = 0.698; P<0.01) while other heavy metals show moderate positive correlation (r^2, 0.36 to 0.67) (Mason et al 1983) between the concentration in wastewater and soil of the study area (Fig. 2) which signifies the transportation of these heavy metals from the wastewater to soil through irrigation.

3. Heavy metal concentrations in Rice and Rice productivity

Concentrations of heavy metals in rice were within the safe limit of WHO and Indian standard (Awashthi, 2000). The mean concentrations of heavy metals in the rice plant parts (Table 3 and Fig. 3) showed that all the studied metals were present and most of the metals accumulated in the roots than other parts. The Cu, Zn, and Mn also accumulated at its highest concentration in roots of the rice plant and followed by straw and grains (Fig. 4). Most metals that were found abundantly in the paddy plants were nutrients like Fe, Mn, Zn, and Cu that are required for various enzyme activities and play important roles in photosynthesis and growth of the plant (Tripathi, Raghunath, and Krishnamoorthy 1997; Hopkins 1999).

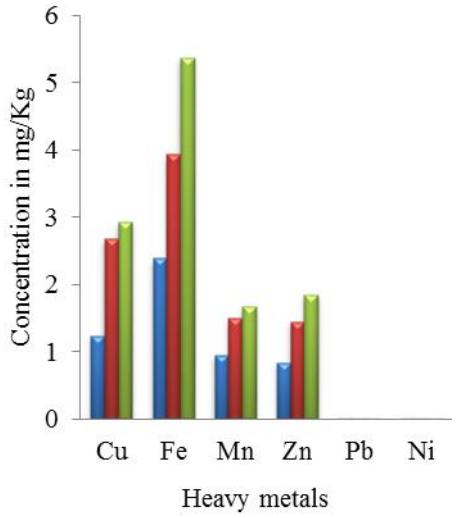

Figure 3

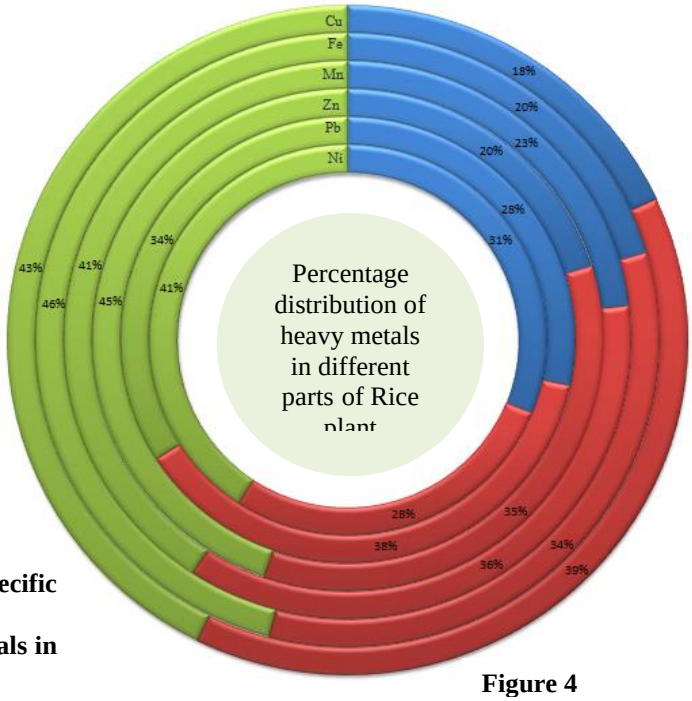

Figure 4

Figure 3: Concentration of metals and their specific distribution in different parts of Rice plant
Figure 4: Percentage distribution of heavy metals in different parts of Rice

Table 3: Mean Heavy metal concentration (mg/Kg dry weight) in Rice grown in wastewater irrigated rural land of Allahabad

	Cu	Fe	Mn	Zn	Pb	Ni
Grain	1.24	2.39	0.95	0.84	0.015	0.0052
Straw	2.69	3.93	1.49	1.45	0.02	0.0047
Root	2.93	5.37	1.68	1.85	0.018	0.0068

Table 4: Comparison between rice plants irrigated with normal well water and wastewater of Bairagiya Drain

Targets	Control	Wastewater irrigated
Rice plant Size (m)	0.98	0.98
Rice plants in 1 cluster	10	10
Rice ears in 1 cluster	6.5	7
Average productivity (Kg/m2)	0.83	0.85

Growth and development of rice plants irrigated by wastewater and normal well water compared in table 4. The average productivity of wastewater irrigated is higher than that of irrigated with well water. This due the fact that wastewater has high concentration of nitrogen, phosphorus, and organic matter in comparison to well water.

4. Daily intake of metals

The daily intake of metals (DIM) was determined by the following equation:

DIM = mc × cf × di / bw (Gupta et al. 2008)

where, "mc" is the metal concentration in vegetables (in milligrams per kilogram) on dry weight basis, cf or the conversion factor of 0.085 was used to convert fresh weight of the vegetables to dry weight as mentioned by Rattan et al. (2005) and "bw" in the equation denotes the body weight (in kilograms). The average daily vegetable intake for adult and children were considered to be 0.345 and 0.232 Kg person/day, respectively, while the average adult and child body weights were considered to be 55.9 and 32.7 Kg, respectively as reported in previous studies (Ge 1992; Wang et al. 2005).

Dietary intakes of heavy metals for adult the consumption of vegetables are in the safe oral reference RfD limit such as for Cu (0.529 µg/Kg/Day), Fe (3.626 µg/Kg/Day), Mn (1.939 µg/Kg/Day), Zn (0.802 µg/Kg/Day), Pb (0.009 µg/Kg/Day) and Ni (0.003 µg/Kg/Day) respectively. This study shows that the DIM values for heavy metals were low through the consumption of food crops grown with contaminated water to wastewater irrigated vegetables in rural agricultural areas of Allahabad. Oral reference dose (RfD) is an estimate of a daily exposure to human population that is likely to be without an appreciable risk of deleterious effects during a life time (USEPA, IRIS 2006). The RfDs for Cu, Fe, Mn, Zn, Pb and Ni are 0.04, NA, NA, 0.3, 0.004, 0.02 mg/Kg/day, respectively (USEPA, IRIS 2006). The risks can be markedly reduced, however, by appropriately matching plant production systems to effluent characteristics (Snow et al. 1999). High-yielding crops with large amounts of nitrogen in their biomass would be more effective than tree plantations at reducing nitrate leaching. Thus, the findings of this study regarding DIM suggest no potential health risk for adults and children with respect to amount of daily intake of heavy metals through ingestion of wastewater irrigated vegetable crops.

IV. CONCLUSION

This study performed on rice plant samples determined the accumulation of heavy metals in rice plant samples collected during their harvesting period irrigated with wastewater of Bairgiya drain and control water. The concentrations of metals in wastewater were found within the permissible limit. Most of the heavy metals studied were found to accumulate mostly in roots of rice plants, while other parts including the straw and grains contained low levels that are below the permissible limits. The heavy metals in the soil studied were mainly derived from the basic rocks found in the study area and availability of toxic metals to rice plants was found to be low. Soil, plant, and water quality monitoring together with the prevention of metals entering the plant, is a prerequisite in order to prevent potential health hazards of irrigation with wastewater. Heavy metal in wastewater of Bairagiya drain used for irrigation, soil and food crops in the study area of Allahabad were compared with the safe limit provided by WHO (2007), SEPA (2005), FAO /WHO standard (Codex Alimentarious Commission 1984) and Indian standard. Application of sewage water increased the yield of crops compared to irrigation with well water; it also increased total N, P, K and organic carbon of soil (Ladwani et al. 2012; Hamilton et al. 2005; Singh et al. 2012). On the other hand the indiscriminate long term use of wastewater for the crop production could result in the concentration that may become phytotoxic (Ghafoor, 1999). Consumptions of food crops contaminated with heavy metals are a major food chain route for human exposure, but it can safe to state that irrigation of agricultural land of rural areas of Allahabad with wastewater has not led any contamination to food crops with heavy metals. Measures must be taken to reduce heavy metal pollution and nutrient loading of irrigation water and soils to protect the safety of both farmers and consumers.

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Efficacy of Parasight F Test in Diagnosis of Falciparum Malaria

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Abstract- A rural hospital based study was conducted on children with clinical suspicion of malaria to evaluate the efficacy of the rapid diagnostic immunochromatographic test, Parasight F test in diagnosis of falciparum malaria compared to the gold standard, the peripheral blood smear. Blood samples from 105 children who presented with clinical suspicion of malaria(fever with splenomegaly) were investigated at the time of admission by both peripheral blood smear and the Parasight F test to detect the plasmodium falciparum species. Of the 63 confirmed cases of malaria, 23 children showed a positive result in the Parasight F test. The Parasight F test showed 100% sensitivity and 100% specificity for the diagnosis of falciparum malaria.

Index Terms- falciparum malaria in children, Peripheral blood smear, Parasight F test

I. Introduction

Despite more than 100 years since Laveran described the Plasmodium species and Ross confirmed its transmission by the female anopheles mosquito, malaria remains to be one of the leading causes of morbidity and mortality worldwide.[1]As per the WHO fact sheet 2012, in the South East Asia, the second most affected region in the world, India has the highest malaria burden with an estimated 24 million cases per year.[2] Worldwide, about 219 million cases of malaria are estimated to occur every year with 6.6million malaria deaths each year whose main victims were children less than 5 years old.[2]Majority of them were due to cerebral malaria and anemia. Among the children referred to hospitals with severe malaria, fatality rate of 10-30% is reported[1,3,4] Severe malaria is caused by the deadly plasmodium falciparum. Rapid detection of the species is hence necessary. Microscopic detection of the parasite is the gold standard for diagnosis of malaria[5]. However, it is time consuming, labor intensive, requires skilled technician and adequate instrumentation and methodology including staining procedures particularly at low parasitemia levels, an energy source to power the microscope and is rather impractical in remote areas. In many areas, malaria patients are treated outside of the formal health services, e.g. in the community, in the home or by private providers where microscopy is generally not feasible in many such circumstances. In these conditions , empirical treatment of malaria becomes a norm which may lead to emergence of resistence.[5,6,7,8,9] Alternatives to this have long been sought and have spurred the development of many nonmicroscopic diagnostic devices based on the antigen detection in the whole blood. Parasight F test is one such immunochromatic test which detects the histidine rich protein 2 antigen of the deadly plasmodium falciparum.[7,8] This aids in the detection of the malaria including in remote areas where health facility coverage is low.[10] Also it allows for a rapid institution of antimalarial treatment.[5]

Though there are many studies conducted on the RDT, not many studies are done exclusively on the children. Hence this study aims at detection of the falciparum malaria in the pediatric age group.

II. Materials and Method

Study was conducted at a rural hospital, Sri Adichunchanagiri Institute of Medical Sciences, Belur. After taking ethical committee clearance and informed consent from the respective parents, children between the ages of 6months to 18 years presenting with fever with splenomegaly were enrolled in the study. Children who received antimalarials in the past 14 days, rheumatoid arthritis, teenage pregnancy were excluded from the study as they may show false positivity.

Details of history and clinical examination of the suspected malaria cases were recorded. Following investigations were sent simultaneously on the day of admission- hemoglobin, total and differential count, platelet count, urine microscopy, peripheral blood smear(PBS), parasight F(PF) test. Depending on the condition of the children, additional tests like blood sugars, liver function test, renal function tests, widal test, CT scan head, lumbar puncture were planned.

Peripheral blood smear: 2ml of venous blood was drawn with aseptic precautions and collected in a sterile EDTA test tube. Two slides, one for thick smear and one for thin smear examination were prepared. Slide for thick smear was dehemoglobinised using distilled water before staining. Slide for thin smear was fixed by dipping it into methanol for 5 seconds. Both the slides were stained with Leishmann stain and allowed to stand for 30 seconds and was then diluted with double volume of distilled water. It was allowed to dry for 15minutes.The slide was then read at 1000X magnification. The duration of examination of the thick and thin smear was 10 minutes and 15-20 minutes which included visualization of 100 fields in each smear. The species and the stage of parasite were reported after examining the thin smear. The patient was considered not to have malaria after 3 negative samples.

Parasight F test: This immunochromatographic assay was done to detect the histidine-rich protein 2 antigen produced and released by plasmodium falciparum. The commercial kit

ParaHIT™ f (manufactured by Span diagnostics Limited developed by PATH, Seattle, Washington, USA).

The test strip composed of chromatographic layer with two invisible transverse parallel lines, are labeled with patient identification number. After puncturing the tip of a finger with a sterile lancet given in the kit, the blood was aspirated into the heparinized glass capillary up to the mark, was transferred immediately to the test strip and placed in 200µl or 4 drops of reaction buffer was added to the test tube. At the end of 15 minutes, the test was interpreted. The test was interpreted as positive if both the test and control band appeared. The test was negative if band appears only in control region. The test was interpreted as invalid if no band appeared in either test or control region. In such a case, the test was repeated on a fresh strip.

III. Statistical methods

The statistical software namely SPSS 15.0, Stata 8.0, MedCale 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel to generate graphs, tables etc. To find significance of association of findings of Parasight F test with peripheral smear findings for falciparum malaria. Diagnostic statistics viz., sensitivity, specificity, PPV, NPV were computed..

IV. Results

During the study, 105 children clinically suspected as malaria were included who fulfilled inclusion criteria(fever with splenomegaly). Of the 105 children, 63 were confirmed positive for malaria (90% CI:malaria 50.44-68.89) by either gold standard test, the peripheral smear and the rapid immunochromatographic assay, the Parasight F test. Rest of the cases were 17% of viral fever, 11.4% of urinary tract infections, 8.6% enteric fever and3.9% of septicemia with meningitis. Of the 63 confirmed cases of malaria, 3 children had both Plasmodium vivax and plasmodium falciparum malaria positive. Details of the PBS is given in Table 1

Table 1

Peripheral smear findings	Number(n=105)	Percentage	90%CI
Positive for falciparum only	20	19.1	12.7-27.6
Positive for vivax only	40	38	29.4-47.7
Positive for falciparum and vivax	3	2.9	0.9-8.1
Negative for malaria	42	40	31.1-49.6

Of the 63 confirmed malaria cases, only 23 were falciparum positive cases. 2 children whose blood culture confirmed enteric fever also showed Pl. vivax species on PBS. Parasight F test was positive in all the falciparum positive cases. In these, 56.5% were male children and 43.5% were female children. Most of the falciparum cases(56.5%) were in the age group of 10-14 years followed by 5-9 years(30.4%) and 2-4 years(13.1%). Presenting symptoms were fever with splenomegaly. Other features included chills and rigors, sweating, headache. Of the 23 falciparum malaria positive children, all of them had splenomegaly. 5 children had hepatomegaly too and 21 had pallor. Investigations showed anemia in 21 out of 23 falciparum positive children. Diagnosis based on PBS and PF test is given in Table 2

Table 2:

Diagnosis	Number(n=105)	Parasight F test		Peripheral blood smear	
		Number	%	Number	%
Falciparum malaria	20	20	100	20	100
Falciparum + Vivax malaria	3	3	100	3	100
Vivax malaria	38	0	0	38	100
Vivax malaria+enteric fever	2	0	0	2	100

V. Discussion

105 children enrolled in the study conducted at the rural hospital in malaria endemic area. PBS and Parasight F test(which detects pl.falciparum species only) done at the time of admission showed 63 confirmed malaria cases. Of these, 23 cases showed positivity to falciparum malaria both on PBS and PF test. The PF test band of 3 children with mixed malaria showed positive results though the band was weakly positive. None of other cases showed any positivity for the Parasight F test. Thus the test was 100% sensitive and 100% specific in comparison to the PBS.

The average time to get the PBS result was 2hours. The preparation of the PBS required to be done by a skilled laboratory technician and the preparation time was about 30minutes and additional few minutes was required to examine the slides either by the microbiologist or atleast by the skilled technician which was reconfirmed by the microbiologist while the PF test was done and results interpreted in 15 minutes and the treatment was started immediately. A similar result was seen in the study of RDTs in travellers.[11]

Though PBS is the gold standard, studies have shown that not always there is a 100% positivity. The present study showed 60% positivity while studies by Schiff et al[12]., showed a 50.8% positivity, while Rickman et al[13] showed 55.5% positivity.

In the present study, the sensitivity of PF test is 100% which is comparable to Sandrine Houzé et al.,[14]which showed sensitivity of 96% which is which is higher than the threshold of 95% recommended by the World Health Organization (WHO)[15] Most of the other studies whose sensitivity range from89% to 100%[16-20] The specificity in these studies range from 80% to 100%. The present study showed a specificity of 100%. Thus the rapid immunochromatographic test, the PF test meets

the criteria for an ideal diagnostic test as there was 100% result comparable to the gold standard test. Also the test results were available faster and it has not detected any false positive cases too, thus qualifying as a reliable test for the diagnosis of the deadly falciparum species.

The Positive predictive value(PPV) was 100 % in the study by Sandeep Arora[16] while other studies showed a range of 75-95%[16-20]. The present study too showed a PPV of 100 %. The negative predictive value was 100 % in the present study while some other studies had a range from 91-98.35%[16-21]

VI. Conclusion

Thus, the Parasight F test is one of the ideal tests for diagnosis as it is simple, sensitive, rapid, specific, easy to perform and does not require electricity for storage, does not require complicated equipments or trained personnel, thus proving as an effective tool in the battle against malaria. However, the limitation is the relative high cost of the kit, inability to indicate the severity of the infection and inability to detect the other species of plasmodium. But in the event of the complicated malaria which is more commonly due to falciparum malaria where rapid diagnosis and early management of the case is required to salvage life, this rapid diagnostic method proves to be a boon especially in remote and rural areas.

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Gender Risk Profile In Acute Myocardial Infarction- A Prospective Study in Indian Population

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Abstract- Acute myocardial infarction is a leading cause of death throughout the world. Very limited data is available regarding the prevalence of various risk factors in different genders which is why this study was planned. Objectives of the study were to look for the risk factors most prevalent in both the genders. 305 consecutive patients in Cardiology OPD presenting with acute MI were studied. Risk factors associated with acute MI were studied like - family history of premature CAD, previous history of CAD, smoking hypertension, diabetes. Patients were divided into two groups. Group A -patients were male and group B patients were female. Risk factors were compared in both the groups. Out of 305 patients diagnosed with AMI, 274 were males and 30 females. Smoking was main risk factor in both the groups (72.62% in male and 53.53% in female), where as previous history of CAD was less frequent in both the groups (12.04% in male and 26.66% in female). Diabetes was more frequent in females (43.33%) as compared to males 25.91%). Smoking, hypertension and diabetes are the major modifiable risk factors in our study. A male who is smoker or a female who is diabetic, presenting with chest pain, can always be suspected of coronary artery disease.

Index Terms- Acute myocardial infarction, coronary artery disease, diabetes.

I. Introduction

Myocardial infarction (MI) due to coronary artery disease is a leading cause of death in the United States, where more than 1 million people have acute myocardial infarctions (AMIs) each year **[1]**. The term myocardial infarction reflects death of cardiac myocytes caused by prolonged ischaemia **[2]**. It can be defined from a number of different perspectives related to clinical, electrocardiographic (ECG), biochemical and pathologic characteristics. Myocardial infarction caused by complete coronary artery occlusion begins to develop after 15–30 min of severe ischaemia (no forward or collateral flow) and progresses from the subendocardium to the subepicardium in a time-dependent fashion (the wave-front phenomenon) **[3]**.

Review literatures suggest that certain factors were predictive of death in patients admitted to hospital with myocardial infarction **[4]**. Chief among these were age, previous medical history (diabetes, previous infarction), indicators of large infarct size, including site of infarction (anterior vs inferior), low initial blood pressure, Killip class on admission and the extent of ischaemia as expressed by ST segment elevation and/or depression on the electrocardiogram. These factors remain operative today **[5]**. Very limited data is available regarding the prevalence of various risk factor for MI. Keeping in view these facts, a study of risk factors in different gender of patients with acute MI was planned.

II. Material and Methods

305 patients with acute myocardial infarction admitted to the intensive care unit of Department of Cardiology, King George's Medical University were investigated. Diagnoses of acute myocardial infarction of the patients were established in the presence of at least two of the following criteria: a) clinical: pain in the anterior thoracic location, b) electrocardiographic c) enzymatic criteria: high levels troponin T. Electrocardiograms were performed on hospital admission, after the initial treatment, at the emergency department. Patients with at least one of the following conditions were excluded: 1. The patients with cardio embolic stroke, cerebral venous sinus thrombosis, CNS vasculitis and hemorrhage due to trauma, tumor, vascular malformation and coagulopathy. 2. Subjects having bacterial and viral infections, inflammatory diseases, thyroid, liver or kidney diseases and suffering with any kind of cancer. 3. Pregnancy

A standardized questionnaire was filled at the time of admission acquire information regarding previous medical history, clinical presentation at hospital admission, in-hospital management, and in-hospital prognosis. Cardiovascular risk factors were defined as follows: dyslipidemia, hypertension and/or diabetes was considered present, if the patient was treated for dyslipidemia, hypertension and/or diabetes or if it was previously diagnosed by a primary care physician according to guidelines **[6],[7]**. A family history of coronary artery disease (CAD) was considered present, if a first-degree relative younger than 60 years had CAD.

III. Result

305 patients who were diagnosed with AMI were investigated. Baseline demographics and clinical characteristics of patients are demonstrated in Table 1. The number of patients in the male group was 274. Their ages ranged from 26 to 89 years with a mean age of 56 ± 12.15 years. In all these patients 89 (32.48%) were hypertensive, 71 (25.91%) were diabetic and 199 (72.62%) were smoker. And in female group total numbers

of patients were 30. The age ranges of were 31-75 with a mean age of 62.58±10.69 (Table-1). In female patients hypertensive were 14 (46.66%), diabetic were 13 (43.33%) and smoker were 16 (53.33%).

Table 1
various risk factors for AMI

Variables	Male N= 274	Female N= 30
Mean age	56.04±12.15	62±10.69
Diabetes	34 (12.40%)	7 (23.33%)
Smoking	160 (58.39%)	14 (46.66%)
Hypertension	29 (10.58%)	3 (10.00%)
Family history of CAD	38 (13.86%)	4 (13.33%0
Previous history of CAD	13 (4.74%)	2 (6.66%)

In both the groups previous history of CAD was least frequent (33, 12.04% in male and 8, 26.66% in female). When comparing diabetes as a risk factors female patients were more in number (male vs female, 13 (43.33% vs 71 (25.91%). (Table-1)

When comparing the electrographic location of AMI in both groups, AWMI is the frequent in both sexes (130, 47.44% in male and 14, 46.66% in female). Whereas there were only 6 (2.18%) number of patients of LWMI and 3 (10%) number of patients of IWMI+RVMI, which was least in both the sexes. (Figure-2)

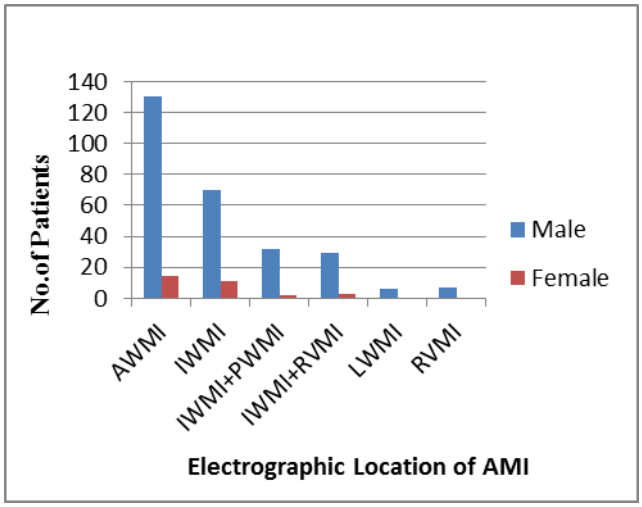

Figure 1- Electrographic Location of AMI

†AWMI- Anterior wall myocardial infarction, IWMI- Inferior wall myocardial infarction, PWMI- Posterior wall myocardial infarction, RVMI- Right ventricular myocardial infarction, LWMI- Lateral wall myocardial infarction

IV. Discussion

In the case series studied, significant differences in risk factor between males and females presenting with AMI was observed. In acute myocardial infarction, in both sexes, smoking and family history of CAD were the most prevalent risk factors, while previous history of CAD is least.

In the present study smoking is the prominent risk factor in both the sexes. Evidence linking smoking to increased risk of myocardial infarction and death is incontrovertible, but the precise mechanisms responsible remain elusive. Morbidity and mortality in coronary artery disease is a consequence of a complex interplay between coronary atherosclerosis (fixed component) and superimposed factors such as vasomotor tone, platelet aggregation and intraluminal thrombosis (dynamic component). It is the dynamic components of this equation that contribute to abrupt or semiabrupt, transient or permanent coronary occlusion leading to acute myocardial infarction and possibly ischemic sudden cardiac death **[8],[9]** Smoking may thus contribute to increased coronary artery disease morbidity and mortality by directly or indirectly influencing the atherosclerotic lesion per se and/or by promoting coronary occlusive phenomena through an interaction with dynamic factors.

Some authors have reported a low prevalence of systemic arterial hypertension in young patients with acute myocardial infarction **[10],[11]** our data are not in accordance with these results, because approximately half of our patients, males and females, had a history of systemic arterial hypertension One of the factors that may have contributed to the higher prevalence of systemic arterial hypertension in our study was the criterion used for diagnosing hypertension (systolic blood pressure ≥ 140 mmHg or diastolic blood pressure m 90 mmHg) **[12],[13]** because in the studies cited, the definition of systemic arterial hypertension requires more elevated blood pressure levels **[10],[11]**. Confirming our observations, Mansur et al **[14]** reported that systemic arterial hypertension was the major risk factor of coronary artery disease in 321 females, both in premenopause and postmenopause.Although HDLcholesterol levels were significantly lower in males when the low HDL variable was tested, no significant difference occurred between males and females.

Diabetes mellitus was not a prominent risk factors for AMI in both groups in our study although the female were more diabetic as compared to male. Finally, approximately half of the males and females in our study had a familial history of early coronary artery disease. Our results have shown that a familial history of coronary artery disease is an important cardiovascular risk factor in young patients of both sexes.

V. Conclusion

Smoking, hypertensions, family history of CAD were the major modifiable risk factors in both the sexes. If a male who is smoker or a female who is diabetic, presents in emergency room with chest pain, they can always be suspected of coronary artery disease. Other conventional risk factors are also prevalent but diabetes and hypertension are not a major health problem.

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An SKR Tree Based Ranking Dominated Location with Circular Safe Zone

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Abstract- In reality, spatial objects (e.g., hotels) not only have spatial locations but also have quality attributes (e.g., star, price). An object p is said to dominate another one p', if p is no worse than p' with respect to every quality attribute and p is better on at least one quality attribute. Traditional spatial queries (e.g., nearest neighbor, closest pair) ignore quality attributes, whereas conventional dominance-based queries (e.g., skyline) neglect spatial locations. From this FDL (Farthest Dominated Location) retrieves the results, includes both quality attributes, and spatial objects with sufficient R-Tree algorithm to retrieve the data. For each query, location based server need to analyze query point and what the query needs to analyze from the database is large to store the data. For this, my project proposes a system include safe zone. This zone creates a circular zone with range for the query, location will be analyzed. This project proposes an efficient index called SKR-tree data structure which performs 1) Spatial filtering, 2) Textual filtering and 3) Object ranking in a fully integrated manner. Moving object database (MOD) engine is the foundation of Location-Based Service (LBS) information systems. The communication costs were the bottleneck for improving query efficiency until the rectangular safe region algorithm partly solved this problem. Theoretical proof and experimental results show that the proposed algorithm substantially outperforms the traditional periodic monitoring and the circular safe region algorithm in terms of monitoring accuracy, reducing communication costs and server CPU time.

Index Terms- Location Based Service, Moving Object Database, Continuous Spatial Query

I. Introduction

The development of technology has made it possible to track moving objects such as vehicles, aircrafts, vessels, wildlife, and human objects such as firefighters in a fire field. Technologies such as global positioning system (GPS), radio-frequency identification (RFID), cellular wireless networks (such as commercial cellular phone networks) and even triangulated wireless fidelity (Wi-Fi) networks can all provide location information in real- time, although at different precisions with different effective ranges.

Two major trends can be identified to manage the large amount of location and property information that varies with time: moving object databases (MOD) and data stream technology (DST). The first approach im- plies extending traditional database techniques with models and index structures suitable to track the loca- tions of the moving objects efficiently. The second approach focuses on the processing of continuous location updates as they arrive. The boundary between these two approaches is not always clear in relation to the topic of this survey: Both propose alternatives to classical data- base techniques, which are not considered appropriate to manage the continuously changing locations of the moving objects [1]. Our research will focus on the MOD approach but can be easily modified to adapt to the DST approach as well since our Dynamic Interval Based Circular Safe Region (DIBCSR) algorithm requires the minimum frequency of location updates which can be provided by both approaches.

MOD is a system that performs storage management and query analysis on time-variable spatial information of moving objects [2-4] which combines multiple disciplines and research areas including geographical information systems (GIS), spatial databases, spatial-temporal databases, computer graphics, computational geometry, artificial intelligence and mobile computing.

Application of MOD requires the optimal efficiency of the queries which can only be provided by continuous spatial-temporal queries. A regular spatial-temporal query only returns a single result set. In contrast, a continuous spatial-temporal query returns result sets continuously from the registration to the cancellation of the query, which is called the effective period of the query. Even if the query conditions remain unchanged during the effective period, the query result must be updated continuously due to the continuous movement of the queried objects. Here are two examples of continuous spatial- temporal queries which provide commonly used LBS such as range query or the k-nearest neighbor (kNN)
query:

1) List all vehicles that appear in region R in the next 10 minutes.

2) Continuously mark the ten closest vehicles to gas station number five.

These types of queries are not commonly supported by traditional relational database engines. In order to facili- tate these continuous spatial-temporal queries, a MOD engine must implement the query processing and ideally, with optimal performance at a low cost.

II. Related Works

Performance of the dynamic updates of the query result set during the effective period is the main research topic of MOD and spatial-temporal reasoning. In order to per- form continuous query optimization in a distributed sys- tem, not only the query cost must be minimized, the communication cost for updating location information of the terminal devices must also be

minimized. However, most of the previous works on continuous queries have focused on reducing the query cost and has ignored the communication cost [5-9], in which the occasions for reporting location information are determined by the terminal device at fixed intervals or when the object's location (constant distance interval) experiences a significant change. This class of uniform time/distance interval strategies has the following weaknesses:

1) The location updates are not adaptive to queries. When queries are scarce or there are no queries at all, a large amount of communication bandwidth and battery power of the terminal device may be wasted on the up- dates.

2) Low efficiency of queries could cause inconsistency with reality. In the periodical update strategy, improving the consistency of the query result with reality relies on the location update frequency increase. This means higher communication costs and may even make the improvement impossible because of the bandwidth and network delay limitation.

3) Unbalanced workload is applied on the server. In order to improve the reality consistency, the server must update large amounts of location information constantly and recalculate all the queries. An overloaded server usually means low responsiveness and poor reliability.

Hu, *et al.* [10] proposed a continuous query update strategy based on a rectangular safe region (RSR) me- thod which can alleviate the previous three problems. However, with analysis and experiments, we found that this strategy requires considerable computation power on terminal devices. This performance bottleneck may be- come more significant with a larger query load.

This project proposes an efficient indexing scheme called **SKR tree** (Spatial Keyword Range tree), which indexes both the textual and spatial contents of objects to support data retrievals based on their combine textual and spatial relevance, which, in turn, can be adjusted with different relative weights. In fig.1structure of SKR tree has nodes which have both spatial and non spatial information of the data object.

Moreover, most of the previous studies only support one specific query type, such as either range queries kNN queries but not both. Our proposed DIBCSR algo- rithm supports both range queries and kNN queries.

III. Safe Region Based Location Updates

Figure 1 demonstrates the infrastructure of a moving object query system. The kernel of the system is the control center (the main server of the system) in the center of the figure which runs the MOD engine, collects location information, handles continues queries and provides query results to the application servers to the right of the figure. Therefore, the major computation workload is applied to the main server/control center of a MOD system. For simplicity, we refer to the main server/control center as server in this paper.

Terminal devices, which are the monitored moving objects, obtain their own location information from the GPS system and transmit it to the server via a wireless communication network. The whole system's timeliness and efficiency is affected by the wireless communication bandwidth. The location information updates are often the bottleneck because of the limited wireless bandwidth and the high sampling rate in the traditional uniform time/distance interval strategies.

The idea behind the rectangular safe region (RSR) al gorithm [10] is to define a rectangular safe region for every object according to the registered query and the latest location obtained. As long as the object's motions do not exceed its safe region, all the query result sets of the object remain unchanged (**Figure 2**). The terminal device is informed of the safe region assignments dynamically. Hence when a terminal device finds that it has exceeded the safe region, it will report its new location information. E.g., when an object *a* in **Figure 2** has moved out of its safe region of *Sa* to location *a'*, it will report its new location to the server which will recalculate the results of a continuous k-nearest-neighbor (kNN) query *Q*1 and a range query *Q*2.

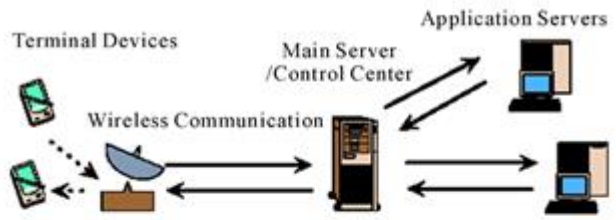

Figure 1. Infrastructure of the MOD system.

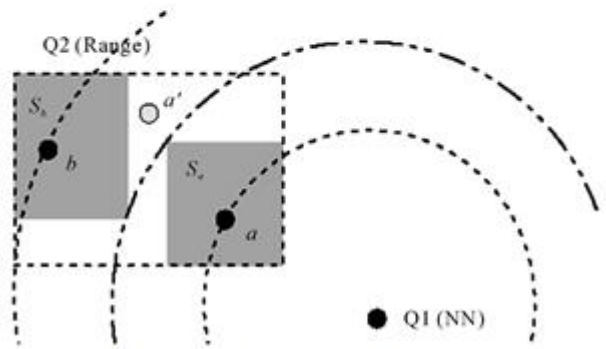

Figure 2. Rectangular safe region.

Through analysis and experiments, we found that although the RSR algorithm is effective, it has the following weaknesses which can be improved:

1) RSR requires that the terminal device has memory to store its current safe region and computing power to determine whether it has exceeded the safe region. However, in practice, many low-cost terminal devices (e.g. a GPS dog collar) do not have memory and computing power in addition to GPS satellites communication.

2) In RSR, data communication is bidirectional. The terminal devices not only need to upload location information to the server, but also need to download safe region information from the server. When the query frequency increases, the frequency of safe region download to the terminal devices increases. When the query frequency is high enough, the communication cost may be even worse than the uniform time interval (UTI) strategy. We have a detailed analysis of this problem in Section 5.2.

3) Computations involved in the RSR strategy are complicated, especially for kNN queries.

On the observation of these problems, we propose a new continuous query algorithm. We define the safe region of object *o* (referred to as *o.sr*) as a circle with the center at the location of the object and the radius of *o.r* (**Figure 3**). Assume the maximum speed of the object is *o.maxspd*, then the continuous query result of query *q* will not be affected within the time interval of *o.r/o. maxspd*. Hence the server can issue a location report query to the terminal device at the time of (*o.r/o.maxspd* - δ) where δ is the sum of communication and computation delays.

In comparison, the advantages of our DIBCSR strategy are:
1) The terminal device does not need to have any com-

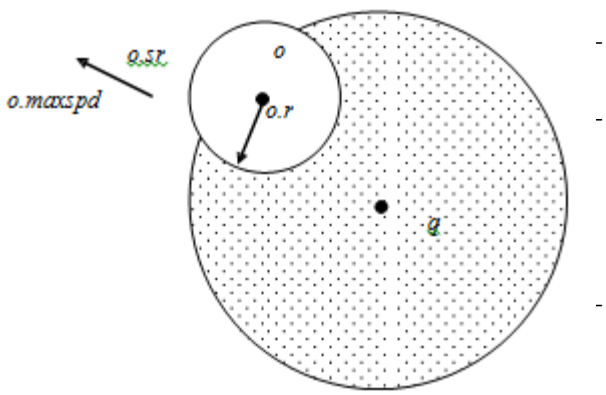

Figure 3. Location update of a moving object with circular safe region under continuous query.

puting power. The only task of the terminal device is to report its location upon the request of the server. This is determined by our main algorithm which is given in Sec- tion 4.1. Moreover, the location update sampling re- quests are distributed by the server. Therefore, when the sampling strategy needs updating, such as when safe regions are reassigned because of objects' movements, only the server is affected and the communication cost will not be affected.

2) The algorithm determining the assignment of a circular safe region is simpler than a rectangular one. There- fore the computation is reduced for safe region assignments. We provide the detailed safe region assignment algorithms for continuous range queries and continuous kNN queries in Sections 4.2 and 4.3 respectively.

3) The updates of safe regions have been minimized with the selection of circular shape safe regions and therefore the communication cost is minimized. We pro- vide mathematical analysis in Section 5.1.

4) The communication cost is reduced in comparison with the RSR strategy. Detailed analysis of this feature is provided in Section 5.2.

5) Computations involved in the RSR strategy are complicated, especially for kNN queries. In contrast, computations are much more concise in our DIBCSR strategy.

IV. Dynamic Interval Based Location Updates

We use C++/Java style pseudo code syntax, including comment syntax of double slash, to represent the algorithms in a more concisely and precisely. Properties of the moving object *o* and continuous query *q* are explained in **Table 1** and **Table 2**.
A separate process will be responsible for determination of the objects that are due for reporting new locations and sending the requests. The main algorithm

Table 1. Properties of a moving object.

q.region	Query region of a range query
q.result	Query result set
q.effUTI	the query effective period
o.circle.p	the center of the circular query region
o.circle.r	the radius of the circular query region

Table 2. Properties of a continuous query.

o.p	Last reported object location
o.r	Radius of the object safe region
o.sr	Object safe region
o.maxspd	Maximum speed of the moving object
o.upt	Next location update time of the moving object

which runs on the server is as following:

***Algorithm* 1. *Main algorithm for continuous query processing*:**

```
//OList is the object list, QList is the query list while (received
query q and
current time t within q.effUTI)
do
{
if (q is newly registered) then
{
//new a query q for processing, either //range or kNN
query
NewQuery(q);
}
if (q is cancelled) then remove q from QList;
if (q is location update of object o) then
{
//update safe region of object o and //related query re- sult sets
UpdateSR(QList, o);
o.upt = t + o.r/o.maxspd - delay;
}
}
UpdateSR(QList, o)
{
//range query location updates processing Update-
SRA(QList, o);
//kNN query location updates processing Update- RSR(QList,
o);
}
```

4.1. The Main Algorithm for Continuous Query Processing

Both continuous range query and continuous kNN query are supported by our strategy. A continuous range query is one that returns all the objects in *q.region* within the query effective period where query region can be either rectangular or circular. A continuous kNN query is one that returns the closest *k* objects to the query location. An ordered kNN query requires the results to be returned in increasing order and an unordered kNN query does not request the results to be in order. An ordered kNN query is what we will consider in this paper and which is more complicated than an unordered kNN query. These two different types of continuous queries require different new query processing and location update processing algorithms which we present in different sections as fol- lows.

4.2. Continuous Range Queries

The query processing and location update algorithm for continuous range queries are as follows:

***Algorithm* 2. SKR Tree**

```
Ne ← 0
  For each p ∈ D do
  geo code p and represent Lp with MBB mp
  if for some e ← Ne, me = mp then
     add p to e's dataset De;
  else
      create a new entry e;
          set me ← mp and De ← {p};
             Ne ←Ne U {e};
          End if
End for
For each e ←  Ne do
     While 1Ne1> n max do
Cluster the data according to min/max into nodes
            Ne ← Ne'
      End while
End for
```

In a range query, the geo function in Algorithm 2 which is the query result of safe region is defined as

$$\mathrm{Req}(q,o.sr)=\begin{cases} Y & \text{if } RCC5(q.r,o.sr)=PPI \\ N & \text{if } RCC5(q.r,o.sr)=DC \\ U & \text{otherwise} \end{cases} \qquad (1)$$

A return value of "*Y*" indicates that the safe region is inside the query region and therefore object *o* is within the result set. A return value of "*N*" indicates that the safe region is outside of the query region and therefore the object *o* is not included in the result set. A return value of "*U*" indicates that the safe region intersects with the query region. The result is therefore undecided. Hence the precise location of the object needs to be ob tained in order to recalculate. The region connection cal- culus (*RCC*) serves for qualitative spatial representation and reasoning and *RCC*-5 is a widely used binary rela- tionship model in automated spatial reasoning [11] with five binary relationships {DC, PO, PP, EQ, PPI} (dis- creteness, proper overlap, proper part, equivalence, proper inclusion) demonstrated in **Figure 4**. The function *RCC*5(X, Y) returns the *RCC*-5 relationship of X and Y for topology analysis.

Algorithm* 3. *Range query update

//The functionality is to update the range query //result set and check/update the object safe //region by invoking the SafeRegion sub //function.

```
UpdateSRA(QList, o)
{
o.r = ∞;
for (∀q ∈ QList and q is a range query) do
{
// If safe region function returns r>0
// then o is within the result set of q
if SafeRegion(q, o, r) then{
q.result = q.result ∪ {o}; return
true;
}
}
}
```

Algorithm* 4. *The calculation of safe region for range query

The purpose of this algorithm is to calculate the safe region radius and decide the query result set. The safe region radius r is returned for the object o under query q. The Boolean return value of true or false indicates whether object o is within the query result set.

```
SafeRegion(q, o, & r)
{
if (q is a rectangular range query) then
{
//Three circumstances exist,
//as demonstrated in Figure 5.
//A: o.p is inside query region I
//B: o.p is inside query region II
//C: o.p is inside query region III
if (o.p is inside query region I) then
{
r = distance from o.p to the closest edge of the rectan- gular
query region;
return true;
}
else if (o.p is inside query region II) then
r = distance from o.p to the closest edge of the rectan- gular
query region;
else // o.p is inside query region III
r = distance from o.p to the closest vertex of the rectangular
query region;
   return false;
   }
   else if (q is a circular range query) then
   {
   //Two circumstances exist,
   //as demonstrated in Figure 6.
   //A: object o is inside the
   //circular query region
   //B: object o is outside of the
   //circular query region
            doq= dist(o.p, q.circle.p);
```

//*dist*(*a*, *b*) represents the distance
//between point *a* and point *b*. *doq* is the //distance between object *o* and query *q*.
r = ABS(*doq* - *q.circle.r*);
if (*doq* <= *q.circle.r*) then return
true;
else
return *false*;
}
}

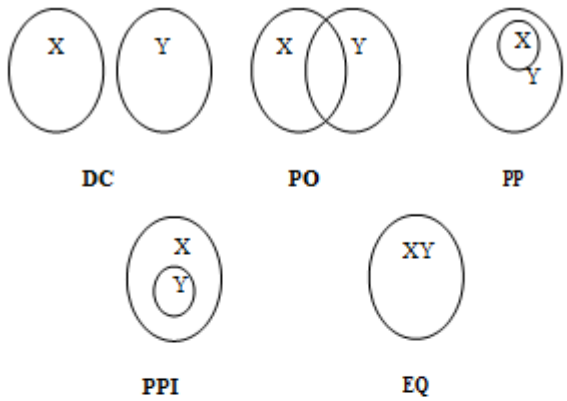

Figure 4. Binary spatial relationships in RCC-5.

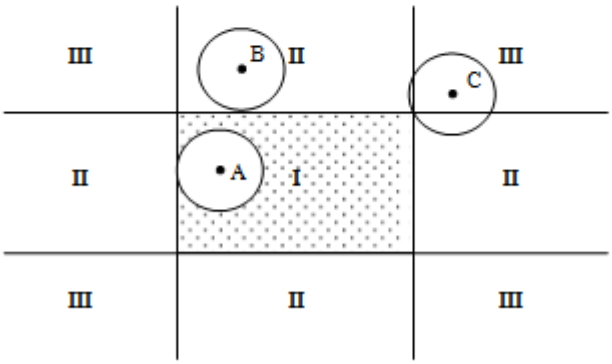

Figure 5. Rectangular range query safe region.

Theorem 1: When the motion of the object in Algo- rithm 4 does not exceed the safe region, the result set of the continuous range query does not change.

Proof: Apparently, under the circumstance, o.sr does not intersect with q.r. Hence object o's motion inside o.sr will not affect the query result set.

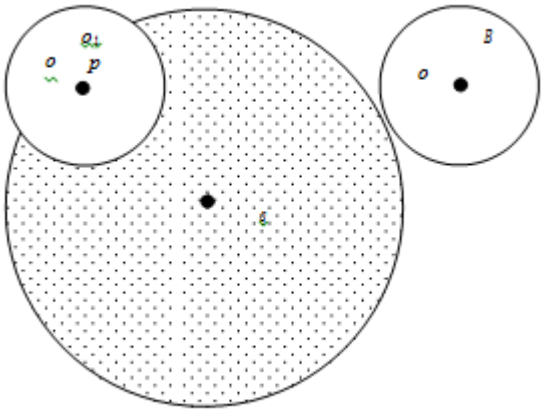

Figure 6. Circular range query safe region.

4.3. Continuous kNN Query

Algorithm* 5. *An ordered kNN query processing
NewQuery(*q*)

//*q* is an ordered kNN query
{
1) Decide the object list *OList* near query location *q.p* based on the spatial-temporal index of moving objects; /*e.g. objects within neighboring rectangles can be se- lected in an R*-tree indexed system. This step reduces the object set that is processed to reduce the following computation.*/
2) Perform sorting to the objects in *OList* by dist (*o.p*, *q.circle.p*) ascending, the nearest *k* + 1objects are saved in *q.result*; /*Quick Sort algorithm is applied and the Compare function is given below. The reason why we save the (*k*+1)*th* object is for the calculation of the safe region.*/
3) Update the safe regions for all objects;
}

Algorithm* 6. *Distance comparison algorithm for o jects
For simplicity, we use *q* to represent *q.circle.p* and object names *o*1, *o*2 to represent the object location *o*1.*p* and *o*2.*p* in this section.
// Function returns –1 when *o*1 is nearer than *o*2; // re- turns 1 when *o*1 is farther than *o*2.
// Since all calculations are floating-point, we do // not consider the equal scenario.
Compare (*q*, *o*1, *o*2)
{
if (*dist*(*q*, *o*1) + *o*1.*r* < *dist*(*q*, *o*2) – *o*2.*r*) then return –1;

if (*dist*(*q*, *o*1) – *o*1.*r* > *dist*(*q*, *o*2) + *o*2.*r*) then return 1;
Query locations of *o*1, *o*2;
//Distances of safe regions to *q* overlaps, //query precise locations for further //comparison.
*o*1.*r* = 0;
*o*2.*r* = 0;
if (*dist*(*q*, *o*1) < *dist*(*q*, *o*2)) then return –1;
else
return 1;

}

4.4. Circular Safe Region Calculation and Updates for Continuous kNN Queries

Following is the formula to update the safe region radius for the i object in the object set ascending sorted by distance to ordered kNN query q in Algorithm 5. Figure 7 shows an example of safe regions assignment in such an ordered kNN query q. The first object in the result set is q and the extra object ok+1 is kept for calculation of safe region radius of ok.

$$o_i.r = \begin{cases} \text{if } 0 < i \le k, \text{ in the result set, then} \\ \min\left\{\frac{dist(o_i, o_{i-1})}{2}, \frac{dist(o_i, o_{i+1})}{2}\right\} \\ \text{if } i > k, \text{ out of the result set, then} \\ \min\{o_i.r, dist(o_{k+1}, q) - quar(q)\} \end{cases} \quad (2)$$

where $quar(q)$ is the radius of the quarantine region for query q which surround and only surround the safe re- gions of all objects in the result set. Therefore, $quar(q) = dist(ok, q) + ok$. **Figure 8** shows how such a quarantine region is assigned for such an ordered kNN query q. Hence we have the following property: either in or out of the kNN query result set (inside or outside the quarantine region), none of the safe regions of objects overlaps with each other. Therefore, when all the objects are moving inside their own safe regions, the result set and its order are not affected.

4.5. Location Update Processing for Continuous kNN Queries

For continuous kNN query, when object location is up- dated, one of the four following scenarios will happen. The detailed update algorithm is given in Algorithm 7:

1) Original location was inside the quarantine region and new location is also inside the quarantine region: order adjustment in the result set is necessary.

2) Original location was outside the quarantine region but new location is inside the quarantine region: a new

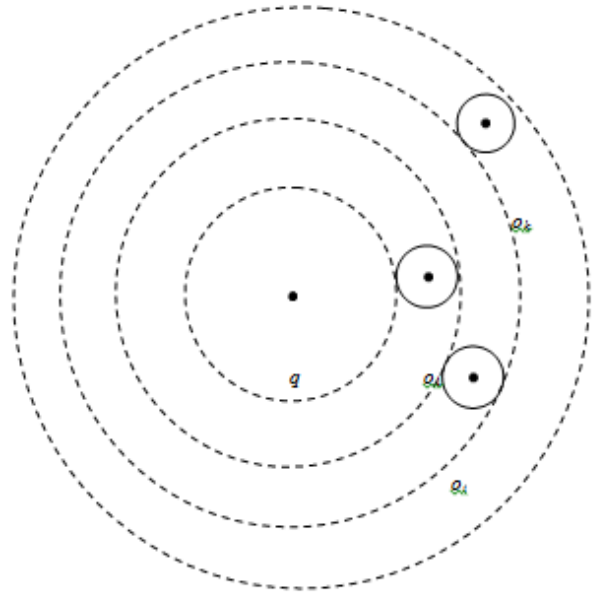

Figure 7. Safe regions assignment in an ordered kNN query.

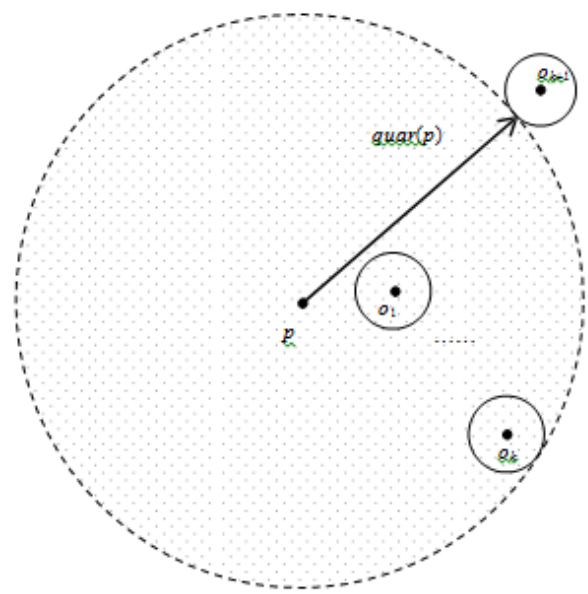

Figure 8. Quarantine region assignment for an ordered kNN

query is necessary to recalculate the complete result set.

3) Original location was inside the quarantine region but new location is outside the quarantine region: same as 2).

Both original location and new location are outside the quarantine region: only need to update the object's safe region.

Algorithm 7. Location update processing for kNN query

//Purpose is to update safe region and result set

UpdateRSR(*QList*, *o*)

{

for ($\forall q \in QList$ and q is a kNN query) do

{

if (($o \notin q.result$ and $dist(o, q) \leq quar(q)$) or ($o \in q.result$ and $dist(o,q) > quar(q)$)) then
{
Execute Algorithm 5;
//Processed as a new query
continue;
}
else if ($o \in q.result$
and $dist(o, q) \leq quar(q)$) then
{
//Original result set of q is $\{o_i | i = 1,\cdots, k\}$, //if object o's original index is i and //index after the new sorting by $dist(q, o)$ //is i'
Execute Algorithm 5 within the range of

$$\begin{cases} i-1, i, \ldots, i', i'+1, & \text{when } i' \geq i \\ i'-1, i', \ldots, i, i+1, & \text{when } i \geq i' \end{cases}$$

Use result set from Algorithm 5 to replace the respec- tive subset in the original result set;
continue;
}
else //$o \notin q.result$ and $dist(o, q) > quar(q)$
{
Adjust $o.r$ following the Req function given by Equa- tion (1);
continue;
}
}
}

V. Analysis and Experiment

5.1. Analysis of the Safe Region Shape

As previously mentioned in Section 3, one reason for selecting the circular safe region shape is to minimize the updates of safe regions and therefore the associated communication cost. We further provide mathematical analysis here.

In a safe region based strategy, the communication cost of a location update is inversely proportional to the minimum location update time. This is because the object's motion direction is generally unpredictable. There- fore its probability of leaving the safe region through any portion of the border is equal. Assume *SR* to be the safe region, *p* to be the last reported location. If in the direction of *p*, the distance from *p* to the edge of the safe region is $k(\theta)$ (**Figure 9**), then the minimum location up- date time is

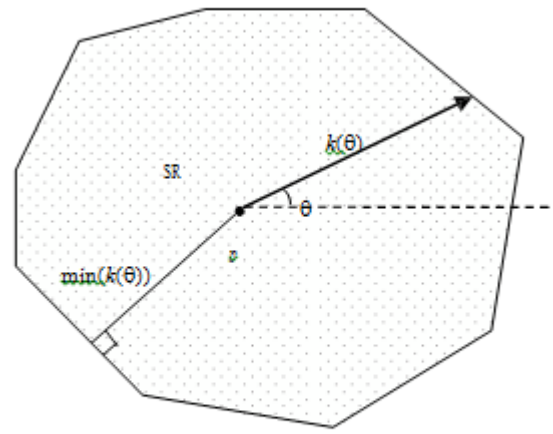

Figure 9. Shape of the safe region.

$$1/cost_{communication} \propto time_{update} = \min(k(\theta))/o.maxspd \quad (3)$$

Assuming *o.maxspd* is a property of the object that we cannot control, our goal is to maximize the min(k(□)) in order to maximize the *tupdate*. When a specific shape of safe region is selected, increasing the area of the safe region is obviously going to increase min(k(□)). However, in a range query or a kNN query, the largest area is eventually bounded by the objects' distribution and the size of the query region. Therefore, if we assume the area of the safe region is determined, then the maximized average distance from *p* to the edge of the safe region in all directions, min(k(□)), will come with the isotropic safe region – a circle.

5.2. Analysis of the Safe Region's Communication Cost

In the RSR strategy [10], data communication is bi-directional: the terminal devices upload location information and download the safe region information. However, the authors only discussed the communication cost of location information upload, which is not precise. We take the bi-directional data communication into consideration in the following discussion and then compare the communication cost with our DIBSCR strategy.

In the RSR strategy, communication in the down-link direction from the server to the terminal device transmits information of the rectangular safe region, each deter- mined by two points or four coordinates. Communication in the up-link direction from the terminal device to the server transmits a location update, each includes one point or two coordinates. In newer wireless networks such as Wi-Fi, Wi-Max or 3G, data is transmitted in data frames (called synchronous transmissions mode). Since the data amount to be transmitted/received by the terminal device every time is quite small which can easily fit into a single frame, the location update rate is the main factor affecting the communication cost. This location update rate is constant for UTI strategy while variable for safe region based strategies. Assume in the RSR strategy, the safe region update rate is s which depends on the query rate of q. We therefore

represent it using the function of s(q) which increases with the query rate of q. And assume the location update rate is u and the communication delay is d. The total communication cost is (s(q) + u)•d which increases with the query rate. Hence when the query rate is high, the RSR strategy can be even worse than the UTI which makes it not feasible.

In contrast, in our DIBSCR strategy, the terminal de- vice does not need to download safe region information which only leaves the location update term of $u \cdot d$. Moreover, the location update rate r is most equal to the the dynamic time interval which is greater than or equal to a preset value. We further provide the estimated location update rate r in DIBSCR as following:

The basic estimate of the location update interval is derived from Equation (3):

$$1/u \propto t_{update} = o.r/o.maxspd \qquad (4)$$

where *tupdate* is the minimum amount of time the object may exceed the circular safe region and therefore requests a location update. The estimate of the location update rate u is therefore relying on the estimate of the object's maximum speed *o.maxspd*.

The estimate of *o.maxspd* can be either fixed (for in- stance the object types of pedestrian, motor vehicle or high-speed train) or it could also be further refined by prediction from the object's historical locations. This could reduce the communication cost when the object is temporarily immobile (such as when the pedestrian stopped by a coffee shop or when the motor vehicle is parked). Certainly in any prediction based speed estimate, we need to be on the conservative side and control the computation cost although there are outstanding predic- tion methods such as Back Propagation Networks (BPN). For simplicity, we do not want to include consideration of a missing rate. One possible conservative estimate is

$$o.maxspd = \min\left(fixed\_max\_speed,\ v_{last} + max\_acceleration * (t_{current} - t_{last})\right)$$

where

fixed_max_speed: the maximum possible speed for an object type

vlast: calculated speed at the last location report time

max_acceleration: the maximum possible acceleration of an object type

tcurrent: the current system time

tlast: the last location report time.

Either the *o.maxspd* is fixed or further bounded by a prediction, it is tightly bounded and hence the minimum amount of time the object may exceed the circular safe region and the maximum location updated rate is tightly bounded and independent of the query rate.

5.3. Experimental Analysis of the System Performance

In order to further evaluate our strategy, we constructed a simulation system to evaluate the UTI strategy, RSR strategy and our DIBCSR strategy. In our simulation system, object *o*'s motion direction and speed are ran- domly generated. The object's speed should not exceed a fixed maximum speed of *o.maxspd*. In UTI simulation, we have two location update intervals of 0.1s and 1s, referred to as UTI(0.1) and UTI(1) respectively in the simulation results.

In our experimental analysis through simulation, three comparison criteria are applied: 1) precision, 2) commu- nication cost and 3) server workload. We analyze the si- mulation results separately in the following section.

1) Precision

The precision of a continuous query result is defined as: at time t, the system query result is RESULT(t); the actual object set that satisfies the query condition is TRESULT(t), standing for the true result. In order to use a higher value to represent higher precision, we define the *equal*(x, y) function to return 1 when $x = y$ and 0 when $x \neq y$. In the time interval of [a, b], we average the equality between the returned value and the true value, and define precision as

$$\frac{1}{b-a}\int_a^b$$

The precision is obviously affected by the communi- cation delay since it causes the difference between the actual location and the reported location. The result is represented in **Figure 10** and the precision of DIBCSR and SBR are approximately the same and both are better than UTI.

The simulation results shown in **Figure 11** confirm our analysis in Section 5.2 that the performance of DIBCSR is significantly better (lower communication cost) than RSR when considering bi-directional communication cost. And at high query rate, communication cost of RSR can be even worse than UTI with a larger time interval (low- er sampling rate).

2) Communication cost

3) System scalability

Figure 12 shows the comparison of server workload for different strategies under the query rate increase. Since the workload is balanced better, both DIBCSR and

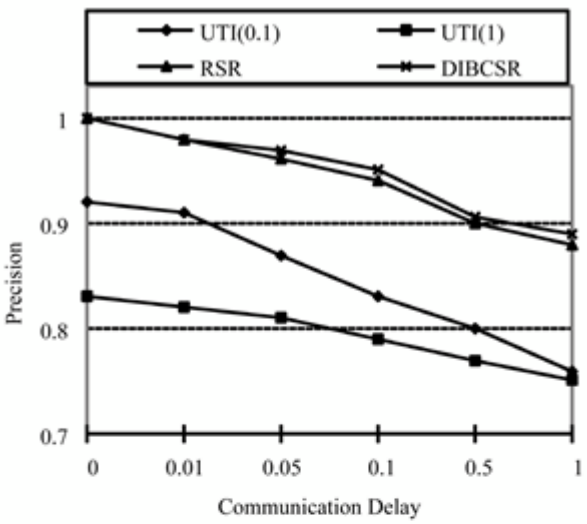

Figure 10. Comparison of precision.

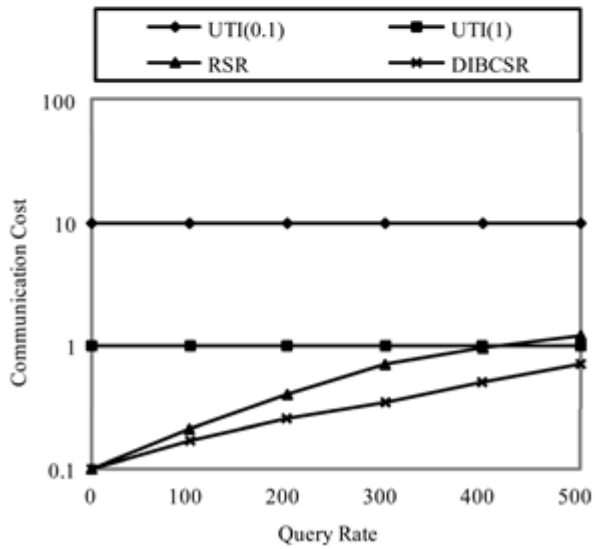

Figure 11. Comparison of communication cost.

RSR apply less workload on the server than UTI. Be- cause we further simplified the safe region computation by applying circular safe region, DIBCSR applies even less workload than RSR on the server. This advantage is more significant under the query rate increase. This low server workload feature of DIBCSR helps to improve the system scalability

VI. Conclusions

This paper analyzes the weaknesses of the RSR strategy and proposes a DIBCSR strategy to replace the RSR strategy for continuous queries in MOD. Theoretical analysis and simulation experiment both show that the new strategy has multiple advantages. Firstly, the new

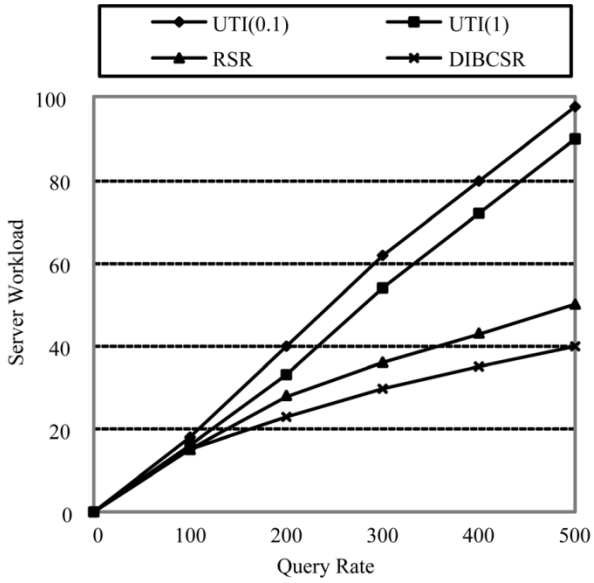

Figure 12. Comparison of server workload.

strategy does not require computation over the terminal devices. Therefore, cost of the terminal devices is reduced under the precondition of equal or better system performance. Secondly, terminal devices do not need to download the safe region information from the server which reduces the communication cost effectively. Finally, computation is simplified by applying circular safe regions. Hence the server workload is reduced which improves the system scalability. Possible future works of the research include implementation of the strategy in an applied MOD engine for a information system providing LBS to public transportation, taxis and private vehicle devices or pedestrians with hand-held mobile devices. Application of our strategy potentially provides real-time range queries and kNN queries to support LBS at a low cost with a high performance in addition to system de- sign and implementation ease and flexibility.

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Influence of Taungya Agroforestry System on Diversity of Native Woody Species and Soil Physico-Chemical Properties in Nigeria

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Abstract- This study assessed the effects of agroforestry system on diversity of native woody species and soil physico-chemical properties. This was achieved by comparing floristic composition and soil physico-chemical properties in four different *Taungya* agroforestry sites and a natural regrowth forest reserve where active logging has not taken place in Ondo State, Nigeria. Two sample plots of 25 m x 25 m were assessed in each site using systematic sampling techniques. All the plants were identified to species level and categorized into tree, shrub, perennial herb, scrambling shrub, epiphyte, climber and their families were identified. Shannon-Weiner and species evenness indices were used to assess and compare native woody species diversity and abundance. Five soil samples were randomly collected from each agroforest plot and natural regrowth forest at depths of 0-15 cm and 15-30 cm using a soil auger to give a total of one hundred soil samples which were air-dried and sieved using 2.0 mm sieve. The results showed that the study area was richer in arable crops compared to native woody species as there were 54 species distributed into 28 families in the natural regrowth forest, 11 species distributed into 9 families in Aponmu, 19 species distributed into 19 families in Owo, 11 species distributed into 10 families in Idanre, and 8 species distributed into 7 families in Ore. Species density gradually reduced from 1392 ha^{-1} in natural regrowth forest to 1192 ha^{-1}, 848 ha^{-1}, 664 $ha^{-1}$and 432 ha^{-1} in Owo, Idanre, Ore and Aponmu *Taungya* agroforests respectively. More climber species were encountered in natural regrowth forest compared to the *Taungya* agroforest sites. Shrubs species recorded were higher in most of the *Taungya* sites compared to natural regrowth forest. The soil texture of all sites, except Owo *Taungya* were sandy clay loam at the two soil depths. The soil pH ranged from 5.3 to 7.1 for the top soil and from 4.0 to 7.0 for the sub soil. Ore *Taungya* site was significantly higher ($P < 0.05$) in soil organic carbon (2.46 g/kg) and total nitrogen (0.20 g/kg) when compared with other agroforestry sites. The cation exchangeable capacity (6.77 cmol/kg) was highest at Aponmu site. These values however, decreased with depths. This study concluded that *Taungya* agroforest averagely enhanced native plant biodiversity conservation and significantly improved the soil quality of the study area.

Index Terms- Taungya, natural regrowth forest, soil physico-chemical properties, species distribution

I. Introduction

Transformation of forest reserves to other land-uses in recent times has caused many complex changes in the forest ecosystem (Henrik *et al.*, 2010, Awotoye *et al.*, 2013); one of such changes is the emergence of *Taungya* agroforestry practice within the forest reserves in Nigeria. *Taungya* farming is the fore-runner to agroforestry. It is of Burmese origin and means "hill" (*Taung*), "cultivation" (*ya*) (Nair, 1993). According to Adedire (2005), agroforestry is a collective name for land-use systems and practices of deliberately growing or retaining trees or shrubs within an agricultural or pastoral land use system, either under the same form of spatial arrangement or in temporal sequence. Approved *Taungya* is the allocation of land to farmers in forest reserves where tree seedlings and arable crops are planted together (Adekunle and Bakare, 2004), it is considered a management option, as a result of many degradation that has taken place in forest ecosystems which, is beyond their capacity to enhance and conserve native woody species diversity (Brown and Boutin, 2009). The increasing size of the world population has led to a tremendous rise in the demand for food and energy. As a result, more forest reserves in the country are now being converted at high pace to farmland and other uses than ever before. According to Roche (1993) *Taungya* may prove to be one of the cheapest means of establishing forests of all kinds and at the same time supplying food for the general population. *Taungya* farming involves the growing of annual or biennial agricultural crops along with the forest species during the early years of establishment of the forest plantation (Jordan *et al*., 1992). The long-term effect of *taungya* practice on regeneration of native woody plant diversity and soil fertility will however depend on the management practices adopted at the initial time as well as subsequent re-establishment phases (Jordan *et al.*, 1992). Many other factors such as canopy cover percentage, leaf area index and stem density (Hardtle *et al.*, 2003 and Lemenih *et al.*, 2004), substrate quality, litter mass depth (Dzwonko and Gawronski, 2002), land use history (Gachet *et al.*, 2007), management practices (Brown and Boutin 2009) and Farmers attitude (Adekunle and Bakare, 2004) determine the ability of *taungya* system to allow natural regeneration of native woody species. Adekunle and Bakare (2004) reported that, the only species most of the respondents in Ondo State were willing to plant was *Tectona grandis* and those native species retained on farmland are tropical indigenous hardwood species such as *Triplochiton scleroxylon*, *Mansonia altissima*, *Chrysophyllum*

albidum, *Celtis zenkeri*, *Milicia excelsa*, *Khaya ivorensis*, *Afzelia africana*, *Strombosia pustulata*, *Treculia africana*, etc. It is important to understand that agroforests are not specifically conceived by farmers to allow biodiversity conservation, instead biodiversity restoration in agroforests results mainly from unintentional processes (Michon and de Foresta, 1995). Nevertheless, with the wide practice of *taungya* and many other agroforestry practices, it is important that further studies are carried out to assess the extent to which these methods of land use can provide habitat for indigenous woody species diversity especially in the tropics. Hence this paper seeks to highlight the contribution of *taungya* agroforestry system as a type of land use method adopted in forest reserve management to conserve native woody species diversity and maintain soil fertility.

II. Materials and Methods

Study Area

The study was carried out in five locations namely, Idanre (Latitude N 06^0 44 20^1, Longitude E 004^0 46 44^1), Owo (Latitude N 06^0 57.32^1, Longitude E 005^0.37.41.4^1), Aponmu (Latitude N$07^0$14.67^1, Longitude E005^0 02.53^1), Ore (Latitude N 06^0 44. 19^1, Longitude E 004^0 46.43^1) and Natural regrowth forest (Latitude N07^0 15.03^1, Longitude E$005^0$02.39^1). Aponmu in Ondo State, Nigeria. There are two distinct geological regions in the study area. First, is the region of sedimentary rocks in the southern part (i.e Idanre and Ore sites), and secondly, the region of Pre-Cambrian Basement Complex rocks in the northern part (i.e Aponmu and Owo sites), the basement complex is mainly of the medium grained gneisses. These are strongly foliated rocks frequently occurring as out crops. A small proportion of the area, especially to the northeast, overlies the coarse grained granites and gneisses, which are poor in dark ferromagnesian minerals (Smyth and Montgomery, 1962). And the soils derived from the Basement complex rocks are mostly well drained, with a medium texture. The soils, classified as Ondo Association, are of high agricultural value for both tree and arable crops.

The climate of the sites is of the lowland tropical rain forest type, with distinct wet and dry seasons. In the southern part (i.e Idanre and Ore sites), the mean monthly temperature is 27°C, with a mean monthly range of 2°C, while mean relative humidity is over seventy five percent. However, in the northern part (i.e Aponmu and Owo sites), the mean monthly temperature and its range are about 30°C and 6°C respectively. The mean monthly relative humidity is less than seventy percent. In the southern part, rain falls throughout the year, but the three months of November, December and January may be relatively dry. The mean annual total rainfall exceeds 2000 millimetres. However, in the northern part, there is marked dry season from November to March when little or no rain falls. The total annual rainfall in the northern part, therefore, drops considerably to about 1800 millimetres.

The natural vegetation of the sites is of the high forest, composed of many varieties of hardwood timber. The *Taungya* sites were part of forest reserve formerly but now de-reserved.

Survey Method

Four *taungya* agroforestry sites and one natural regrowth forest site were used in order to determine the floristic composition, species diversity and soil physico-chemical properties within each site. Two sample plots of 25 m x 25 m, were mapped out in each site. A *Taungya* agroforest plantation which was established in the year 2007 was used for the whole assessment in each location. All plant species were identified on the field to species level. Those that could not be identified on the field were collected, labelled and brought to Ife Herbarium for proper identification. The woody species were identified and enumerated and their girths at breast height (GBH) cm were measured using girthing tape.

Plant Parameter Measurements

The following parameters were measured in each site:

Plant species density, tree height, girth at breast height (GBH), basal area, Shannon-Weiner diversity index H^1, index of species richness, and Simpson index of similarity.

Plant species density (ha^{-1}): Plant species density (ha^{-1}) was calculated as the number of plant species per plot converted to hectare using the formula below:

$$\text{Plant species density } (ha^{-1}) = \frac{x}{25 \times 25} \times 10{,}000 \quad \ldots\ldots (1)$$

Where x = Number of plant species

Relative density: This was calculated using the formula below:

$$RD = \frac{x}{100} \times 100 \quad \ldots\ldots (2)$$

Where x = number of plant species

Tree height: Tree height of each woody species within each plot was measured using a graduated ranging pole.

Girth at breast height (GBH) and Basal area (m^2): Within each plot, woody plant girths were measured at breast height (GBH) with a tape for trees that were 3m or more tall and at mid-point for those less than 3m tall. The girth measurements were used to calculate the basal area of each tree using the formula below:

$$\text{Basal area } (m^2) = \frac{c^2}{4\pi} \quad \ldots\ldots (3)$$

Where c = girth at breast height in meters

π = constant value of 3.14

The basal area (m^2 ha^{-1}) for each species and all the woody species were calculated for each plot according to equation (3).

Shannon-Weiner diversity index H^1: It was calculated using equation (4):

$$\text{Shannon-Weiner diversity index } (H^1) = -\sum_{i=1}^{s} pi \ln(pi) \ldots\ldots$$

Where

H^1 = Shannon-Weiner diversity index

S = total number of species in the plot

P_i = proportion of a species to the total number of plants in the community

ln = natural logarithm

Menhinick's index of species richness: and this was calculated as:

$$d = \frac{s}{n} \quad \ldots\ldots (5)$$

d = Menhinick's index of species richness
s = number of species per plot
n = number of plant per plot

Simpson index of similarity: and this was calculated as:

$$SI = 100 \times \frac{a}{(a+b+c+d+e)} \quad \ldots\ldots (6)$$

a = Number of species present in both site under consideration
b = Number of species present in site 1 but absent in site 2
c = Number of species present in site 2 but absent in site 1
d= Number of species present in site 3 but absent in site 1 and 2
e= Number of species present in site 4 but absent in site 1, 2 and 3

Soil Sampling

Five quadrats of 5m x 5m were made within each 25m x 25m plot from where soil samples were randomly collected from each plot of agroforest and natural regrowth forest at depths of 0-15cm and 15-30cm using a soil auger to give a total of one hundred soil samples which were air-dried and sieved using 2.0 mm sieve.

Soil Laboratory Analysis

Water Holding Capacity of the Soil was determined according to the method of Pramer and Schmidt (1964). The soil bulk density was determined by adopting core method (Blake and Hartge, 1986), particle size by hydrometer method (Bouyoucous, 1962), organic matter and carbon by Walkley-Black wet oxidation method (Nelson and Sommers, 1982) as well as total nitrogen by micro-kjeldal digestion method (Bremner *et al.*, 1994). The soil pH was measured electrometrically in water at 1:2 soil/water ratio using pH meter (Rhoades, 1996). Exchangeable acidity was determined by titration method (Mclean, 1965). Available phosphorus was determined by using Bray No.1 method, while exchangeable cations (K^+, Ca^{2+}, Na^+ and Mg^{2+}) was determined using 1M NH_4OAc buffered at pH 7.0 as extractant. Also, the Atomic Absorption Spectrophotometer was used to read the K^+ and Na^+ concentrations in the soil samples. In the data analysis, one way analysis of variance (ANOVA) and Duncan multiple range tests were employed to separate treatment means with a significance level of $P < 0.05$.

III. Results

Vegetation parameters

Density of the Woody Species (per hectare) in all the Five Study Sites.

The density of the woody species (per hectare) in all the five study sites is presented in Table 1. There was a total of 432 plants ha^{-1} consisting of 11 species in Aponmu site where *Cola gigantea* was the native species with the highest density while *Albizia adanthifolia, Alchornea cordifolia, Antiaris toxicaria, Blighia sapida, Lecaniodescus cupanioides, Margaritaria discoidea* and *Vernonia amygdalina* had the lowest density of 8 plants ha^{-1} each. In Idanre site, 832 individual plants ha^{-1} consisting of 9 species were assessed *Rauvolfia vomitoria* had the highest density of 56 plants ha^{-1} while *Capsicum frutescens* and *Lonchocarpus cyanescens* had the lowest density of 8 plants ha^{-1} each. Owo site had 1176 individual plants ha^{-1} consisting of 17 species where *Ficus exasperata* had the highest density of 24 plants ha^{-1} while *Antiaris toxicaria, Baphia nitida, Cola gigantea, Deinbollia pinnata, Ficus mucoso, Lecaniodescus cupanioides, Mallotus opupositifolius, Markhamia tomentosa, Newbouldia laevis, Ricinodendron heudelotii, Uvaria chamae* and *Vernonia amygdalina* had the lowest density of 8 plants ha^{-1} each. Ore site had 664 individual plants ha^{-1} consisting of 8 species where *Vernonia amygdalina* had the highest density of 56 plants ha^{-1} while *Cola millenii* had the lowest density of 16 plants ha^{-1}. Natural regrowth forest site had 1392 plants ha^{-1} consisting of 49 species where *Cola gigantea* had the highest density of 280 plants ha^{-1} while *Bosqueia angolensis, Brachystegia euryoma, Deinbollia pinnata, Ficus mucoso, Ficus sur, Lecaniodescus cupanioides, Mallotus oppositifolius, Markhamia tomentosa, Buchholzia coriacea, Cathium spp, Cnestis ferruginea, Cuviera acutiflora, Diospyros menbuttensis, Drypetes gilgiana, Glyphaea brevis, Helalobus monopetalus, Holoptelea grandis, Lecaniodescus cupanioides, Margaritaria discoidea, Myrianthus arboreus, Picralima nitida, Pterocarpus osun, Ricinodendron heudelotii, Stemonocoleus micranthus, Sterculia oblonga, Sterculia rhinopetala* and *Terminalia superba* had the lowest density of 8 plants ha^{-1} each. Overall, site E had the highest native woody species density per hectare (1392 ha^{-1}) while site A had the lowest (432 ha^{-1}).

Table 1: Density of woody species (per hectare) in all five of the study sites.

S/N	SPECIES	FAMILY	Density ha^{-1} Aponmu	Idanre	Owo	Ore	Natural forest
1	*Albizia adanthifolia*	Mimosoideae	8	16	-	-	-
2	*Albizia zygia*	Mimosoideae	-	-	-	-	16
3	*Alchornea cordifolia*	Euphorbiaceae	8	16	-	-	-
4	*Antiraris toxicaria*	Moraceae	8	-	8		16
5	*Baphia nitida*	Papilionaceae	-	24 ± 8	8	16	24±8
6	*Blighia sapida*	Sapindaceae	8	-	24 ±8	-	32±16
7	*Bosqueia angolensis*	Moraceae	-	-	-	-	8
8	*Brachystegia euryoma*	Caesalpiniodeae	-	-	-	-	8
9	*Buchholzia coriacea*	Capparaceae	-	-	-	-	8
10	*Capsicum frutescens*	Solanaceae	-	8	-	-	-
11	*Cathium spp*	Compositae	-	-	-	-	8
12	*Celtis mildbraedii*	Ulmaceae	-	-	-	-	16
13	*Celtis zenkeri*	Ulmaceae	-	-	-	-	40±8
14	*Chrysophyllum albidum*	Sapotaceae	-	-	-	-	32
15	*Cleistopholis patens*	Annonaceae	-	-	-	-	16
16	*Cnestis ferruginea*	Connaraceae	-	-	-	-	8
17	*Cola gigantea*	Sterculiaceae	16	-	8	-	280
18	*Cola millenii*	Sterculiaceae	-	-	-	8	48
19	*Cuviera acutiflora*	Rubiaceae	-	-	-	-	8
20	*Deinbollia pinnata*	Sapindaceae	-	-	8	-	-
21	*Diospyros dendo*	Ebenaceae	-	-	-	-	64
22	*Diospyros menbuttensis*	Ebenaceae	-	-	-	-	8
23	*Diospyros soubreana*	Ebenaceae	-	-	-	-	80±16
24	*Drypetes chevalieri*	Euphorbiaceae	-	-	-	-	64
25	*Drypetes gilgiana*	Euphorbiaceae	-	-	-	-	8
26	*Enanthea chlorantha*	Annonaceae	-	-	-	-	16
27	*Faraga macrophylla*	Rutacea	-	-	-	-	16
28	*Ficus mucoso*	Moraceae	-	-	8	-	8
29	*Ficus exasperate*	Moraceae	-	-	24 ±8	-	-
30	*Ficus sur*	Moraceae	-	-	-	-	-
31	*Funtumia elastica*	Apocynaceae	-	-	-	16	104±24
32	*Glyphaea brevis*	Tiliaceae	-	-	-	-	8
33	*Helalobus monopetalus*	Annonaceae	-	-	-	-	8
34	*Holoptelea grandis*	Ulmaceae	-	-	-	-	8
35	*Lannea welivitschii*	Anacardiaceae	-	-	-	-	16
36	*Lencaniodescus cupanioides*	Sapindaceae	8	-	8	-	8
37	*Lonchocarpus cyanescens*	Papilionaceae	-	8	-	-	-
38	*Lonchocarpus sericeus*	Papilionaceae	-	-	-	-	16
39	*Mallotus oppositifolius*	Euphorbiaceae	-	-	8	-	72±8
40	*Manihot esculentum*	Euphorbiaceae	64 ± 16	456± 24	608±96	352±48	-
41	*Mansonia altissima*	Sterculiaceae	-	-	-	-	40±8
42	*Margaritaria discoidea*	Euphorbiaceae	8	-	-	-	8
43	*Markhamia tomentosa*	Bignomiaceae	-	-	8	-	-
44	*Microdesmis puberula*	Pandaceae	-	-	-	-	32
45	*Milicia excelsa*	Moraceae	-	-	-	-	16
46	*Musa parasidica*	Musaceae	8	-	-	-	-
47	*Musa sapientum*	Musaceae	-	96± 16	224±32	128±16	-
48	*Myrianthus arboreus*	Moraceae	-	-	-	-	8
49	*Newbouldia laevis*	Bignoniaceae	-	-	8	-	-
50	*Picralima nitida*	Apocynaceae	-	-	-	-	8
51	*Pterocarpus osun*	Papilionaceae	-	-	-	-	8
52	*Rauvolfia vomitoria*	Apocynaceae	-	56 ± 8	-	16	-
53	*Ricinodendron heudelotii*	Euphorbiaceae	-	-	8	-	8
54	*Rinorea dentate*	Violaceae	-	-	-	-	24±8
55	*Rothmannia longiflora*	Rubiaceae	-	-	-	-	16

56	*Sorindeia warneckei*	Anacardiaceae	-	-	-	-	24
57	*Stemonocoleus micranthus*	Caesalpinioideae	-	-	-	-	8
58	*Sterculia oblonga*	Sterculiaceae	-	-	-	-	8
59	*Sterculia rhinopetala*	Sterculiaceae	-	-	-	-	8
60	*Strombosia pustulata*	Olacaceae	-	-	-	-	72±24
61	*Tectona grandis*	Verbenaceae	288 ± 32	152± 24	200±24	72±24	-
62	*Terminalia superba*	Combretaceae	-	-	-	-	8
63	*Trichilia prieuriaria*	Meliaceae	-	-	-	-	24
64	*Uvaria chamae*	Annonaceae	-	-	8	-	-
65	*Vernonia amygdalina*	Asteraceae	8	-	8	56±24	-
	Total		432	832	1176	664	1392

* ± Standard Error.

Comparison of Vegetation Variables of the Five Study Sites.

The comparative analysis of the vegetation parameters which include, density per hectare, mean GBH, mean height, most abundant family, most abundant species, habit, Shannon-Weiner index of diversity, index of species richness, basal area, Sorenson index of similarity is presented in Table 2. There was considerable variation in the plant species composition and abundance in all the five study sites. The most abundant plant species encountered in Aponmu *Taungya* agroforest and in natural regrowth forest was the *Cola gigantea* and in Idanre, Owo and Ore (*Taungya* agroforests) *Rauvolfia vomitoria*, *Ficus exasperata* and *Vernonia amygdalina* were the most abundant plant species encountered. The most abundant family encountered in Aponmu *Taungya* agroforest was the family Verbenaceae and in Idanre, Owo and Ore (*Taungya* agroforests) the family Euphorbiaceae was the most abundant family encountered, while the most abundant family encountered in Natural regrowth forest was the family Sterculiaceae. The species diversity index was found to be highest in Natural regrowth forest (H^1 = 3.43), low in Aponmu *Taungya* site (H^1 = 1.27). The assessment of similarity between the five study sites using Sorenson's index of similarity (Table 3) showed that, Idanre and Ore *Taungya* sites had the highest similarity (90.5 %) closely followed by Owo and Ore *Taungya* sites (90.1 %). The lowest similarity was found between Ore *Taungya* site and Natural regrowth forest (1.4 %) while Aponmu and Idanre *Taungya* sites had (80.0 %), Idanre and Owo *Taungya* sites (87.5 %), Aponmu *Taungya* and Natural regrowth forest sites (21.5%), Ore and Aponmu *Taungya* sites (75.8 %), Owo and Aponmu *Taungya* sites (77.8 %), Owo *Taungya* and Natural regrowth forest sites (20.4%), Ore *Taungya* and Natural regrowth forest sites (10.51%). Highest species density of 1488 plants $ha^{-1}$was encountered in the natural forest site while the lowest species density of 432 plants ha^{-1} was encountered in Aponmu *Taungya* sites. The comparison in terms of the basal area revealed that Natural regrowth forest had the highest basal area (25.89 m^2 ha^{-1}) and Ore *Taungya* agroforest had the lowest basal area (1.67 m^2 ha^{-1}). The composition of plants in terms of their habit also revealed that Natural regrowth forest had the largest tree species (1176 ha^{-1}) while Ore Taungya had the lowest (334 ha^{-1}). Owo *Taungya* agroforest site, had the largest shrub species (648 ha^{-1}) and Aponmu *Taungya* agroforest site, had the lowest shrub species (80 ha^{-1}). Owo *Taungya* agroforest also had the largest perennial herb species (224 ha^{-1}) and Natural regrowth forest had the lowest (0 ha^{-1}). Scrambling shrubs were not present in all the sites except in Natural regrowth forest and Idanre *Taungya* agroforest where three and one species per hectare of scrambling shrubs were encountered respectively. The natural regrowth forest had a dense growth of trees and climbers than the *Taungya* agroforest sites. Epiphytes were not present in all the sites except in Owo and Idanre *Taungya* agroforests where eight species per hectare of epiphytes was encountered (Table 2).

Table 2. Summary of the vegetation comparing the five study sites

SPECIES VARIABLES	APONMU	IDANRE	OWO	ORE	NATURAL REGROWTH FOREST	TOTAL
Number of family	9	10	11	7	28	62
Number of species	11	11	19	8	54	98
Density (ha^{-1})	432	848	1192	664	1488	4624
Mean basal area	10.44	3.23	9.07	1.67	25.89	50.29
Total mean GBH	234.6	120.5	414.97	80.83	1241.1	2029
Total mean height	53.3	37.7	81.3	37.18	405.3	614.78
Most abundant family	Verbenaceae	Euphorbiaceae	Euphorbiaceae	Euphorbiaceae	Sterculiaceae	
Most abundant native woody species	*Cola gigantea*	*Rauvolfia vomitoria*	*Ficus exasperate*	*Vernonia amygdalina*	*Cola gigantea*	
HABIT DESCRIPTION						TOTAL
Tree	334	168	312	112	1176	2112
Shrub	80	560	648	424	192	1904
Perennial herb	8	96	224	128	0	456
Scrambling shrub	0	8	0	0	24	32
Epiphyte	0	8	8	0	0	16
Climber	0	8	0	0	96	104
Shannon-Weiner	1.26623	1.49451	1.58448	1.42582	3.4326	

Table 3: Sorenson Species Index of Similarity (%)

SITES	Aponmu	Idanre	Owo	Ore	Natural Regrowth Forest
Aponmu	-	-	-	-	-
Idanre	80.0	-	-	-	-
Owo	77.8	87.5	-	-	-
Ore	75.8	90.5	90.1	-	-
Natural Regrowth Forest	21.5	1.4	20.4	10.51	-

Soil Parameters

(a) Particle size distribution

Owo *Taungya* agroforest site had the highest sand content (70 % and 69 %) at both 0-15 cm and 15-30 cm depths respectively and *Taungya* agroforest at Aponmu site had the lowest sand (46 % and 45 %). These values were significantly different ($P < 0.05$). The sand fraction is also significantly higher than silt and clay in all the sites (Table 4). The textural classification revealed that the soil of all the study sites at 0-15 cm were sandy clay loam except the *Taungya* agroforest in Owo site which was loam sand while at 15-30 cm all the five study sites were sandy clay loam.

Table 4: Particle size distribution of the soil in all the sites under consideration

	0-15 cm depth				15-30 cm depth			
Land use type	Sand %	Silt %	Clay %	Textural Class	Sand %	Silt %	Clay %	Textural Class
Natural regrowth forest (NRF)	64^{d}	21^{c}	15^{b}	Sandy clay loam	62^{c}	20^{c}	19^{c}	Sandy clay loam
Taungya Agroforest Idanre (TID)	52^{b}	17^{b}	31^{d}	Sandy clay loam	50^{b}	18^{b}	20^{c}	Sandy clay loam
Taungya Agroforest Ore (TOR)	62^{c}	15^{a}	23^{c}	Sandy clay loam	61^{c}	16^{a}	24^{d}	Sandy clay loam
Taungya Agroforest Owo (TOW)	70^{e}	19^{bc}	11^{a}	Loam sand	69^{d}	20^{c}	10^{a}	Sandy clay loam
Taungya Agroforest Aponmu (TAP)	46^{a}	39^{d}	15^{b}	Sandy clay loam	45^{a}	40^{d}	16^{b}	Sandy clay loam

*Values followed by the same letter in the same column are not significantly different at $P < 0.05$ Level according to Duncan multiple range test.

(b) Soil pH

Aponmu *Taungya* agroforest site had the highest pH value (7.1) at 0-15 cm, closely followed by Owo *Taungya* agroforest site (7.0) while the Ore Taungya agroforest site had the lowest pH value (5.3). The *Taungya* agroforests at Aponmu and Owo sites were significantly higher ($P < 0.05$) than other three sites (Table 5). The two sites also had the highest pH value (7.0) at 15-30 cm while Ore *Taungya* agroforest site had the lowest pH value (4.0). *Taungya* agroforest Aponmu and *Taungya* agroforest Owo sites were also significantly higher ($P < 0.05$) than other three sites (Table 6).

(c) Water holding capacity

Aponmu *Taungya* agroforest site had the highest water holding capacity value (57.0) at 0-15 cm and Ore *Taungya* agroforest site had the lowest water holding capacity value (42.0). *Taungya* agroforest Aponmu site was significantly higher at ($P < 0.05$) than other four sites (Table 5). Aponmu *Taungya* agroforest site also had the highest water holding capacity value (58.0) at 15-30 cm and Ore *Taungya* agroforest site had the lowest water holding capacity (44.0). The water holding capacity of the soil in Aponmu *Taungya* agroforest site was also significantly higher ($P < 0.05$) than other four sites (Table 6).

(d) Organic matter content

Ore *Taungya* agroforest site had the highest organic matter content (4.28) at 0-15 cm while Owo *Taungya* agroforest site had the lowest organic matter content (2.95). Ore *Taungya* agroforest site was significantly higher ($P < 0.05$) than other four sites (Table 5). Ore *Taungya* agroforest site also had the highest organic matter content (4.23) at 15-30 cm and Owo *Taungya* agroforest site had the lowest organic matter content (1.21). Ore *Taungya* agroforest site was also significantly higher ($P < 0.05$) than other four sites (Table 6).

Table 5: Chemical characteristics of the top soil at 0-15 cm in the entire site under consideration

Land use type	pH	WHC %	Om g/kg	OC g/kg	TN g/kg	P mg/kg	Ca cmol/kg	Mg cmol/kg	K cmol/kg	Na cmol/kg	EA cmol/kg
NRF	6.2^{c}	48.5^{c}	3.82^{c}	2.22^{c}	0.166^{d}	7.93^{a}	4.63^{c}	0.7^{d}	0.29^{b}	0.2^{a}	0.7^{c}
TID	5.7^{b}	48.3^{c}	3.56^{b}	2.07^{b}	0.158^{c}	13.99^{d}	3.13^{a}	0.5^{c}	0.19^{a}	0.17^{b}	0.4^{b}
TOR	5.3^{a}	42^{a}	4.28^{d}	2.46^{d}	0.201^{e}	9.33^{c}	4.0^{b}	0.4^{bc}	0.21^{a}	0.16^{c}	0.15^{a}
TOW	7^{d}	46.6^{b}	2.95^{a}	1.72^{a}	0.142^{a}	9.56^{c}	4.63^{c}	0.3^{a}	0.2^{a}	0.16^{c}	0.3^{ab}
TAP	7.1^{d}	57.0^{d}	3.56^{b}	2.07^{b}	0.151^{b}	8.86^{b}	6.0^{d}	0.3^{a}	0.31^{c}	0.16^{c}	0.25^{a}

*Values followed by the same letter in the same column are not significantly different at $P < 0.05$ according to Duncan multiple range test.
TAP (SITE A): Taungya Agroforest Aponmu
TID (SITE B): Taungya Agroforest Idanre
TOW (SITE C): Taungya Agroforest Owo
TOR (SITE D): Taungya Agroforest Ore
NRF (SITE E): Natural regrowth forest

Table 6: Chemical characteristics of sub soil at 15-30 cm in the entire site under consideration

Land use type	pH	WHC %	Om g/kg	OC g/kg	TN g/kg	P mg/kg	Ca cmol/kg	Mg cmol/kg	K cmol/kg	Na cmol/kg	EA cmol/kg
NRF	6.0^{c}	48.8^{c}	2.15^{b}	1.25^{a}	0.093^{b}	10.73^{b}	3.50^{c}	0.5^{b}	0.17^{c}	0.18^{c}	0.6^{d}
TID	4.7^{b}	50.0^{b}	2.63^{c}	1.52^{b}	0.119^{d}	14.92^{d}	1.88^{a}	0.5^{b}	0.16^{bc}	0.16^{b}	0.4^{c}
TOR	4.0^{a}	44.0^{a}	4.23^{d}	2.46^{d}	0.192^{e}	15.39^{e}	3.25^{b}	0.6^{c}	0.15^{b}	0.16^{b}	0.3^{b}
TOW	7.0^{d}	49.7^{b}	1.21^{a}	1.70^{c}	0.061^{a}	12.59^{c}	3.25^{b}	0.4^{a}	0.13^{a}	0.16^{b}	0.2^{a}
TAP	7.0^{d}	58.0^{d}	2.15^{b}	1.25^{a}	0.11^{c}	8.63^{a}	4.38^{d}	0.9^{d}	0.24^{d}	0.13^{a}	0.3^{b}

*Values followed by the same letter in the same column are not significantly different at P value of 5% Level according to Duncan multiple range test.

Legend
TAP (SITE A): Taungya Agroforest in Aponmu
TID (SITE B): Taungya Agroforest in Idanre
TOW (SITE C): Taungya Agroforest in Owo
TOR (SITE D): Taungya Agroforest in Ore
NRF (SITE E): Natural regrowth forest

IV. Discussion

Floristic Composition

Studies on the floristic composition and structure are instrumental in sustainability of forest since they play a major role in the conservation of plant species and in management of ecosystem as a whole (Tilman 1988; Ssegawa and Nkuutu, 2006). Measurement of species diversity is an indicator that helps to determine the well being of an ecological system (Magurran, 1988). Shannon-Weiner index of species diversity indices recorded, revealed that natural regrowth forest had the highest index (3.43), coupled with highest number of individual species (54) and families (28). The value of Shannon-Weiner index (H) of diversity is normally found to fall between 1.5 and 3.5, if the value is close to five it implies high diversity of a particular species (Michael, 1984; Mittermeier *et al*., 1998). Comparatively, Owo agroforest site had the highest species diversity index (1.58) among the *taungya* sites, closely followed by Idanre (1.49) and Ore (1.43), while the least was Aponmu agroforest site (1.27). The implication of this is that the natural regrowth forest is more diverse, than all the *taungya* sites investigated. Generally in terms of plant species density in all the sites examined there is variation in the plant species distribution. The result of the study revealed that natural regrowth forest had the highest native woody plant species density, when compared with the agroforest sites.

The density of the native woody species (Trees and Shrubs) varied considerably in the different sites under consideration; the shrubs were significantly high in most of the *Taungya* sites compared to the natural regrowth forest. Perennial herbs were encountered in the four *Taungya* agroforest sites, but completely absent in the Natural regrowth forest. This was in agreement with White (1983) who noted that, in a forest the ground layer is often sparse or absent; grasses are absent and if present are localized or inconspicuous. Scrambling shrubs were only present in both natural regrowth forest and Idanre *Taungya* agroforest site. The natural regrowth forest had a dense growth of trees and climbers than the *Taungya* agroforest sites. Continuous clearing of vegetation for arable and tree crops had caused reduction in plant diversity in the *Taungya* agroforest sites because it reduces the regeneration of woody trees and climbers. The most abundant native plant species encountered in Aponmu Taungya agroforest site was *Cola gigantea*, while other economic species such as *Albizia adanthifolia*, *Antiaris toxicaria*, *Lecaniodescus cupanioides* and *Blighia sapida* were also present but in smaller numbers. This supports the position of Michon and de Foresta (1995) that agroforests help to conserve biodiversity and this is the assurance of agroforest production and reproducibility. The success recorded in Aponmu *Taungya* agroforest site was also enhanced by effective monitoring of the forest by the forest officers, due to the proximity of the forest to the state capital. In all the *Taungya* agroforest sites examined, *Tectona grandis* were the dominant species encountered and this corroborates Adekunle and Bakare (2004) who reported that the only species most of the respondents in Ondo State are willing to plant is *Tectona grandis* since, it is a fast growing exotic species with commercial and timber values, and this indicated that Teak plantation strive well when it is planted with food crops on the same site. In Idanre, Owo and Ore *Taungya* agroforest sites, agricultural crops such as *Manihot esculentum w*as the most abundant plant species encountered this is because farmers are more interested in their agricultural crops rather than the government owned trees and native woody species. This corroborates Michon and de Foresta (1991) that simple agroforestry (i.e *Taungya* agroforests) is often dominated by agricultural crops like maize, cassava, rice, cocoa, coffee, and hence are of more interest to the agriculturists. *Manihot* spp happens to be the most planted agricultural crop in these areas due to its high yield and demand for *Manihot* products such as Gari, Fufu and others. The most abundant tree species encountered in the Natural regrowth forest were tree species (*Cola gigantea*, *Funtumia elastica*, *Diospyros species)* in *Sterculiaceae*, *Apocynaceae* and *Ebenaceae* families. These three families were among the most abundant families encountered by Adekunle (2006) in Shasha forest reserve that fall within lowland rainforest ecosystem of Nigeria, just like the sites investigated here. *Cola gigantea* and *Funtumia elastica* have characteristics for conspicuous seed and easy dispersal by wind. This must have enhanced their spread in the areas investigated.

Overall result for the girth size distribution showed that natural regrowth forest had the highest number of woody species per hectare in the largest girth size (81 cm and above) and followed by Aponmu *taungya* agroforestry site. The other three (3) agroforestry sites had no woody species in the largest girth size. The implication of this is that most of the big trees might have been selectively removed by the farmers which are evidenced by the presence of many plants in the small girth sizes dominated by non-timber species. This is an indication that the original vegetation of the study sites might have been altered by some illegal activities of forest utilization and it also shows that the trees are generally immature and far below stipulated minimum girth approved for exploitation by law. It is also an indication that the forest plots are degraded.

Sorenson's index of similarity however revealed that the *taungya* sites were not significantly different from one another. This may be due to the fact that they were all established in the same year, and they had the same tree-crop combination. However, they were significantly different from the Natural regrowth forest site. This may be attributed to the intentional removal of other plant species considered to be weeds by the farmers, since they were only paying attention to the native woody species rather than their arable crops.

Soil Properties

The species composition can have significant effect on soil physical properties, which in turn can reflect the soil fertility of a given area. The particle size distribution of the soil in all the sites under consideration revealed that the soils were sandy clay loam in all the sites at both depths except Owo *Taungya* site which was loam sand at 0-15 cm. This agrees with Oloyede (2008) that depending upon the pre-existing soil conditions, tree species, rate of growth, time since establishment and plantations on agricultural land have the

potential to change soil properties, either positively or negatively or many have no effect at all.

The chemical properties of the soil in all the sites under consideration showed that, the pH in all the sites examined ranged from slightly acidic to neutral (6.0 - 7.1) and therefore good for plant growth and development. Although soil pH is often considered as the master variable of soil, its importance in nutrition management cannot be understated. The soil pH is comparatively higher in Aponmu and Owo sites compared to the other three sites. This may be due to leaching of the base elements. Juo and Manu (1996) found that growing vegetation tend to decrease soil pH, with low nutrient stocks. Brandy and Weil (1999) have reported that soil pH is strongly influenced by the nature of the vegetation and the amount of organic matter in the soil especially in the tropical environment. Natural regrowth forest had the highest exchangeable acidity value, coupled with highest sodium and magnesium content at both 0-15 cm and 15-30 cm soil depth compared to the other agroforest sites. This might not be unconnected with the fact that *Tectona grandis* is not a nitrogen fixing tree and instead demand for available nutrients competitively with the planted crops. It is reported that these variation in acidity may be explained from differences in the degree of neutralization of the soil exchange complex (Rhoades and Binkley, 1996). Significantly higher values of organic matter coupled with organic carbon and total nitrogen were recorded in Ore agroforest site and relatively low in Owo *taungya* site at both soil layers compared to other sites. This observation could be attributed to the role of agroforest inconsistent addition of organic matter to the soil through dead and decaying roots. Available phosphorus was significantly higher in Idanre and Ore at both soil surface layers compared to the other sites. This might not be unconnected with the presence of phosphorus fixing species such as *Alchornea cordifolia* in these two sites. This is in conformity with the reports of Kang *et al.* (1984) that some species such as *Alchornea cordifolia* and *Gliricidia sepium* have high phosphorus content and have the potential of fixing phosphorus when present in the soil. Water holding capacity was significantly low in Ore *taungya* site compared to the other sites at both soil layers. This might be as a result of the textural class which are not significantly different in both depths coupled with high organic matter. Overall, the result of soil properties in all the sites examined showed that there is significant difference between the Natural regrowth forest and the four *taungya* agroforest sites.

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Enhancing Communication Skills through Mini Projects in Engineering Education Using Audio-Visual Aids -A Study

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Abstract- "What you learn today determines what you become tomorrow"- Anonymous

English has gained the status of an international language, with its intercontinental proliferation. In the present context of teaching English to engineering students it was observed that students have basic communication skills. However, these skills are inadequate to meet the changing educational trends. To get an edge over the competitors, students are left with hardly any choice but to add values to their communication skills to exhibit their true potential. But the importance to these communication skills at times are downplayed in engineering programmes in favour of an over emphasis on the technical skills.

This attitude and practice can be dwindled with the help of audio and visual aids.

As ***Lenin*** quote:

"Theory without practice is impotent.
Practice without theory is blind."

This paper is an attempt to explore the various possibilities of developing competence in English language learning. It focuses on how audio and visual aids like English music, animated English movies, news paper articles, advertisements, and English conversations serves as the important inputs in the context of teaching English as a second language. An attempt has also been made in this study by designing the **mini projects** which are intrinsically motivating and compatible with a learner-centered educational philosophy.

Index Terms- Audio-visual aids, Communication Skills, Engineering education, Mini projects, Activities.

I. Introduction

English is an important tool for today's international communication. With its global spread, English has gained the status of an international language. The demands of the 21st century calls for the abilities to think critically, listen, speak, collaborate and communicate effectively (ASCD, 2008 *Association for Supervision and Curriculum Development*). In the present scenario of engineering education, students developed and enhanced basic communication skills like reading, writing, speaking and listening. These skills build a necessary foundation that influences and shapes the types of engineers. But with the changing educational trends, availability of qualified personnel, the competition for job acquisition and job sustainability is becoming more strenuous. To get an edge over the competitors, students are left with hardly any choice but to add values to their communication skills to exhibit their true potential. But the importance to these communication skills at times are downplayed in engineering programmes in favour of an over emphasis on the technical skills.

This attitude and practice can be dwindled gradually with the help of modern audio -visual aids like English music, animated English movies, news paper articles, advertisements, English conversations both in audio and video and so on, which serves as the important inputs in the context of teaching/learning English as a second language. This motivates the students to absorb the body language, voice modulation, vocabulary from the audio and video source of information effectively. An attempt has also been made in this paper by designing the **mini projects** which are intrinsically motivating and compatible with a learner-centered educational philosophy.

II. Rationale for the Study/Context of the Study

According to Kozma (1994) learning is an active, constructive, cognitive and social process by which the learner strategically manages available cognitive, physical, and social resources to create new knowledge by interacting with information in the environment and integrating it with information already in memory. Audio –Visual based educational system today provides an opportunity to coordinate multiple possibilities for influencing the way information is presented and processed like improvement in self-concept , mastery of basic skills, student-centered learning and engagement in the learning process, more active processing resulting in higher-order thinking skills and better recall, gain confidence in directing their own learning. It has been largely observed that listening, speaking, reading and writing skills are not exploited optimally to meet the current market demands of the professionals arising in various jobs related settings. It is also observed that students appearing for various competitive exams such as IELTS, TOEFL, etc despite making common errors exhibit certain

typical, speech habits, expressions, mannerisms owing to dialectical influences of their respective regions. Hence, the present study proposes to fill in the gaps by equipping the students with all the necessary skills, catering to the professional needs.

III. PROBLEMS IN THE CURRENT SCENARIO IN TEACHING ENGLISH

Since traditional educational methods and tools, such as chalkboard lectures and textbooks do not satisfy some of the needs of the students. Research in second language in the teaching/learning over the decades has proved that integration of LSRW develops the proficiency of L2 learners. Hence the revised JNTUH-Andhra Pradesh syllabus aims to improve the language proficiency of the students in English with an emphasis on LSRW skills. It aims to equip the students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions and be able to mark stress and recognize and use the right intonation in sentences and also aims to develop an awareness in the students about the significance of screen reading and enables them to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc. It also aims to develop speaking skills through speaking activities along with writing exercises, but largely it is observed that most of the English classes do not pay conscious attention to these skills equally because most often these activities are confined to the text due to

- Institutional constraints related to infrastructure, and timely completion of syllabus.
- Teachers' limited awareness in bringing authentic texts to enhance effective listening
- Socio economic background of the students etc.

Teaching English in the present scenario is a challenge that demands both the teacher's and the learner's attention. Since, it plays a critical role not only in communication, but also in the acquisition of language. Therefore, it is necessary for teachers to weave these activities into the curriculum to create a balance that mirrors the real-world integration of listening with speaking, reading, and writing.

IV. OBJECTIVES OF THE STUDY

- How speaking can be practiced with the help of audio-visual aids by introducing the learner to the native speakers accent, intonation ,rhythm etc;
- How a reading text can be exploited using audio-visual aids /multimedia in improving learners L2 proficiency.
- To expose the learners to genre specific texts.
- To suggest some of the tasks and mini projects designed with the help of multimedia authentic texts to improve the learners' L2 proficiency.
- To expose the learners to micro –macro level listening exercises to enhance comprehension and develop other listening skills and writing skills in the form of exercises.

V. AUDIO –VISUAL BASED EDUCATIONAL SYSTEM

The teaching profession is filled with countless opportunities to enrich the academic lives of students. While some concepts and educational objectives will be easy for students to grasp, others will require thinking creatively to ensure that important learning objectives are met. Using audio/visual aids in teaching, is one way to enhance lesson plans and give students additional ways to process subject information. **"A picture is worth a thousand words"**.

Audio-visual technology has an important role to play in the modern classroom. Teachers can annotate on the images shown on the screen or the board, zoom in and out, get different views and angles and capture still shots with the help of the visual aids in teaching. Schooling the students with audio-visual aids is essential in the technological age. Teachers must use various types of audio-visual aids to interact with students. The teacher has to identify the key points of the contents so that student can retain the information easily without any confusion. Thus, audio-visual aids in teaching boost school, colleges and universities to enhance teaching methodology.

Audiovisual aids are defined as any device used to aid in the communication of an idea. From this definition, virtually anything can be used as an aid, providing it successfully communicates the idea or information for which it is designed. Even though early aids, such as maps and drawings, are still in use, advances in the audiovisual field have opened up new methods of presenting these aids, such as videotapes and multimedia equipment which allow more professional and entertaining presentations to be presented.

According to the current research, the more sensory modes in which mental representation is stored, the more likely they will be remembered (Borsook. Higginbotham &Wheat, 1992) Bagget (1989) posits that images are stored in memory. These images contain more information because they have more cognitive pegs that can be used to make associative and referential connections between visual representations and information held in long term memory. The use of audio-visual aids has always been an integral part of education from traditional devices to modern technological devices like movies, radio, tape-recorders and television.

Audio-visual aids in the classroom can enhance teaching methods and improve student comprehension. Auditory learners focus more on the spoken word rather than the written one. Taped recordings of lectures or movies are helpful to auditory learners because they pick up on speech nuances such as tone and pitch. Today's technology offers many choices to the informed educator who wishes to capitalize on a new generation's appetite for multimedia presentations.

There are numerous web sites on the **World Wide Web** that have been created specifically for ESL/EFL learners as well as for native speakers of English. There are

- websites provides interactive quizzes on Grammar, Vocabulary designed for basic, intermediate and advanced level students.

- websites provides interactive quizzes on Current News, Geography, Grammar, History, Idioms, Slang, Words, People, Reading Comprehension, Science, Vocabulary, World Culture, and Writing.
- websites for the selection of English reading comprehension exercises, many of which are based on ESL examination questions including Cambridge ESOL, TOEFL, IELTS and other major exams for the beginner, intermediate or advanced level students.
- provides online grammar exercises, vocabulary videos, pronunciation, quizzes for beginners, intermediate & advanced level English Learners.
- Websites for Video and audio resources for learning English.
- websites to teach English through English movies like Cast Away, Titanic, ELF etc; this site provides movie guides which are available in PDF, HTML and WORD formats with print options.

Below are some of the informative **websites** developed specifically for ESL students. It would be useful for the student as well as the facilitator.
*(Note: (URLs) are subject to change.)

Table: 1 Important websites for ESL learners

BRITISH COUNCIL	**www.learnenglish.british**
NONSTOP ENGLISH	**www.nonstopenglish.com**
EnglishClub 17 YEARS	**www.englishclub.com**
English-Zone.Com	**www.english-zone.com**
English Tutor	**www.rong-chang.com**
english-at-home.com	**www.english-at-home.com**
world-english	**www.world-english.org**
English online www.learn-english-today.com	**www.learn-english-today.com**
ESLnotes.com presents... ...The English Learner Movie Guides	**eslnotes.com/index.html**
ESL Exercises	**www.englishmedialab.com**
UE UsingEnglish.com English Language (ESL) Learning	**www.usingenglish.com**

VI. METHODOLOGY

Over the past decade, views regarding English as a second language instruction have changed significantly. Several previously held assumptions have changed and new methods have emerged for helping learner's proficiency in ESL. There are two types of audio-visual aids. Firstly, Non-Projected Display Materials like

- Chalkboard and Whiteboard
- Flannel board and Magnet board
- Flip board, Charts and Wall-Charts
- Handouts, Posters and Pictorial Materials
- Real objects and Models

Secondly, Projected Display Materials like

- Overhead Projector / Slide Projector
- Tape Recorder /Video Recorder
- DVD/CD player

However, these aids have varying degrees of complexity and more than one type can be combined to create a sophisticated presentation. Generally speaking, the greater the complexity of the audio-visual aid, the more time and effort it will take to prepare. Therefore a variety of factors will need to consider like what are the characteristic features of the aids, how large is the target group of students, how many times will the presentations being staged and so on.

For example **Handouts** is Simple, very easy to use, no audibility/visibility problems, can depict lots of information, lasting reference.

Flipcharts & Whiteboards are - Simple, easy to use, can be pre-prepared; can be annotated via discussion,

Digital Whiteboards are– very flexible, use as a whiteboard, a projection surface for PC presentations, interactive flipchart.

Slide Shows are professional, good at getting attention, retains interest, can have high impact.

OHP – Overhead Projectors are - Very common equipment, easy to use, easy to interact with, can be prepared quickly, transparencies can be stored. **PC/Computer based presentations** are – professional, flexible and impactful, most popular method of presentation, equipment widespread and increasingly affordable.

Audio Tapes are - Very effective in specialist role, inexpensive broadcast equipment.

Videos are - Very high impact, common broadcast equipment.

Multimedia is combined use of modern digital aids to create a powerful and impactful presentation and easy to update.

Physical Models gives- Very high impact, good attention getter, makes a concept tangible.

The audio-visual aids further provide the opportunity for natural integration of the four language skills (reading, writing, speaking, and listening) In fact all the communication skills are interrelated. It is common knowledge that one who listen well can speak well, and one who reads well can write well.

As ***Francis Bacon*** observed,

"Reading maketh a full man, conference a ready man, and writing an exact man.".

VII. MINI PROJECTS

An attempt has been made in this paper to design mini projects which would focus and highlight all the four necessary skills which are intrinsically motivating and compatible with a learner-centered educational philosophy.

I Project with Music: (Duration: Two Weeks)

Procedure:

1. Students are formed into groups. Each student in the group has to select one song.
2. Write the reason for selecting the song in 100 words and write the theme and inner meaning of the song.
3. Write the lyrics of the song (including chorus)
4. Substitute the content/main lyrics with synonyms and rewrite the lyrics of the song (without losing the meaning of the song).
5. **Vocabulary:** Identify parts of speech in the lyrics of your selected song including articles and list them in the given format.

Table 2: Format for Grammar section

Noun	
Pronoun	
Verb	
Adverb	
Adjective	
Preposition	
Conjunction	
Interjection	
Articles	

6. Write the meanings/synonyms and antonyms for difficult words/lyrics in the song.
7. Identify idiomatic phrases/phrasal verbs/homophones in the lyrics of the selected song and list them in the given format.

Table 3: Format for vocabulary section

Idiomatic phrases	
Phrasal verbs	
Homophones	

8. **Speaking Activity:** Assume that you (student) are a band singer, and gather your team members and give the title for your album. Now each one of you assume that you are lyricist and singer of your selected song and release your album by promoting your song individually in front of the press reporters.
9. **Writing Exercise:** Write a letter to your favourite channel requesting to play your album songs in their programmes (Hint: mention name of the programme, duration of the song, timings, and request them to mention the amount they charge for that promos)
10. **Mock Interview:** Assume that your album hit the box office and your favourite channel anchor is interviewing your band .Now enact and write dialogues of your interview. At the end of the interview sing any selected song from your album.

II *Project with News paper: (Duration: Two Weeks)*

Procedure:

1. Select any 5common topics (news like sports, education, celebrity, Health, Politics etc;) from the below mentioned daily news papers and file all the titles with respective photographs.
2. Now write the titles of the selected topic/news and write the content/gist of the news in your own words in the given format.

Table 4: Format for writing

Title of the selected news				Gist
The Times Of India				
The Hindu				
The Indian Express				
The Deccan Chronicle				

3. Now assume that you are the writer and editor of your own firm. Give your title of the selected topic /news and write the article in your own words.

Table 5: Format for writing

My paper:
My Title:
My Article:

4. **Vocabulary**: Identify minimum 10 verbs and 10 adjectives per day and write its meanings and rewrite those identified words in your own sentences
5. **Speaking Activity: News Bulletin:** Assume that you are the news reader in your favourite channel and it is your turn to read news. (Two readers for 1 week)

III *Collage Project: (Duration: Two Weeks)*

Procedure:

1. Select a topic

(Hint: Current social topics like poverty/child labour/traffic/terrorism/ragging…) write the reason for selecting the topic in 100 words.

2. Collect and file the pictures related to the selected topic and arrange them in the chart in an artistic way. **Note:** You can collect and file as many pictures/photographs as you can related to the selected topic, there is no size limit for the collage)
3. Now describe every picture in your own words/give your own title to the picture.
4. Write an imaginary short story for any 10 pictures/photographs.
5. Provide the current statistics/graphs related to your topic.
6. **Speaking Activity:** Assume that you are the member of some committee, present your views in front of the public with the help of your collage by referring to the statistics/graphs with your own possible precautions to control or eradicate the problem.

VIII. LIMITATIONS IN IMPLEMENTING AUDIO – VISUAL BASED EDUCATIONAL SYSTEM

Despite its educational benefits in language learning contexts, a task in itself does not necessarily guarantee its successful implementation unless the teacher, the facilitator and controller of the task performance, understands how tasks actually work in the classroom. More importantly, the teacher, who wants to try implementing **Audio –Visual based educational system** successfully, is required to have sufficient knowledge about the instructional framework related to its plan, procedure, and assessment**.**

But most of the time, teachers believed that this system will give teachers an undue psychological burden as a facilitator and that it would require much more preparation time. Some teachers are reluctant to implement **Audio –Visual based educational system** as their self-perceived inability to use the target.

Most EFL teachers still use the traditional lecture-oriented methods, which they are accustomed to, and more than that, they have the psychological pressure of facing some new disciplinary problems in using this system. In relation to task participants' roles and classroom arrangements, it might be true that EFL teachers have become accustomed to working in teacher-centered classrooms, thus adopting a one-way instruction method rather than two-way interaction.

A major problem that EFL teachers generally face in carrying out this type of approach is how to design appropriate tasks. But a teacher, however, needs to be flexible and dynamic in controlling the language learning environment, because the nature of language learning substantially demands that learners actively participate in language use activities. An attempt should be made to link the classroom language learning with language activation outside the classroom

IX. CONCLUSION

It is anticipated that incorporating **Audio –Visual based educational system** educational techniques relative to conventional educational tools would significantly increase a student's learning curve. It will also improve student's motivation to learn, promotes a deeper level of understanding.
In other words it offers a change from the traditional teaching routines though which many learners have previously failed to communicate.

It encourages learners to experiment with whatever literary pieces they can recall, to try things out without fear of failure, to express themselves with basic fluency and accuracy. Different colleges will use different **Audio –Visual** teaching materials, at the same time, the level of the students' linguistic competence are also different, so the teachers should analyze their courses and their learners, and then design tasks based on their courses and their learners.

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Agripreneurship Development as a Tool to Upliftment of Agriculture

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Abstract- A shift from agriculture to agribusiness is an essential pathway to revitalize Indian agriculture and to make more attractive and profitable venture. Agripreneurship have the potential to contribute to a range of social and economic development such as employment generation, income generation, poverty reduction and improvements in nutrition, health and overall food security in the national economy. Agripreneurship has potential to generate growth, diversifying income, providing widespread employment and entrepreneurial opportunities in rural areas. This paper mainly focused on basic concepts of agripreneurship, entrepreneurship skills, and needs of agripreneurship development in India along with major reason for promoting agripreneurship development in country.

Index Terms- Agripreneurship, Entrepreneurs, Entrepreneurship Skills, Potential areas, Employment Generation, Poverty Reduction and Agribusiness.

I. Introduction

Indian economy is basically agrarian economy. On 2.4 percent of world land India is managing 17.5 percent of world population. At the time of independence, more than half of the national income was contributed by agriculture along with more than 70 percent of total population was dependent on agriculture (Pandey, 2013). Agriculture and allied sectors are considered to be mainstay of the Indian economy because these are important sources of raw materials for industries and they demands for many industrial products particularly fertilizers, pesticides, agriculture implements and a variety of consumer goods (Bairwa *et al*., 2014a). Due to the changing socio, economic, political, environmental and cultural dimensions over the world, farmers' and nations' options for survival and for sustainably ensuring success in changing their respective economic environments has become increasingly critical. It is also worth noting that the emergence of the free market economies globally has resulted in the development of a new spirit of enterprise "Agripreneurship" and the increased individual need for responsibility for running their own businesses (Alex, 2011). Entrepreneurship is connected with finding ways and means to create and develop a profitable farm business. The term The terms, entrepreneurship and agripreneurship are frequently used in the context of education and small business formation in agriculture. Dollinger (2003) defines entrepreneurship in agriculture as the creation of innovative economic organization for the purpose of growth or gain under conditions of risk and uncertainty in agriculture. Gray (2002) on the other hand defines an entrepreneur as an individual who manages a business with the intention of expanding the business and with the leadership and managerial skills necessary for achieving those goals. In the face of growing unemployment and poverty in rural areas and slow growth of agriculture there is need of entrepreneurship in agriculture for more productivity and profitability of agriculture. The Agripreneurship program is necessary to develop entrepreneurs and management workforce to cater agricultural Industry across the world (Bairwa *et al*., 2014b). Agripreneurship is greatly influenced mainly by the economic situation, education and culture (Singh, 2013).

II. Basic Terminology related with Agripreneurship Development

1- Agripreneurs – in general, agripreneurs should be proactive, curious, determined, persistence, visionary, hard working, honest, integrity with strong management and organizational skills. Agripreneurs also known as entrepreneurs. Entrepreneurs may be defined as innovators who drive change in the economy by serving new markets or creating new ways of doing things. Thus, an agripreneurs may be someone who undertakes a variety of activities in agriculture sector in order to be an entrepreneur.

2- Agripreneurship – Agripreneurship is the profitable marriage of agriculture and entrepreneurship. Agripreneurship turn your farm into an agribusiness. The term Agripreneurship is synonym with entrepreneurship in agriculture and refers to agribusiness establishment in agriculture and allied sector.

3- Agriclinics – these are envisaged to provide expert advice and services to farmers on technology, cropping practices, protection from pests and diseases, market trends, prices of various crops in the markets and also clinical services for animal health which would enhance productivity of crops/animals and increased income to farmers (Global Agrisystem, 2010).

4- Agribusiness Centres – these are envisaged to provide farm equipments on hire, sale of inputs and other services.These centres will provide a package of input facilities; consultancy and other services with the aim of strengthen transfer of technology and extension services and also provide self employment opportunities to technically trained persons (Chandra shekara, 2003).

III. Need of Agripreneurship Development

Since the inception of New Economic Reforms, adoption of liberalization, privatization and globalization (LPG) and world trade organization (WTO) in 1992 – 95, it is expected that rural area will grow at par with urban area. Performance of agriculture

during first phase of economic reforms till 1998 remained driving force for this notion among all the spheres of academia, administration and government (Singh, 2013). However, things went on different path in the later years and performance of agriculture has not remained satisfactory. Till recently, agriculture used to be treated as just an activity of land tilling and crop harvesting but growing waste land, depleting natural resources, growing migration by rural youth to urban areas, negative perception of the children of farmers towards farming, and emerging technologies in agriculture have necessitated redesigning of agricultural activities. Applying the thought and practice of entrepreneurship in the field of agriculture generates wide range of economic benefits like – increased agri productivity, creation of new business ventures, new Jobs, innovative products and services, development of rural areas and increased wealth. Traditional farmers who are unaware of scientific agriculture and effective agri management systems are unable to cope up with delaying monsoons, drought, crop debts, fake seeds and shortage of fertilizer, as a result resort to committing suicide. The managerial, technical and innovative skills of entrepreneurship applied in the field of agriculture many yield positive results and a well trained agripreneurs may become a role model to all such disheartened farmers. Sah (2009) state that developing entrepreneurs in agriculture will solve the entire problem like (a) Reduce the burden of agriculture (b) Generate employment opportunities for rural youth (c) Control migration from rural to urban areas (d) Increase national income (e) Support industrial development in rural areas (f) Reduces the pressure on urban cities.

IV. Entrepreneur's qualities and Entrepreneurial Skills for Agripreneurship

Entrepreneurs are those people who exhibit common traits such as single-mindedness, drive, ambition, creative, problem solving, practical, and goal-oriented. An entrepreneur is an individual who recognizes an opportunity or unmet need and takes the risk to pursue it. He needs to develop these abilities, managing productivity and seeking out new markets (Singh, 2013). Personal qualities of an agri-entrepreneur significantly affect the agribusiness (Brockhaus and Horwitz, 1986; Nandram and Samson, 2000). Self criticism, leadership, market orientation and creativity are important for successful entrepreneurship development.

Entrepreneurship skills are considered to be those competencies required to accomplish tasks and activities related to the farm business. These can be developed by learning and experience. Hanf and Muller (1997) suggest that in a dynamic environment with fast technical progress, open minded farm entrepreneurs will recognise more problems than they are able to rationally solve. Man *et al*., (2002) categorized entrepreneurial competences in six key areas which includes opportunity recognition skills, relationship building, Organizing, Strategic competences, conceptual thinking and problem solving skills. Lauweres (2002) study of weaknesses in entrepreneurship and selected seven critical success factors which are management and strategic planning, knowledge of the ecosystem, capable and professional staff, understanding of the value chain perspective, craftsmanship, ability to learn and seek opportunity and enterprising personal characteristics. Thus, management skills are the complete package of skills that a farmer would use in order to develop the farm business. Kallio and Kola (1999) in a study of farmers in Finland attempted to determine what factors gave farmers competitive advantage over other farmers suggest that there are seven characteristics of a successful farm and farmer (1) profitable production seemed to be associated with continuous evaluation of production, incomes and expenditures (2) constant development of cognitive and professional skills i.e. Continual Professional Development (CPD) (3)They benefit from a positive work ethic (4) goal-oriented operation, i.e., the ability to set goals, to reach them and to set new ones (5) utilization of recent information that is relevant for the individual farmer's own circumstances and the needs of the farm (6) favourable starting points for the enterprise, meaning good condition of machinery, buildings, land and an appropriate balance between pricing of product and investments in production (7) cooperation with others in the supply chain. Schiebel (2002) reported that successful farmers differ from others in terms of three personality traits. They have more belief in their ability to control events, problem-solving abilities and social initiative. Agripreneurs is a dynamic business manager performing various agri based activities using different resources viz. physical resources, financial resources, human resources and information, in order to accomplish a certain goal.

V. Major Reasons for Promoting Agripreneurship in India

In India, 52% of total land is cultivable as against 11% in the world. All 15 major climates of the world, snow bound Himalayas to hot humid southern peninsula; Thar desert to heavy rain areas all exist in India. There are 20 agro-climatic regions and nearly 46 out of 60 soil types in the country. Sunshine hours and day length are ideally suited for round the year cultivation of crops. India is the centre for biodiversity in plants, animals, insects, micro-organism and accounts for 17% animal, 12% plants and 10% fish genetic resources of the globe. In the live stock sector, India has 16% of cattle, 57% of buffalo, 17% of goats and 5 % of sheep population of the world. Agriculture contributes 13.2% to GDP, 15.2% of total exports and provides employment to 58.4% of country's work force (Mittal, 2009).

Agriculture remains a key sector of the Indian economy accounting for 13.2 per cent share in the gross domestic product (GDP) and about 13 per cent of the total export earnings. India is the second largest producer of rice and wheat in the world; first in pulses and fourth in coarse grains. India is also one of the largest producers of cotton, sugar, sugarcane, peanuts, jute, tea and an assortment of spices. In terms of the real value added, the Indian agriculture sector ranks third, after China and the United States. The share of agriculture in the total value added to the economy, at around 13.2 per cent, is still quite high. This implies that agriculture is likely to remain a priority, both for policy makers as well as businesses, in the foreseeable future and any move to ramp up the sector calls for a multi-pronged strategy. In recent years, there has been a considerable emphasis on crop diversification towards horticulture (fruits, vegetables, ornamental crops, medicinal & aromatic plants and spices), plantation crops (coconut, cashew nuts and cocoa) and allied

activities. Creation of critical infrastructure for cold storage, refrigerated transportation, rapid transit, grading, processing, packaging and quality control measures open major opportunities for investment. India is second highest fruit and vegetable producer in the world (134.5 million tons) with cold storage facilities available only for 10% of the produce. We are second highest producer of milk with a cold storage capacity of 70,000 tonne and sixth largest producer of fish with harvesting volumes of 5.2 million tones. India is fifth largest producer of eggs in the world. Investments in cold chain required storing 20% of surplus of meat and poultry products during 10th plan require Rs 500 Crores (Sah, 2009). Thus, Indian agriculture need to convert in agribusiness due to above mentioned reasons which only possible through agripreneurship development.

VI. Role of Agripreneurship in National Economy

Agripreneurship plays various roles in the growth and development of national economy through entrepreneurship development which increases the income level and employment opportunities in rural as well as urban areas (Bairwa *et al*., 2012). Agripreneurship also play following role in the economic system (Sah, 2009).

- ☞ It helps in inducing productivity gains by smallholder farmers and integrating them into local, national and international markets.
- ☞ It helps in reducing food costs, supply uncertainties and improving the diets of the rural and urban poor in the country.
- ☞ It also generating growth, increasing and diversifying income, and providing entrepreneurial opportunities in both rural and urban areas.

VII. Possible Areas of Entrepreneurship Development in Agriculture

Nowadays, Easy access to technology, emergence of micro financing, liberalized government rules, awareness and training programmes on agri and allied sectors and finally changing mindset of the highly qualified people to go for self employment in the field of agriculture have contributed significantly in enhancing the potentiality for agripreneuership in India (Bairwa *et al*., 2014). Agriculture have several areas of entrepreneurship which include the activities like, Dairying, Sericulture, Goat rearing, Rabbit rearing, Floriculture, Fisheries, Shrimp Farming, Sheep rearing, vegetable cultivation, nursery farming, farm forestry(Pandey, 2013). The possible areas of entrepreneurship in agriculture are:-

1- Agro produce processing units – There units do not manufacture any new product. They merely process the agriculture produce e.g. Rice mills, Dal mills, decorticating mills etc.
2- Agro Produce manufacturing units – These units produce entirely new products based on the agricultural produce as the main raw material. E.g.-Sugar factories, Bakery, Straw board units etc.
3- Agro-inputs manufacturing units – These units produce goods either for mechanization of agriculture on for increasing manufacturing plants, e.g.-Fertilizer production units food processing units, agricultural implements etc.
4- Agro service centres –These include the workshops and service centre for repairing and serving the agricultural implement used in agriculture.
5- Miscellaneous areas – besides the above mentioned areas, the following areas may prove to be encouraging to establish agri enterprises such as setting up of Apiaries ,feed processing units, seed processing units, mushroom production units, commercial vermin-compose units, goat rearing farmers club, organic vegetable and fruits retail outlet, bamboo plantation and jatropha cultivation.

VIII. Conclusion

Agripreneurship is the need of hours to make agriculture a more attractive and profitable venture. It is clear that there is a great scope for entrepreneurship in agriculture and this potentiality can be tapped only by effective management of agri elements such as – soil, seed, water and market needs. An individual with risk bearing capacity and a quest for latest knowledge in agriculture sector can prove to be a right agripreneurs. The agriculture sector has a large potential to contribute to the national income while at the same time providing direct employment and income to the numerically larger and vulnerable section of the society. Agripreneurship is not only an opportunity but also a necessity for improving the production and profitability in agriculture and allied sector.

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LOW-POWER AND LOW-AREA ADAPTIVE FIR FILTER BASED ON DISTRIBUTED ARITHMETIC AND LMS ALGORITHM

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Abstract- In this manuscript, an unusual adaptive FIR filter using distributed arithmetic (DA) for area efficient design is implemented. DA is bit-serial computational action and uses parallel look-up table (LUTs) apprise and equivalent implementation of filtering and weight-update operations to appliance high throughput filter rates irrespective of the filter length. The full adder based conditional signed carry save accumulation for DA-based inner product computation is swapped and design by using 10 transistor full adder based carry save accumulation of shift accumulation, with the intention of the proposed design, it can reduce the area complexity and power consumption. The least-mean-square (LMS) algorithm adaptation is functioned to update the weight and abate the mean square error between the assessed and chosen output. The weight increment block based adder/subtractor cells is exchanged by carry save adder in order to reduce area difficulty. It comprises of multiplexors, smaller LUT, and practically half the number of adders contrasted to the present DA-based design.

***Index Terms*:** Adaptive Filter, Distributed Arithmetic (DA), Finite Impulse Response (FIR), Least Mean Square (LMS) Algorithm, Lookup table (LUT).

I. INTRODUCTION

Adaptive filters find extensive use in many signal processing applications such as channel equalization, echo cancellation, noise cancellation [1]. The finite impulse response (FIR) filters whose weights are updated by the famous Widrow-Hoff least mean square (LMS) algorithm is the most popularly used adaptive filter not only due to its simplicity but also due to its satisfactory convergence performance [5]. The direct form configuration on the onward path of the FIR filter results in a long critical path due to an inner product computation to obtain a filter output. Consequently, it is required to reduce the critical path of the structure if the input signal has high sampling rate. By reducing the
critical path of the structure, thereby, the critical path could not exceed the sampling period.

Distributed arithmetic (DA) is so named because it performed arithmetic operation. DA is bit serial computation in nature and it eliminates the need for hardware multipliers and is capable of implementing large order filters with very high throughput. A lot of study has been done to implement the DA based adaptive FIR filter for area efficient design, the multiplier-less distributed arithmetic (DA) based technique has achieved plenteous popularity for its high throughput, but it results are increased in cost-effective, area and time efficient computing structures [8]. DA based hardware efficient adaptive FIR filter inner product has been suggested by Allred *et al.* [2] using two separate lookup tables (LUTs) Filtering lookup table and Auxiliary lookup table for filtering and weight updating module. Later, Guo and DeBrunner [3], [4] have improved the design structure in [2] by using only one lookup table instead of two LUTs for both filter and weight updating module. On the other hand, the design process in [2], [3], [4] and [8] require more cycles for lookup table (LUT) update for each new sample, hence it do not support high sampling rate. Meher and Park have improved the design with low adaptation delay for high speed DA based adaptive filter [6]. In a recent paper, Meher and Park proposed a new DA based adaptive filter architecture for low power, low area and high throughput with very low adaptation delay [7].

This brief proposes an adaptive FIR filter using distributed arithmetic for area efficient design. High Throughput is achieved by using a parallel lookup table update and equivalent implementation of filtering and weight-updating operations. The conditional signed carry saved accumulation for DA-based inner product computation is designed by using 10 transistor full adder based carry saved accumulation of shift accumulation. The use of the proposed design helps to reduce the area complexity and power consumption.

In the next section, a brief study of the least mean square (LMS) adaptive algorithm, followed by the description of the proposed DA based technique filter in Section **III.** The structure of the proposed adaptive filter and description of the proposed DA based adaptive FIR filter in Section **IV**. Results and Conclusions are given in Section **V** and **VI**.

II. Review of LMS Adaptive Algorithm

The LMS algorithm computes a filter output and an error value that is equal to the difference between the current filter output and the desired response for every clock cycle. In every training cycle, the estimated error is then used to update the filter weights. The weights of LMS adaptive filter during the *n*th iteration is updated according to the following equations [6]:

$$w(n+1) = w(n) + \mu \,.\, e(n) \,.\, x(n) \qquad (1a)$$

Where

$$e(n) = d(n) - y(n) \qquad (1b)$$

$$y(n) = w^{qT}(n) \,.\, x(n) \qquad (1c)$$

The input vector $x(n)$ and the weight vector $w(n)$ at the *n*th training iteration are respected given by

$$x(n) = [x(n), x(n-1), \dots, x(n-N+1)]^{\mathrm{T}} \qquad (2a)$$

$$w(n) = [w_0(n), w_1(n), \dots, w_{N-1}(N)]^{\mathrm{T}} \qquad (2b)$$

$d(n)$ is the desired response, and $y(n)$ is the filter output of the nth iteration. $e(n)$ denotes the error value generated

during the nth iteration, which is used to update the weights, μ is the convergence factor, and N is the filter length.

In the case of filter designs, the feedback error $e(n)$ becomes available after certain number of cycles, called the "adaptation delay". The pipelined architectures therefore use the delayed error $e(n-m)$ for updating the current weight instead of the most recent error, where m is the adaptation delay. The weight update equation of such delayed LMS adaptive filter is given by

$$w(n+1) = w(n) + \mu \,.\, e(n-m) \,.\, x(n-m) \quad (3)$$

III. Proposed DA-Based Approach for Inner Product Computation

In each cycle, the LMS adaptive filter needs to perform an inner-product computation which contributes to the most of the critical path. Let the inner product computation of (1c) be given by

$$y = \sum_{k=0}^{N-1} r_k \,.\, s_k \quad (4)$$

Where r_k and s_k for $0 \le k \le N-1$ form the N – point vectors corresponding to the current weights and most recent $N-1$ input respectively. Let us assume L be the bit width of the weight, every component of the vector weight may be expressed in 2's complement representation

$$r_k = -r_{k0} + \sum_{l=1}^{L-1} r_{kl} \,.\, 2^{-l} \quad (5)$$

Where w_{kl} denotes the lth bit of r_k. Substituting (5), we can write (4) in an expanded form

$$y = -\sum_{k=0}^{N-1} s_k \,.\, r_{k0} + \sum_{k=0}^{N-1} s_k \,.\, [\sum_{l=1}^{L-1} r_{kl} \,.\, 2^{-l}] \quad (6)$$

To convert the sum-of-product form of (4) into a distributed form, the order of summations over the indices k and l in (6) can be interchanged to have

$$y = -\sum_{k=0}^{N-1} s_k \,.\, r_{k0} + \sum_{l=0}^{L-1} 2^{-l} \,.\, [\sum_{k=0}^{N-1} s_k \,.\, r_{kl}] \quad (7)$$

and the inner product given by (7) can be computed as

$$y = [\sum_{l-1}^{L-1} 2^{-l} \,.\, y_l] - y_0 \,,\; y_l = \sum_{k=0}^{N-1} s_k \,.\, r_{kl} \quad (8)$$

Meanwhile any element of the N-point bit sequence $\{r_{kl}\ for\ 0 \le k \le N-1\}$ can either be 1 or 0, the partial sum y_l for $l = 0,1,\ldots,L-1$ can have 2^N possible values. If all the 2^N possible values sum y_l are precomputed and stored in a LUT, the partial sum y_l can be read out from the LUT using the bit sequence $\{r_{kl}\}$ as address bits for computing the inner product.

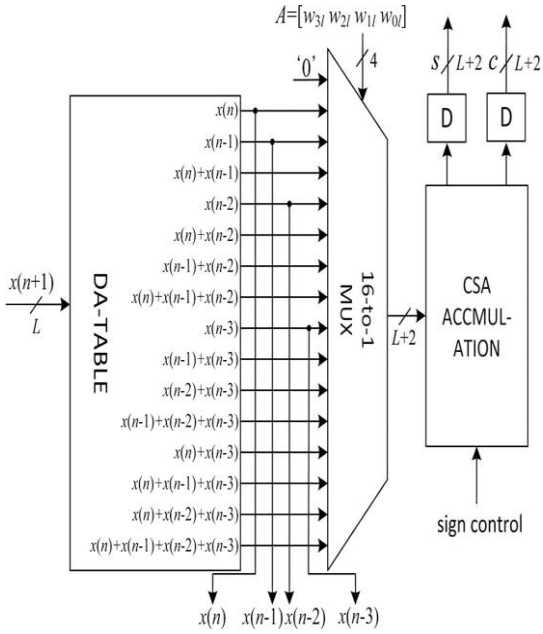

Figure 1: DA-based implementation of four point inner product

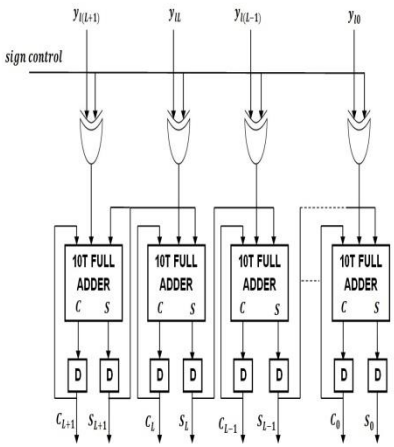

Fig 2: Carry save implementation of shift accumulation

The inner product of (8) can therefore be calculated in L cycles of carry save implementation of shift accumulation, followed by LUT-read operations corresponding to L number of bit slices $\{r_{kl}\}$ for $0 \le l \le L-1$, as shown in Fig. 1. Since the carry save implementation of shift accumulation in Fig. 2 required more area and power consumption.

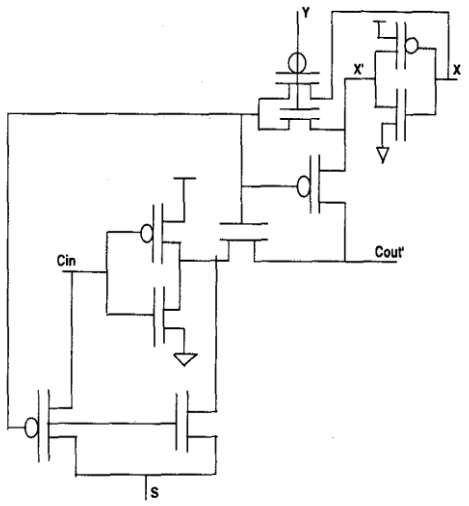

Figure 3: 10T 1-Bit Full Adder

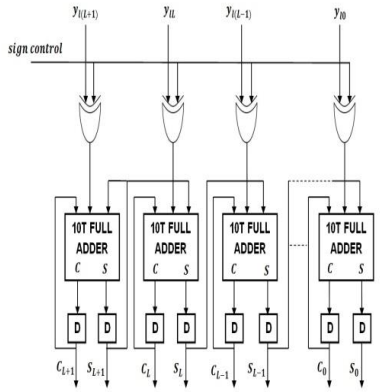

Figure 4: Carry save adder accumulation

The carry save implementation of shift accumulation based full adder is design by using 10 transistor one bit-full adder [9] as shown in Fig. 4. The bit slices of vector r are fed one after the next in the LSB to the MSB order to the carry save accumulator. Finally, the sum and carry output of the carry save accumulator is obtained after L clock cycle are required to be added by a final adder. The content of the kth LUT location can be expressed as

$$c_k = \sum_{j=0}^{N-1} x_j \,.\, k_j \qquad (9)$$

where k_j is the $(j+1)$th bit of the N - bit binary representation of integer k for $0 \le k \le 2^N - 1$ can be precomputed and stored in RAM based LUT of 2^N words. However, instead of storing 2^N words in LUT, we store $(2^N - 1)$ words in a DA table of $(2^N - 1)$ registers.

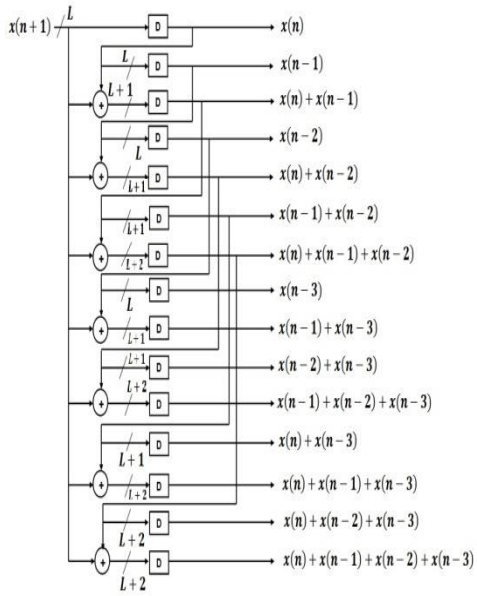

Figure 5: Distributed arithmetic table

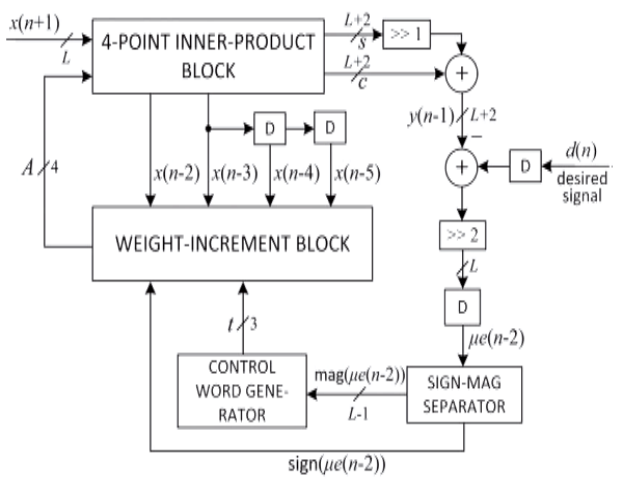

Figure 6: Proposed structure of DA-based LMS adaptive filter length $N = 4$

DA table for N=4 is shown in Fig. 5. DA table contains only 15 registers to store the precalculated sums of input words. In DA table, seven new values of c_k are computed by seven adders in parallel.

IV. Proposed Structure of Adaptive FIR Filter

A straight-forward DA-based implementation of inner product requires LUT of very large size. For that reason, the computation of the inner products of large orders needs to be decomposed [4] into small adaptive filtering blocks as shown in Fig. 6 and large order adaptive filters shown in Fig. 7.

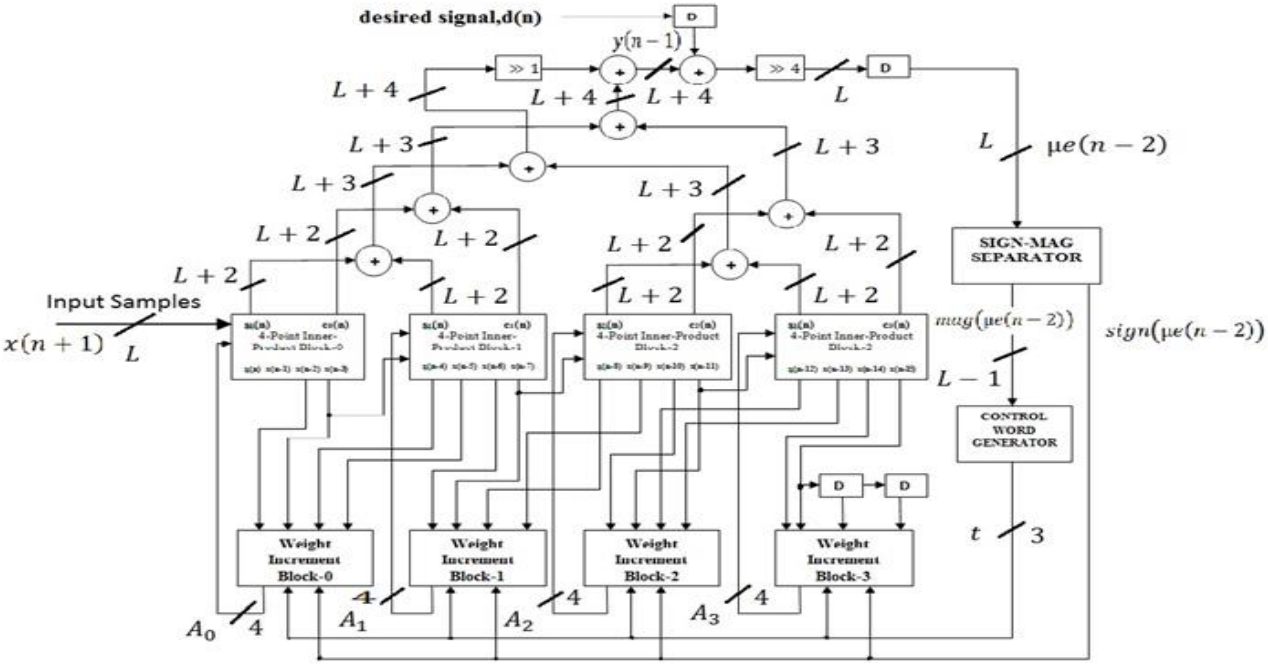

Figure 7: Proposed structure of DA-based LMS adaptive filter of length N=16

The structure of DA-based adaptive filter of length N=4 comprises of a four-point inner-product block and a weight-increment block along with additional circuits for the computation of error value $e(n)$ and control word t for the barrel shifters. The four-point inner-product block [shown in Fig. 1] contains a DA table consisting of an array of 15 registers [shown in Fig. 5] which stores the partial inner products y_l for $0 < l \leq 15$ and a 16:1 multiplexor to select the content of one of those registers from the DA table. Bit slices of weights A = $\{w_{3l}\, w_{2l}\, w_{1l}\, w_{0l}\}$ for $0 \leq l \leq L-1$ are fed to the MUX as control in LSB –to- MSB order, and the output of the MUX is fed to the carry save accumulator using 10T full adder as shown in Fig. 4. After L bit cycles, the carry save accumulator shift accumulates all the partial inner products and generates a sum and carry output word of size (L+2) bit each. The carry and sum words are shifted added with an input carry "1" to generate filter output which is subsequently subtracted from the desired output $d(n)$ to obtain the error $e(n)$.

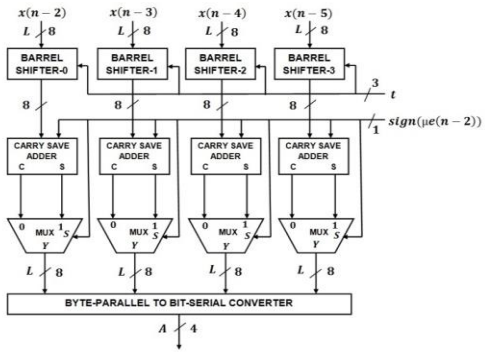

Figure 8: Structure of the weight-increment block for $N = 4$

```
if r6=1 then t= "000";
else if r5 = 1 then t= "001";
else if r4 = 1 then t= "010";
else if r3 = 1 then t= "011";
else if r2 = 1 then t= "100";
else if r1 = 1 then t= "101";
else if r0 = 1 then t= "110";

r = abs(μe(n − 2))
r_i: ith bit of 7 − bit word r
```

Figure 9: Logic used for generation of control word t for the barrel shifter for $L = 8$

As in the case in [4], all the bits of the error except the most significant bit (MSB) one are ignored (8th Bit). The remaining bits are magnitude of the error, the magnitude of the computed error is decoded to generate the control word t for the barrel shifter. The logic used for the generation of control word t for the barrel shifter is shown in Fig. 9. The number of shifts t in that case is increased by i locations accordingly to reduce the hardware complexity. The weight increment unit [shown in Fig. 8] for $N = 4$ comprises of 4 barrel shifters and four carry save adder cells. The barrel shifter shifts the different input values x_k for k = 0,1,2,…, $N-1$ by appropriate number of locations. The barrel shifter yields the desired increments are fed to the carry save adder with the sign bit from the error value. The sign bit of the error is used as the control for the 2:1 MUX to select any one of the sum or carry output from the Carry save adder. The output of the MUX is fed to the Byte-parallel to Bit-serial converter to convert 8 bit data into 1 bit data. The output waveform of DA-based adaptive FIR filter (N=16) as shown in Fig. 10.

Figure 10: DA-based LMS adaptive FIR filter of length N=16

V. Results

Thus the existing and proposed designs in [7] and [8] are implemented in Xilinx 14.1 using verilog code. Along with area and power of corresponding design are measured using Tanner 15.1 EDA in 250nm CMOS technology.

Table 1: Implementation Results Using Xilinx 14.1 and Tanner 15.1

Designs	Filter Length	Area (sq.µs)	Power (mW)
Existing	N = 16	18264	9.41
Proposed	N = 16	17220	8.49

VI. Conclusion

In this script, an adaptive FIR filter using distributed arithmetic (DA) for area efficient design is implemented. High throughput is drastically enriched by parallel (LUTs) update and equivalent implementation of filtering and weight-update operations. The proposed carry save accumulation using 10 transistor full adder schemes of signed partial inner products for the computation of the filter output and also modified in weight increment block. By this way it utilizes low area, low power consumption and the throughput of the filter rates increases irrespective of the filter length.

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Spawning aggregation of Melibe viridis Kellart (1858) from Gulf of Kachchh – Western India

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Abstract- Opisthobranchs are the least studied group of animals in the phylum Mollusca in context to the Indian subcontinent. They are one of the best indicators of the reef resilience. *Melibe viridis* Kellart (1858) belonging to subclass Opisthobranchia has been recorded from the reefs of Gulf of Kachchh only in the west coast of India. The current paper describes the first record of spawning aggregation of the species in the Gulf of Kachchh in the western India.

Index Terms- Opisthobranchs, Mollusca, Melibe viridis, Gulf of Kachchh, Western India, Spawning aggregation

I. Introduction

Opisthobranchs commonly known as sea slugs are among the least studied group in the taxonomy of the marine molluscs. In the west coast of India, the state of Gujarat has 1650 km long coast line having major coastal ecosystems like coral reefs, mangroves, sandy beaches, inter tidal mudflats and rocky shores. Studies on the opisthobranch fauna of Gulf of Kachchh are limited to a few publications by Eliot (1909a,b)**,** Gideon *et al.* (1957), Burn (1970), Menon *et al*. (1970), Narayanan (1969, 1970, 1971a,b), Rudman (1980), Deomurari (2005) and Apte *et al* (2010). The most comprehensive work on the opisthobranchs of the Gulf of Kachchh was that by Narayanan (1969) and Apte *et al* (2010).

Melibe viridis (Kelaart, 1858) is a nudibranch gastropod (suborder: Dendronotia family: Tethydidae) with a wide distribution in the Indian and Western Pacific Oceans (Cattaneo-Vietti & Thompson, 1989; Gosliner and Smith, 2003; Zenetos *et al*. 2003). The species was first described as *Meliboea viridis* Kelaart (1858) but this description was ignored by subsequent authors who reported it. The revision by Gosliner and Smith (2003) considers all these names (*Meliboea viridis* Kelaart (1858), *Melibe fimbriata* Alder & Hancock, 1864 *Melibe vexilillifera* Bergh, 1880 *Promelibe mirifica* Allan, 1932 *Melibe japonica* Eliot, 1913) synonyms of *Meliboea viridis* Kelaart (1858) and suggests retaining the name *Melibe viridis* (Kelaart, 1858).

Distribution of the species: Known from the Indian and Western Pacific Oceans from Mozambique, Zanzibar, Sri Lanka, India, Vietnam, Japan, Philippines and Australia. In the Meditteranean Sea it is found from Greece (Gosliner & Smith 2003). The record of *M. viridis* on the west coast of India is only from Gujarat coast which dates back in 1909 by Hornell and Eliot. However after that it was not reported till 2005 when Deomurari reported three specimens from the Bay of Poshitra. For rest of the India, this species is reported from Mandapam (Sundaram, 1969). In the recent studies of March 2011, however, authors have recorded spawning aggregation of 48 individuals and 22 egg ribbons in 3 transects of 50 x 2 meters each.

II. Materials and Method

The present study included opportunistic data collection during biodiversity assessment surveys and other studies of the coral reefs in the Gulf of Kachchh, by the authors in the year 2010. Specimens were observed on the reef of Boria (Fig. 1) in the Gulf of Kachchh. The reef is protected as Marine National Park. This reef is dominated by the sandy and rubble patches intercepted with massive corals. 3 Belt Transects (Sutherland, 1997) of the length of 50 meter x 2 meters were used to determine the target species density. The Geo-cordinates were recorded using Garmin E-trex ultra model GPS. The length of the species was estimated using verneer- calipers. The photographs were taken using Intova 7 mp digital camera with its underwater housing. Basic calculations were carried out using Prism software ver.3.0

Fig 1: Study site Boria reef in the Gulf of Kachchh.

III. Results and Discussion

The species was recorded from Boria reef ($22^0$24'53"N $69^0$13'19"E) in the South-western Gulf of Kachchh. The reef mostly remains submerged during regular low tide. It is only during the negative tides that the reef gets fully exposed. The substrate is dominated by the deposition of rubbles on the reef covering more than 30 % of the reef and at some places extending to 80% (Transect 2). The species has tan ground colour with yellowish ting. Body elongated, with translucent appearance. Internal organs are visible. Cerata are thick, elongated and broad. The number of cerata ranged from 5 to 7. The taxonomic account of the species is as follows,

Phylum: Mollusca
Class: Gastropoda
Subclass: Opisthobranchia
Order: Nudibranchia
Suborder: Dendronotina
Family: Tethydidae
Genus: *Melibe*
Species: *viridis* Kellart (1858) (figure 2)
Synonyms of the species: *Meliboea viridis* Kelaart (1858)
Melibe fimbriata Alder & Hancock, 1864,
Melibe vexilillifera Bergh, 1880
Promelibe mirifica Allan, 1932
Melibe japonica Eliot, 1913

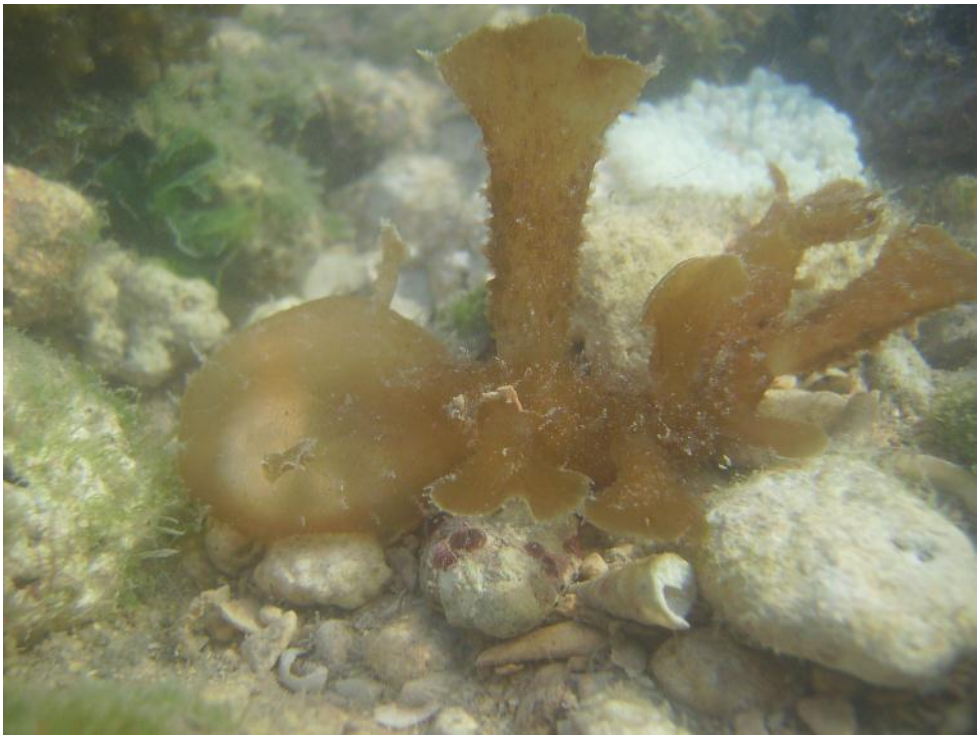

Figure 2: *Melibe viridis* Kellart (1858) at Boria reef

48 individuals in 3 transects of 50 meters were recorded along with 22 egg ribbons suggesting massive spawning aggregation. In any of the studies carried out in the Gulf of Kachchh (Eliot 1909a,b)**, (**Gideon *et al.* 1957), (Burn 1970), (Menon *et al*. 1970), (Narayanan 1969, 1970, 1971a,b), (Rudman 1980), (Deomurari 2005), including the most recent studies (Apte *et al.* 2010) the species has not been reported till date. The studies carried out by Alder and Hancock (1864) reported the species *M. fimbriata*. Eliot (1909a, b) suggested the presence of *M. rangii*, Bergh with a probability of *M. fimbriata*, Alder & Hancock from Okha reef. In the study of Eliot (1909a, b) the specimen length is recorded 80 to 100 mm, whereas in the current study maximum length was recorded to be 120 mm. In any of these studies the spawning of the genus *Melibe* has not been mentioned. The study by Mastrototaro *et al.* (2004) in the mediterranean sea recorded at least ten specimen in spawning condition with maximum length of 60 to 143 mm of the specimen. The current study carried out in the Gulf of Kachchh significantly describes the mass spawning aggregation of *Melibe viridis* Kellart (1858) with an average ratio of 2:1 specimen and egg ribbon, in the Gulf of Kachchh in the western part of India for the first time.

Figure 3: Egg ribbon of Melibe viridis Kellart (1858)

Table 1: Numerical data collected for the observation

Transect No	Total Individuals recorded	Density / m^2	No. of Egg ribbons	Max. Length of the individual in given transect
T – 1	14	0.14	8	120 mm
T – 2	23	0.23	11	110 mm
T – 3	11	0.11	3	98 mm
Total	**48**		**22**	

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Significance and prevalence of Tamoxifen related endometrial changes in patients of carcinoma breast

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***Abstract*- Background**: Tamoxifen acts as an estrogen agonist on the female genital tract. The side effect of major concern is endometrial carcinoma.

Aim: The aim of this study was to determine the prevalence and significance of endometrial changes in breast cancer patients, receiving tamoxifen and the factors influencing it.

Materials and Methods: The cohort comprised of 10 years retrospective group (RG) and one year prospective group (PG) of patients receiving tamoxifen. Transvaginal ultrasonography (TVS) was done at scheduled intervals and fractional curettage was carried out if endometrial stripe thickness (EST) ≥ 15mm.

Results: Only 12 (11.6%) patients on tamoxifen therapy developed EST ≥ 15mm. Two (16.66%) patients with suspicious histopathology on fractional curettage underwent TAH+ BSO. Amongst them one patient had adenosarcoma of mixed mullerian variety. In the PG, the EST increase at the initiation of tamoxifen therapy and at six monthly intervals till 1 year, was statistically significant with p-value of <0.05. This increase was consistent for a period of 2-7 years of tamoxifen usage and was mainly limited to the postmenopausal group.

Conclusion: Routine screening has not shown to be very helpful but regular follow up especially in the presence of clinical triad i.e. vaginal bleeding, abnormal findings on clinical examination and increased EST on TVS warrants a more aggressive approach to detect uterine malignancy at an early stage.

Index Terms- Breast cancer, tamoxifen therapy, transvaginal ultrasonography, hyper-estrogenic states, endometrial cancer

I. Introduction

The ultimate goal of endocrine therapy in breast cancer is to achieve decreased estrogen levels. Among the negative effects, tamoxifen also has a positive (agonist) estrogen agonist effect on the female genital tract.[1] This agonist effect on the endometrium can stimulate proliferation, which increases the risk of polyps, hyperplasia, and endometrial cancer by 2 to 4 fold compared with patients not receiving tamoxifen. The expected annual risk of endometrial cancer in patients on tamoxifen therapy is approximately two per thousand patients.[2] Tamoxifen doubles the risk of endometrial cancer after 1-2 years of usage and quadruples after 5 years.[3] The best way to prevent tamoxifen induced endometrial cancer is to ensure a routine baseline screening with transvaginal ultrasonography. Screening programs helps in detecting premalignant endometrial lesions because without baseline assessment, such lesions may grow or later be attributed to Tamoxifen. Endomrtrial thickness in tamoxifen patients may vary but thickness equal to or greater than 8mm are usually suspicious as compared in control subjects (9 - 13 mm vs. 4.0 - 5.4 mm).[4]. Endometrial cancer is usually associated with a measurement greater than 10mm.[5] At an EST value of 5mm, transvaginal sonography (TVS) had a positive predictive value of 9% for detecting any abnormality. The sensitivity was 90%, the specificity was 48%, but the negative predictive value was 99%.[6] The likelihood of abnormality is greater for patients who have abnormal vaginal bleeding, discharge, abnormal glandular cells on papanicolaou smear or an endometrial measurement on ultrasonography of more than 8mm, these findings should prompt an aggressive evaluation of the endometrium.[7]

This study was designed to determine the prevalence and significance of endometrial changes in patients using tamoxifen as adjuvant therapy in breast cancer. The rationale behind this study was to detect endometrial cancers at an early stage and to determine any statistically significant association between tamoxifen and various factors like duration of tamoxifen therapy, menstrual status and hyperestrogenic states.

II. MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Radiotherapy at Christian Medical College & Hospital, Ludhiana. Patients who received treatment for breast cancer with tamoxifen as one of the component in previous 10 years were enrolled in the retrospective group (RG). New patients enrolled over one year of commencement of study were enrolled in the prospective group (PG). Analysis of all the patients of carcinoma breast who were using tamoxifen was done with six-monthly TVS to assess the EST. A baseline TVS at the beginning of tamoxifen therapy was done in the PG group and then it was followed up every six months. Any patient who presented with EST equal to or greater than 15mm or presented

symptomatically with vaginal bleeding underwent a fractional curettage.

The patients qualifying for the inclusion criteria were premenopausal and postmenopausal women irrespective of age and patients who have been treated for breast cancer, either early or advanced stages, with tamoxifen. Patients receiving concurrent treatment with other hormonal agents or who presented with prior histopathologically proven endometrial carcinoma or atypical hyperplasia were excluded from the study. In the retrospective study group, inclusion criteria and exclusion criteria were same.

The data were analyzed using SPSS (Statistical Package for Social Sciences) version 16.0 and Epi Info Version 6. Analysis was also done using cross-tables and Chi-square tests for various categories of different variables.

III. RESULTS

One hundred and three patients came for follow up during the study period. Amongst them, 73 patients consented to undertake the above mentioned protocol and they were included in the RG. In the one year PG, all 30 patients who consented for the study protocol, were enrolled. (table1).

TABLE 1: Table showing the comparative data of the two study groups.

*Body mass index (BMI) was used for ascertaining nutritional status.

	Retrospective group (RG) (n)	**Prospective group (PG) (n)**
Number of patients	73	30
AGE in years (mean±SD)	48.61±10.62	47.70±7.54
Nulliparous	5	0
Primiparous	5	5
Multiparous	62	25
No information	1	0
Premenopausal	25	7
Postmenopausal	34	14
Iatrogenic menopausal	5	5
Perimenopausal	9	4
Underweight(<18.5)	5	0
Healthy weight(18.5-24.9)	25	13
Overweight(25-29.9)	20	11
Obese(>30)	23	6

TVS ultrasound was done for all patients on initiation of tamoxifen and at six-monthly intervals in PG. EST more than 5 mm on TVS was considered as endometrial thickening. Increased EST was noted in 87.37% patients. The other findings on TVS, number of patients showing space occupying lesion (SOL) and the histopathological examinations (HPE) findings are shown in (table 2).

Table 2: Representation of transvaginal sonographic findings and histopathological findings

TVS findings	**RG+PG(n=103)**	**%**
↑EST	90	87.37
Cystic changes	26	25.24
SOLs	8	7.76
Normal EST(≤ 5mm)	13	12.62
Total	103	100
	RG	**PG**
Increased endometrial stripe	9	3
Underwent fractional curettage	6	2
TAH+BSO	2	0
Histopathological findings		
Benign	4	2
Malignant	1	0

SOL= space occupying lesion, TAH+BSO = trans abdominal hysterectomy and bilateral salpingo-opherectomy

* TVS findings in both Prospective group and Retrospective group and subsequent intervention in patients with endometrial stripe >15mm, followed by patients undergoing fractional currettage and finally trans abdominal hysterectomy and bilateral salpingo-opherectomy in patients with suspicious findings and histopathological findings.

One patient showed hyperplastic polypoidal changes on fractional curettage and another patient had findings suspicious of malignancy. Both underwent transabdominal hysterectomy and bilateral salpingo-opherectomy (TAH & BSO). HPE confirmed simple hyperplasia with polypoidal growth (figure 1) in the first case and adenosarcoma of mixed mullerian type (figure 2) in the second case.

Fig 1: Figure showing H & E stained section of endometrium on low power view (10X). Stromal hyperplasia with glandular changes is visible

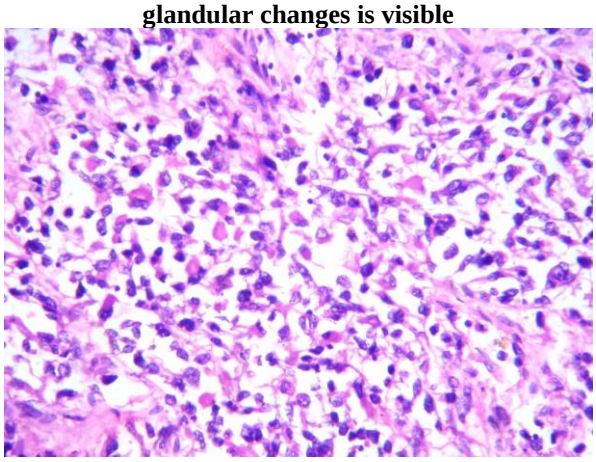
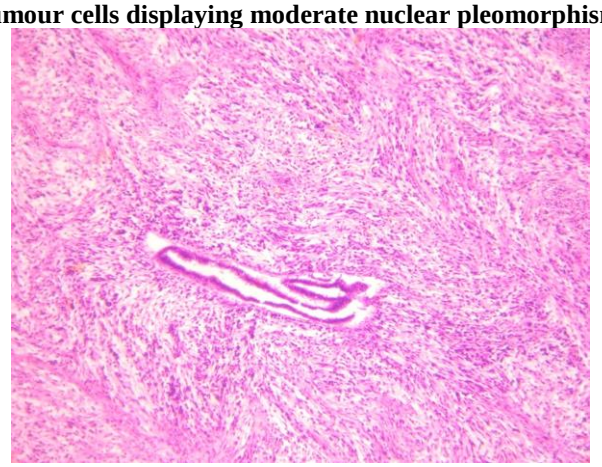


Fig 2: Figure showing H & E stained section from endometrium on high power view (40X). Spindle shaped tumour cells displaying moderate nuclear pleomorphism



Both these patients had presented symptomatically with vaginal bleeding. After hysterectomy, the first patient was switched over to letrozole, an aromatase inhibitor (AI) and the second patient with malignancy, received adriamycin based chemotherapy followed by radical radiotherapy and intravaginal brachytherapy.

Patients in the PG had tamoxifen exposure for < 1year, and amongst them none developed an EST of ≥ 15mm. In the RG, it was evident that patients using tamoxifen for 2-7 years showed a consistent pattern of increase in the EST, but due to less number of patients, it was difficult to ascertain the changes beyond seven years of usage. Eleven patients demonstrated increased EST of ≥ 15mm in RG. It was found that 54.5% (n=6) patients developed changes in EST between 3-6 years of tamoxifen, while 18.2% (n=2) patient developed changes between 2-3 years. Strikingly 27.3% (n=3) patients showed endometrial changes within one year. (Fig 3) Malignancy developed in one patient between 4-5 years of tamoxifen therapy. Figure 3 shows a graphical representation between the duration of tamoxifen therapy (years) on x-axis and the mean of EST (mm) on y-axis. The mean EST (mm) was calculated among the total number of patients who presented during the respective years for follow up and underwent TVS.

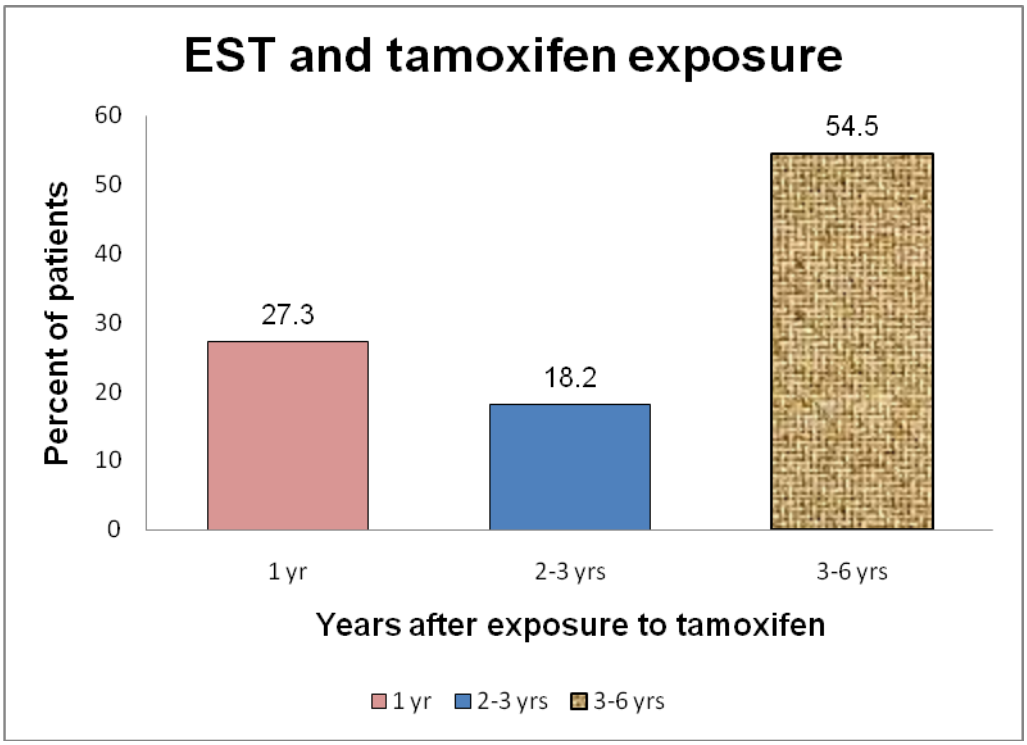


Fig 3 EST & tamoxifen exposure

The figure is showing the number of patients with EST 15mm or above after exposure to tamoxifen. Highest incidence noted in 3-6 years after exposure.

- EST= Endometrial stripe thickness

The pattern of EST changes noted was different in premenopausal and postmenopausal group of patients. There was a consistent rise in EST in postmenopausal group of patients. The EST change was not linear in premenopausal patients and was showing peak around the 3rd and 6th year of tamoxifen therapy (Fig 4).

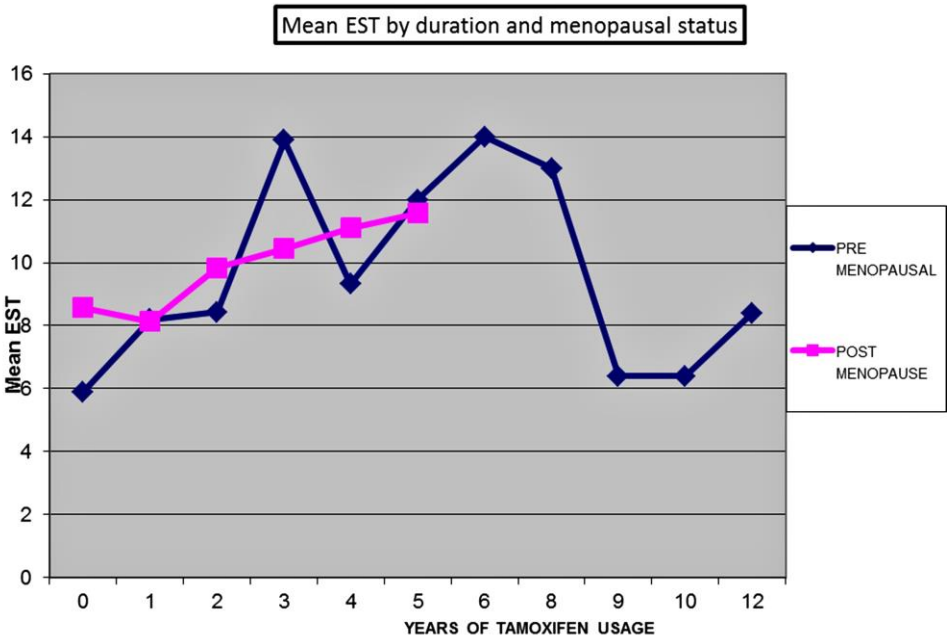


Fig 4: Line diagram comparing mean EST changes in pre and postmenopausal patients of breast cancer on tamoxifen. The EST changes were not consistent in the premenopausal patients. Peak rise in EST was noted in the 3rd and 6th years of tamoxifen therapy in premenopausal group. In the postmenopausal group, there was a consistent rise in EST from one year till 5th year of exposure to tamoxifen with peak around the 5th year.

The EST rise in the postmenopausal patients on tamoxifen therapy over time was statistically significant. The usual pattern is a decrease in EST after menopause. So, the rise in EST in postmenopausal patients could be attributed to tamoxifen exposure. In premenopausal women the increase in EST was not significant and it could be attributed to the phase of the menstrual cycle. Chi square for linear trend of the menopausal status and EST was analyzed. For premenopausal women the linear trend value was 1.575 with a p-value of 0.2095, and for postmenopausal women it was 2.270 with a p-value of 0.131. The odds ratio was 2, 4 and 3.3 at 5 yrs, 6 yrs and 7 yrs respectively. There was no significant correlation found between increased endometrial stripe thickness and hyperestrogenic states.

IV. DISCUSSION

It is estimated that tamoxifen patients have a threefold increase in endometrial proliferation and polyps, and a tenfold increase in endometrial hyperplasias compared with controls. Although the incidence of these endometrial changes is high, the chance of these conditions progressing to endometrial cancer is low; only atypical hyperplasia, an uncommon finding, was a significant (27%) risk of progression to cancer.[8]

Endometrial hyperplasia is a histological diagnosis characterized by proliferation of endometrial glands resulting in a greater gland-to-stroma ratio than observed in normal endometrium. The WHO classification of endometrial hyperplasia is based upon two factors: i) the glandular/stromal architectural pattern, which is either simple or complex. ii) The presence or absence of nuclear atypia. They are further divided into a) simple hyperplasia b) complex hyperplasia c) simple atypical hyperplasia d) complex atypical hyperplasia.[9] TVS is the first line imaging modality for screening of tamoxifen induced endometrial hyperplasia. Studies conclude that an endometrial thickness greater than 8mm on TVS had a 100% positive predictive value for endometrial disease.[10] The normal postmenopausal endometrium appears as a single echogenic line and should not exceed 5 mm as a bilayer thickness.[11] In our study, we considered the normal EST as ≤ 5mm, anything above this was taken as increased EST. Gynecological intervention was reserved for patients with EST ≥ 15mm or any symptomatic presentation. At an EST value of 5mm, TVS had a positive predictive value of 9% for detecting any abnormality. The sensitivity was 90%, the specificity was 48%, but the negative predictive value was 99%. Based on these values, over half of the women would require TVS, with a low yield (4%) of endometrial carcinomas.[12]

Amongst all the patients in the PG comprising of 30 patients, none had tamoxifen exposure at the time of baseline TVS, while among the 73 patients in the RG the period of tamoxifen exposure ranged from 1 year to 10 years. ATAC trial discussed that tamoxifen treatment results in a doubling of the risk of endometrial cancer after 1-2 years and a quadrupling after 5 years of therapy respectively.[13] The findings could be represented in figure 3, showing that tamoxifen behaves as an agonist on the endometrial lining leading to consistent increase in EST as the years of tamoxifen exposure increased. It is evident from the graph that there is progressive increase in EST from two years to five years of tamoxifen exposure.

The baseline TVS in the PG showed that none of the patients had any endometrial pathology or EST equal to or more than 15mm at initiation of tamoxifen, while in the subsequent TVS, at six monthly interval, three (10%) patients showed an increase in EST to equal to or more than 15mm, whereas in the RG one out

of 9 patients developed increase in EST to 15mm after yearly estimation. Our findings were supported by the study which observed that tamoxifen induces uterine abnormalities from as early as 3 months of therapy.[3] In the HPE, six patients had simple hyperplasia, one patient showed polypoid features and the other had features suspicious of malignancy. The other findings are tabulated in table 2. Both these patients belonged to RG. Here we would like to mention that in this study there was no baseline TVS data available for the patients in RG. In the absence of baseline TVS any endometrial lesions may grow or later be attributed to tamoxifen. In this study, out of the total 103 patients who underwent TVS all were asymptomatic except two patients, who belonged to RG and were postmenopausal, validating the statistical significance of tamoxifen induced EST in postmenopausal women. Particularly, these were the same patients who on fractional curettage had polypoidal changes and features suggesting malignancy and underwent TAH+BSO. The findings of one patient consisted of polypoid features and the other patient had adenosarcoma of mixed mullerian variety. Both these patients had presented symptomatically with vaginal bleeding. Supporting our observation, in the NSABP-P1 study most endometrial cancers were diagnosed in symptomatic group.[14] It has also been confirmed in the study by Cheng and coworkers that 67% of postmenopausal women receiving tamoxifen who reported abnormal bleeding had a pathologic finding, including 6 women (19%) with premalignant or malignant lesions. It is therefore recommended that abnormal bleeding in such patients be promptly and aggressively evaluated.[15] The prevalence of endometrial cancer in the study was 1 per 500 women, which correlates with the NSABP B-14 study.

We tried to establish a correlation between the occurrence of hyperestrogenic states and increased EST. For this we categorized our patients with increased EST and found the frequency of hyperestrogenic states i.e. increased BMI and hypertension among them. At the end we could not prove any association between them in view of p-value > 0.05. However in a meta-analysis, it was found that increase in BMI by 5kg/m^2 increases the EST (1.59, p<0.0001).[16] It was also confirmed that obesity increases EST independently, however hypertension increase the EST in the presence of obesity.[17]

V. CONCLUSION

From the above discussion, it is evident that any patient receiving or who has previously received tamoxifen and/or who reports abnormal vaginal bleeding should be promptly evaluated. They should be advised to undergo annual gynecological examinations and should inform in case of abnormal gynecological symptoms e.g. menstrual irregularities, abnormal vaginal bleeding, lower abdominal pain or pressure symptoms. A screening program may detect premalignant endometrial precursors. If no baseline assessment is made such lesions may grow or later be attributed to tamoxifen. The thickness of normal endometrium in women receiving tamoxifen however is yet to be defined. Care must be taken, however, not to over interpret the TVS findings of the EST in tamoxifen-treated patients. The likelihood of abnormal EST is greater for patients who have abnormal bleeding, discharge than in asymptomatic tamoxifen-users. There are no data to suggest that routine endometrial sampling in asymptomatic women taking tamoxifen to reduce the incidence of breast cancer would be beneficial. Since tamoxifen-associated endometrial cancers appear to have a similar stage, grade and histology as endometrial cancers occurring in the general population, their prognosis is generally good. Fractional curettage should be reserved for patients with any sign of abnormal vaginal bleeding, including spotting or brownish vaginal discharge. The risks of tamoxifen induced endometrial cancer must be weighed against the benefits of tamoxifen in reducing breast cancer recurrence and contralateral breast cancers..

CONFLICT OF INTEREST

There was no conflict of interest in this study.

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Speciation of Candida Species Isolated From Clinical Specimens by Using Chrom Agar and Conventional Methods

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Abstract- Candida spp especially non albicans Candida are increasingly being isolated from clinical specimens. The conventional methods of identification are time consuming and difficult to perform. The study was done to evaluate the performance of conventional identification method (phenotypic and biochemical) and commercially available chromogenic Candida speciation media (CHROM agar) for the identification of medically important yeast and yeast-like organisms in a routine clinical microbiology laboratory. A total of 60 yeast strains were included during the one and half years study period. The conventional methods used for speciation of yeast isolates were germ tube test, chlamydospore formation test on corn meal agar, sugar fermentation test and sugar assimilation test and were compared against chromogenic agar medium (CHROM agar). *Candida albicans* (51.6%) was the most common *Candida* species, followed by *C. tropicalis* (25%), *C. krusei* (16.6%) and *C. glabrata* (6.6%). Agreement between the conventional method and chromogenic methods was 96% for *C. albicans*, 100% for *C. tropicalis*, 100% for *C. krusei* and 100% *C. glabrata*. *C. albicans* was the most common single species isolated. However, species other than *C. albicans* are gaining clinical significance (48% of all isolates in the present study). CHROM agar is a convenient and rapid method of identification of Candida species even in resource poor settings.

Index Terms- Candida, CHROM agar, identification, sugar assimilation test

I. Introduction

Candida spp. are the members of the normal flora of the skin, mucous membranes, and gastrointestinal tract. They are endogenous opportunists which cause secondary infection in individuals with some underlying immunocompromised conditions. Candidiasis is a common fungal disease found in humans affecting mucosa, skin, nails and internal organs of the body.

Candida albicans is generally considered the major pathogen among the *Candida* species. An increase in the prevalence of non-albicans species has been noted during the last decades.[1,2] There is growing evidence of the increasing use of azoles causing this epidemiological shift. Characterization to species level helps to identify those strains which might be intrinsically resistant to some of the antifungal agents.[3,4] Speciation of Candida isolates is conventionally done by germ tube test, sugar assimilation and sugar fermentation tests. Newer methods include CHROM agar, API systems, Vitek 2 ID system and molecular methods.[5,6,7] Germ tube test is a rapid method to differentiate *C. albicans* and *C. dubliniensis* from other *Candida* spp. For further speciation chlamydospore formation test, sugar fermentation test and sugar assimilation test can be done. But these tests are time consuming and labour intensive. Among the newer tests, CHROM agar is rapid and cost effective as compared to other expensive systems like API systems, Vitek 2 ID system and molecular methods.

In the present study, we speciated *Candida* isolates using germ tube test, chlamydospore formation test, sugar fermentation test, sugar assimilation test and also evaluated the performance of commercially available chromogenic *Candida* speciation media i.e, CHROM agar.

II. MATERIALS AND METHODS

The present study was carried out between October 2011 and April 2013 in the Department of Microbiology, SGT Medical College, Budhera, Gurgaon. A total of 60 consecutive *Candida* isolates from various clinical specimens like high vaginal swab, urine, blood, sputum, pus, catheter tip, ear swab from patients with candidiasis and stool sample from patients with antibiotic associated diarrhoea were included in the study. These specimens were processed for the isolation of *Candida* spp. using standard Mycology methods.[5] Gram staining was performed from direct specimen and the specimens were inoculated on Sabouraud's dextrose agar slants, incubated at 37°C for 24 hrs. Germ tube test was done and the positives identified were either *C. albicans* or *C. dubliniensis*. *C. albicans* were further identified by growth at 45°C and Chlamydospore formation on corn meal agar.[7] All the 60 isolates were subjected to Sugar fermentation test and Sugar assimilation test for final confirmation of species.

Simultaneously the *Candida* spp. were inoculated on CHROM agar and incubated at 37°C for 24 hrs and the species were identified by type and colour of the colonies on CHROM agar media as per manufacturer's instructions. (Table 1.)

III. RESULT

A total of 60 *Candida* spp. were isolated from various clinical specimens .Table 2 gives the distribution and sources of *Candida* spp. identified by the gold standard conventional method. *Candida albicans* (52%) was the most common species isolated. Among the non albicans candida, *C. tropicalis* (25%)

was the commonest followed by *C. krusei* (17%) and *C. glabrata* (7%). (Table 2).

These 60 strains were also subjected to identification using CHROM agar. The results along with sensitivity and specificity of Chrome agar for various species are given in table 3. There was an agreement in identification by CHROM agar method in 59 (98%) strains. Only one strain which was identified as *C. glabrata* by the sugar assimilation test was identified as *C. albicans* by chrome agar method. The sensitivity and specificity of CHROM agar was 100% for C. Tropicalis and C. Krusei, for C. albicans the sensitivity was 100% and specificity was 96% and for C. glabrata the sensitivity was 75% and specificity was 100%. (Table 3).

IV. DISCUSSION

The potential clinical importance of species-level identification has been recognized as *Candida* species differ in the expression of virulence factors and antifungal susceptibility. Non albicans candida are on the rise due to increasing immunocompromised states. Non albicans Candida are more resistant to fluconazole, therefore species level identification has a direct impact on choice of empirical antifungal treatment. Also there may be geographic variation in the species isolated which necessitates that we have data on the distribution of candida species in different geographic regions. In the present study C. albicans predominated i.e, 52%. Predominance of C. albicans was also seen in a study.[8] However higher incidence of non albicans candida ranging from 54 - 74% have been seen in various studies.[4,9,10] Among the non albicans species, Candida tropicalis is reported to be the most predominat species as discussed elsewhere. In our study also C. tropicalis was the most common non albicans species.

For differentiation between different species of candida conventionally Germ tube test, chlamydospore formation, sugar fermentation and assimilation tests are being used which are laborious and time consuming. CHROM AGAR is a rapid method to differentiate between different candida species. It facilitates the detection and identification of candida species from mixed culture and provides result in 24-48 hours. In our study, sensitivity and specificity of CHROM agar for Candida albicans were 100% and 96%, C. tropicalis were 100% and 100%, C. krusei were 100% and 100% and C. glabrata 75% and 100% respectively. A sensitivity of 80% for C. tropicalis, and 89% for C. albicans has been reported in a study who also reported that misidentification of C. tropicalis was seen due to difficulty in interpretation of green color.[6] We, however, did not face any such difficulty and our results were consistent with the results of conventional methods. CHROM agar has the advantage of being technically simple, rapid and cost effective as compared to the conventional methods.

Being a rural hospital and medical college, our study had its own limitations of small sample size, inability to perform antifungal susceptibility tests. However CHROM agar has proved to be a valuable method for identification of Candida species even in resource poor settings.

V. CONCLUSION

Along with Candida albicans, non albicans Candida spp like C. tropicalis, C, krusei and C. glabrata are increasingly being isolated from clinical specimens. CHROM agar is a simple, rapid and inexpensive method with good sensitivity and specificity for identification of such species.

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Table 1: Colour of various Candida spp. on CHROM agar for identification

	Name	Colour on Chrom agar
1.	*C. albicans*	Light green
2.	*C. tropicalis*	Metallic blue
3.	*C. krusei*	Rose pink
4.	*C. glabrata*	White

Table 2: Isolation of Candida spp. from clinical specimens

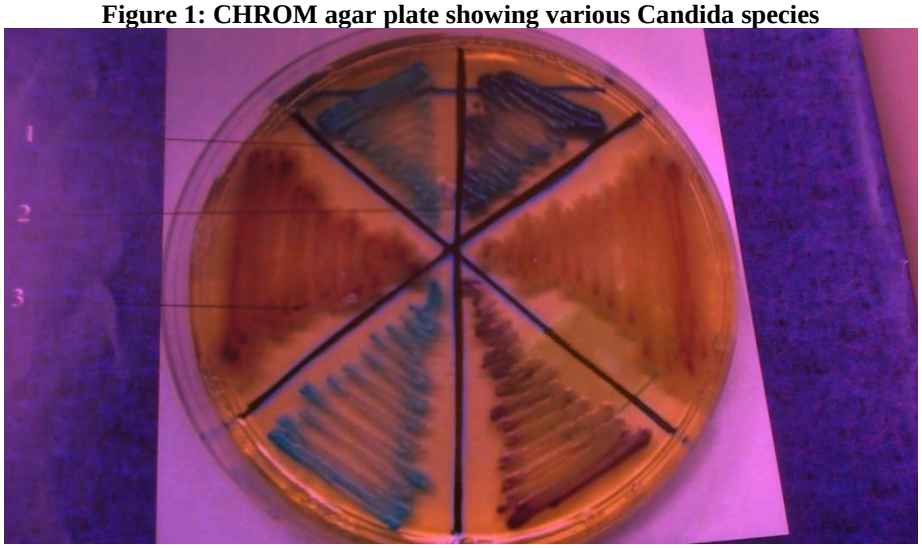
Nature of specimen	Number of *Candida* spp.	*Candida* spp. identified			
		C.albicans	*C.tropicalis*	*C.krusei*	*C.glabrata*
1. High vaginal swab	20	15	2	0	3
2. Urine	12	4	6	2	0
3. Stool	10	5	2	2	1
4. Blood	8	1	4	3	0
5. Sputum	3	3	0	0	0
6. Pus	3	0	1	2	0
7. Catheter tip	2	2	0	0	0
8. Ear swab	2	1	0	1	0
Total	60	31	15	10	4

Table 3: Sensitivity and specificity of CHROM agar for identification of various species of Candida

Candida spp.	No.of *Candida* spp. identified by conventional method	No.of *Candida* spp. identified using CHROM agar	Sensitivity of CHROM agar	Specificity of CHROM agar
1. C. albicans	31	32	100%	96%
2. C. tropicalis	15	15	100%	100%
3. C. krusei	10	10	100%	100%
4. C. glabrata	4	3	75%	100%

FIGURE

Figure 1: CHROM agar plate showing various Candida species



1. Candida albicans; 2. Candida tropicalis; 3. Candida krusei

TABLES

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12. Blood	8	1	4	3	0
13. Sputum	3	3	0	0	0
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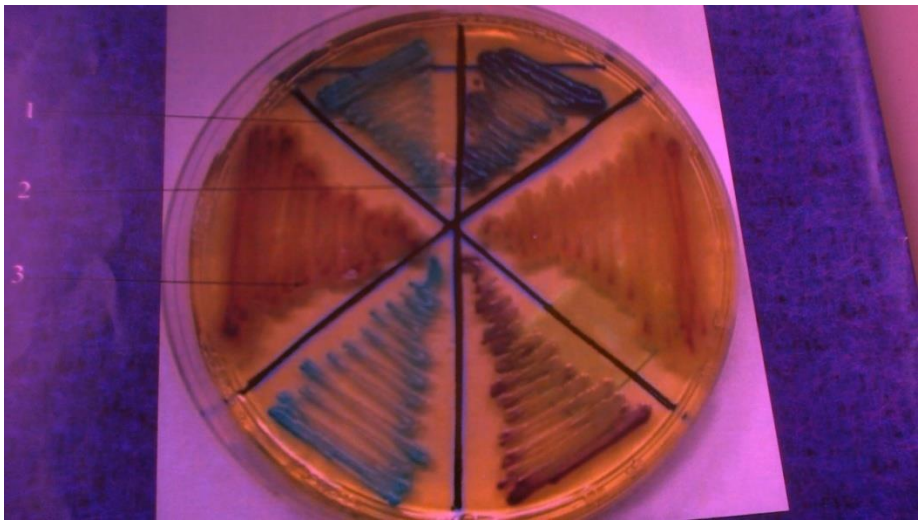

1. Candoida albicans
2. Candida tropicalis
3. Candida krusei

Changing Current Scenario of Rice-Wheat System in Indo-Gangetic Plain Region of India

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Abstract- The Indian Green revolution region "Indo Gangetic Plain" occupies nearly 15% of the total geographical area of the country. The study area covered five states (Punjab, Haryana, Utter Pradesh, Bihar & West Bengal) in the Indian part of IGP, extended from 73º E and 32º N to 89º E and 21º N. Rice- wheat system is a main food security system of the India. The analysis of rice yield with rainfall CV=0.10 was observed and coefficient of correlation between rainfall and yield was 0.44 and wheat was computed which less than linear function is provided value of R^2 of 0.55, which is reasonably less indicating that 55% variation in wheat yield is explained by the yearly rainfall. The major agricultural areas identified the rice-wheat crop calendar was identified using the SPOT VGT IMAGES. The images were classified in ERDAS Imagine using Density slicing classification (Un-supervised) algorithm. The analysis of kharif and rabi time series data; the overall analysis of total DN values are divide in three range classes viz. 128, 128-192 &192 assigned in pink, yellow and green, and re-classified in low, medium and high agriculture area. The overall DN values of kharif and rabi season average temporal data analysis are observed medium class (128-192) have 46.6% and 57.1% values coverage area and high coverage area having only 13% and 17.6 % respectively. The remote sensing and GIS technology play an important role to control and management of problematic areas. The long term study of satellite data are help to monitor with latest technology for save fertilized crop land.

Key words: IGP, DN value, Density slicing, SPOT, Cropping system

I. Introduction

The Indian Green revolution region " Indo Gangetic Plain " occupies nearly 15% of the total geographical area of the country. It is one of the most fertile large plain to developed agriculture based densely populated region. It produces about 50% of the total food grains to feed 40% of the population of the country [1]. The Indo-Gangetic Region is bound on the north by Himalayas. The IGPs, also known as the "Great plains", it is formed by the basin of three distinct rivers systems-the Indus, the Ganga and the Brahmaputra [2]. The major rivers of this systems are the Ganges and the Indus along with their tributaries; Beas, Yamuna, Ravi, Chambal, Sutluj and Chinab. These plains comprise one of the world's greatest stretches of flat and deep alluvium [3]. It is the source of the fertile alluvium soil which is favorable for double and triple cropping. The important crops grown in the Indian IGP are rice *(Oryza sativa* L.), maize *(Zea mays* L.), pearl millet (*Pennisetum glaucum* L.) and sorghum (*Sorghum bicolor* L.) in Kharif season and wheat (*Triticum aestivum* L.), barley *(Hordeum vulgare* L.), chickpea (*Cicer arietinum* L.),and mustard *(Brassica* sp), in rabi seasons and cotton (*Gossypium sp*), sugarcane (*Saccharum officinarum* L.), and potato (*Solarium tuberosum* L.) are cash crops in this region [4]. Rice (*Oriza sativa)*-Wheat (*Triticum aestivum*) cropping system is the most important predominant cropping system of the IGP in India. It is the "food bowl" or "food basket" of India having 53 per cent of total area under rice and wheat crops. RWS occupies around 42% of the total agricultural area in the India [5]. Rice is mostly grown in *Kharif* (June October) season, while wheat is mostly grown in *Rabi* (December-April) season [6&7]. The major cropping systems are rice-wheat, maize-wheat, sugarcane- wheat, cotton-wheat, rice-mustard-jute, rice-potato and rice-vegetables-jute. The three major cropping systems are rice-wheat rice-fallow and rice-mustard- summer rice belongs to four region of IGP but pre dominated system is rice-wheat and occupies 72% of the total cultivated area [8]. The rapid spread of rice-wheat system has mainly been attributed on account of its better adaptability, availability of high yielding varieties and mechanization of both crops. The productivity of these system are higher because the agro climatic conditions i.e. productive alluvial soil, maximum irrigated land , sub tropical climate is most favorable to rice and wheat crops in comparison to other cereals. Therefore the farmers of central plain zone are adopting rice-wheat system in large scale. The crop production pattern the IGP can also be divided into two major zones western (Haryana, Punjab, parts of central, western & northern) dominated by rice-wheat cropping systems and eastern part (Eastern UP, Bihar and West Bengal) dominated by rice based cropping systems. Climate change is one of the most important global environmental challenges facing humanity with implications for food production, natural ecosystems, freshwater supply, health, etc. After decades of continuous cropping, over irrigation, urbanization, pest pressure nutrient mining, burning of crop residue and water shortage. That problem is covering all IGP areas [9]. The effects of global warming combined with the region's rapidly growing population. Declining soil fertility (Punjab), development of salinity (Haryana, South –west Punjab) ground water depletion (Central & Western UP), floods (Bihar & West Bengal).

The advances satellite remote sensing (RS) data, Global Positioning System (GPS) and Geographical Information Systems (GIS) have vital role in system based study. Remote sensing provides tools for advanced cropping system management [10]. Many land use studies has been successfully using RS approach [11, 12&13].The remote sensing data for prospective view; multi spectral, multi-resolution and frequent monitoring capability can provide various spatial information amenable to cropping systems analysis. The LANDSAT (US), SPOT (France), IRS (India) and IKONOS [14] spacecrafts have been launched for earth observation. The IRS

series- IRS1A, 1B, 1C, &D satellites provide a wide range spatial, temporal and multi –spectral data used for inventorying, management and monitoring of the different resources(renewable & non-renewable) of the nation [15&16]. Multi temporal remote sensing data are widely acknowledge as having significant advantages over single date imagery [17] for studying dynamic phenomena. SPOT (French: *Satellite Pour l'Observation de la Terre*, "Satellite for observation of Earth") is a high-resolution, optical imaging Earth observation satellite system operating from space. SPOT4 launched March 24, 1998 and now stopped functioning July, 2013. S10 or 10-day synthesis: a result of the merging of data strips from 10 consecutive days[18]. The purpose of this study is to analysis of rice wheat system covering IGP areas during vegetative growing period in March & August. Then early predict to production/yield based on 1 km spatial SPOT VGT image. SPOT vegetation (VGT) has been found very useful to study the dynamics temporal agricultural system [19].

II RESEARCH ELLOBORATIONS

Why IGP- Rice- wheat system is a main food security system of the India. It also providing food, income and employment to millions of people engaged with this system based related work. The changing of climatic factors (temperature and rainfall) and natural problems (floods and drought) declining the rice and wheat crop productivity. The continuous excessive uses of chemical fertilizer, weed control and pest control chemical giving the problems to soil health as well as in environment. The rice-wheat rotation is one of the largest agricultural production systems of the world. The nursing of climate and soil of Indo Gangetic states (Punjab, Uttar Pradesh, Haryana, Bihar and WB.) area with the help of advance tools & technology.

Objectives

The study aimed to analysis of changing current scenario about rice and wheat crop with the time series SPOT VGT data during vegetative season viz. August and. March.

Study area

The study area covered five states (Punjab, Haryana, Utter Pradesh, Bihar & West Bengal) in the Indian part of IGP (Figure 1), extended from 73º E and 32º N to 89º E and 21º N [20]. These five states cover nearly 15.8% of the total geographical area of the country and 37.4% of the population of the country. The analysis of current districts distribution list of India in IGP covered states are observed 179 districts but 172 districts distributed this area and 4 districts are covered to other agro-climatic regions (Table 1). The IGP have dominated loam soil but Haryana and south west Punjab having sandy soil with low rainfall. The climate of the Indo-Gangetic Region is dominated by the Asian summer monsoon. The cool, dry winter is followed by a warming trend with daytime temperatures reaching as high as 45°C in June or July.

Table 1: Distribution of States and region of IGP

State/UT	Region	No. of District	
Punjab	Trans-Gangetic Plain Region (District: 51)	20	Indo-Gangetic Plain Region (District: 172)
Haryana		21	
Delhi		9	
Chandigarh		1	
Uttar Pradesh*	Upper -Gangetic Plain Region (District: 45)	45	
Bihar + Uttar Pradesh	Middle-Gangetic Plain Region (District:61)	38+23	
West Bengal*	Lower-Gangetic Plain Region (District:15)	15	
*Uttar Pradesh: 4 Districts & West Bengal: 3 Districts not included			

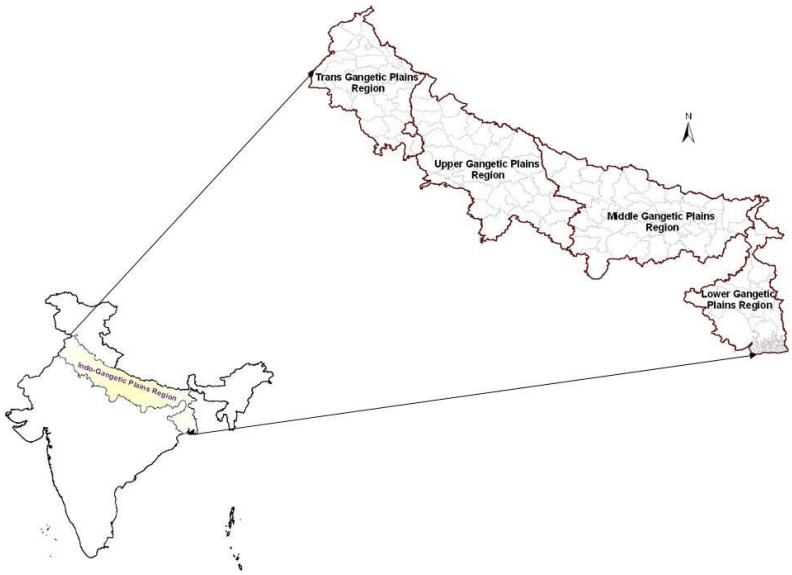

Figure 1: Study area

Planning Commission [21] divided the country into 15 broad agro-climatic zones based on physiogrphy and climate. The IGP (Figure 2) in India is divided in four agro climatic regions namely Trans Gangetic Plains Region (TGP), Upper Gangetic Plains Region (UGP), Middle Plains Region (MGP) & Lower Gangetic Plains Region (LGP). These zones are combinations of agro ecological, socio economic and political factors. It is not purely based on agro- ecological zones.

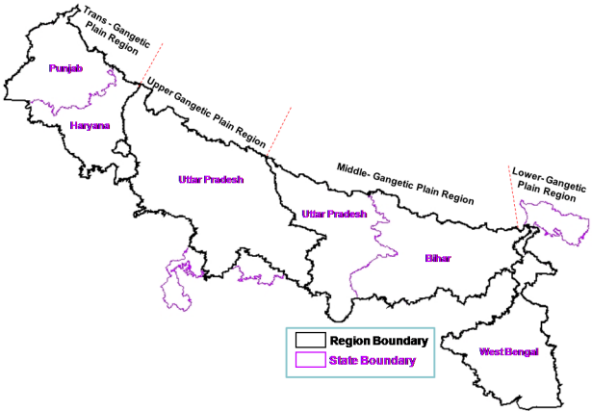

Figure 2: Map showing agro climatic regions of Indo-Gangetic Plains (IGP)

The data and method

The present study is based on secondary sources of time series analysis of rice and wheat data that are obtained from ICAR website [22&23]. The 10 years (2000-01 to 2010-11) data was used for achieve the stipulated objectives. The climatic data- rainfall, livestock census, population data and satellite images (2000-01 to 2010-11) are collected from the published records, cropping systems atlas [24], bulletin of the Directorate of Agricultural Statistics; SDDS-DES, Ministry of Agriculture, Govt. of India; ICAR report; DACNET; FSI-report and other national level institute reports and websites.

The climatic data (normal/annual rainfall,) of IGP for continuous 10 years 2000 to 2010 data were obtained from India water portal website, IMD, New Delhi; NASA POWER and [25]. The census data information of India and IGP states is taken from year 2001 & 2011 census report [26]. The 16th and 18th livestock data (1997 & 2007) were collected from different states animal husbandry websites [27] and reports [28].The state level land utilization and fertilizers consumption in rabi & kharif season data [29] were collected from FSI-2011 [30] report & related websites. The thematic layers of India, five states were joined in GIS to prepare a mosaic for the Indo- Gangetic Plain. The agro climatic region boundaries [31] were delineated from the master database of IGP. The remote sensing data used in this study included the Single composite data set (1to10days) S10 NDVI data derived from VEGETATION sensor of SPOT-4 satellite (Table. 2). The data was used to two different vegetative growth seasons (Figure 3) August and March of the every agricultural year (2000to2012). The time series remote sensing data freely download from SPOT VGT website www.free.vgt.vito.be. [32].

Table 2: List of data used in the study

Data type	Data product	Satellite/ sensor	Spatial resolution/ scale	Time period	Source
Raster	Crop rotation	SPOT VGT S-10	1kmx1km	Year 2000-12 (March & August)	www.free.vgt.vito.be

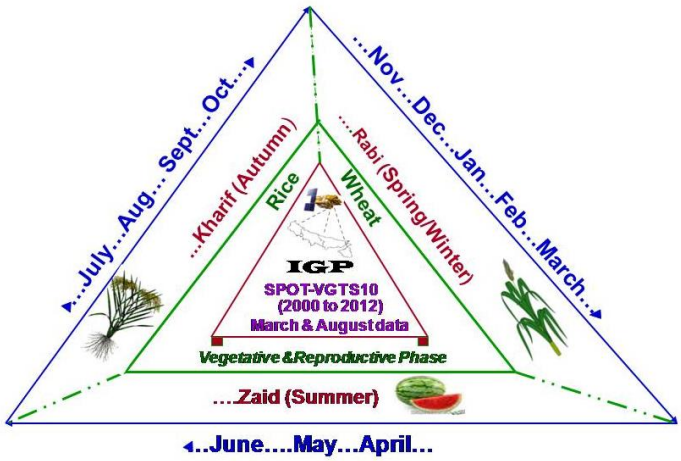

Figure 3: Crop calendar of IGP during Rabi, Kharif & Zaid season

Methodology

The major crops, different livestock, census, land uses and climatic data are integrated in the MS excel. The different type of statistical data analysis viz. Coefficient of Variation (CV), Correlation of Coefficient (R^2) and Trend Analysis to given important current scenario of current change pattern of time series data. The study area boundary feature file (.shp) was used for GIS layer in ARCGIS software to extracted information from remote sensing images. The data S10 was downloaded from the VGT [29] free data product Internet site. The ten-day composite NDVI products of SPOT- VEGETATION (VGT) sensor remote sensing imageries for the period year 2000 to 2012 for March (rabi) and August (kharif) in zip format data are used. The work station (hp Trinitron) with ERDAS IMAGINE 9.0 software was used for processing and analysis of remote sensing data. The software was used for processing and analysis of remote sensing data (Figure 4). The images are downloading in Hierarchical Data Format (HDF) format and directly open in ERDAS IMAGINE to save in .img format. The dataset were geometrically corrected with the help of the ground Control Points (GCPs) and WGS84 Geographic lat/ long projection system in ARCGIS. The GCPs (Ground Control Points) were distributed uniformly throughout the image with minimum root mean square (rms) error of less than 0.5 were selected. Polynomial transformation of 1st order was used because the correction programme runs faster with it and it also avoids geometric distortion in areas of very few GCPs. The study area subset with a vector polygon file (.shp file) representing the area boundary (AOI). Study area boundary overlay was done after completing geometric correction of the image. The SPOT VGT temporal series of image opened into the viewer of the ERDAS IMAGINE. The single band was stacked to create temporal series data (2000 to 2012) of March (for Wheat) and initial August (for Rice) month. The images were convert in digital numbers (DN Values) based in to series of classes, so there corresponding all the dates were generated from DN values. The numbers of gray levels classes were identified based on colour range.

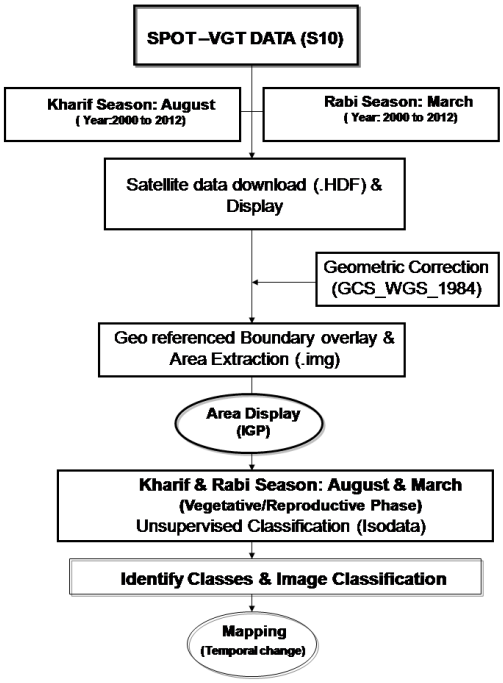

Figure 4: Flow chart of Methodology used in the study

III RESULTS OR FINDINGS

The statistical analysis (coefficient of variation (R^2) and trend analysis) are employed to study the trends in area, production and productivity of the rice-wheat crop. The rainfall, fertilizers, livestock & population census, land cover and remote sensing data analysis are given current scenario of IGP. After analysis of different data findings are discussed in sequence as under.

Current Scenario of rainfall pattern

The ten years monthly data were calculated in mean value, standard deviation and coefficient of variability is presented in Table.2. The average annual actual rainfall of ten years estimated 759.2 mm was observed in IGP. The standard deviation from mean annual rainfall was 340.7mm and coefficient of variation 0.45. The maximum coefficient of variation 67.6% observed year 2007 and minimum coefficient of variation 44.2% observed in year 2010.The lowest rainfall 607.7mm was observed in year 2000 while higher rainfall 939.1mm in year 2008. An increasing trend of monthly rainfall@8.76mm/year has been noticed (Figure 5). The ten years average moving trend of rainfall 721.86mm was observed

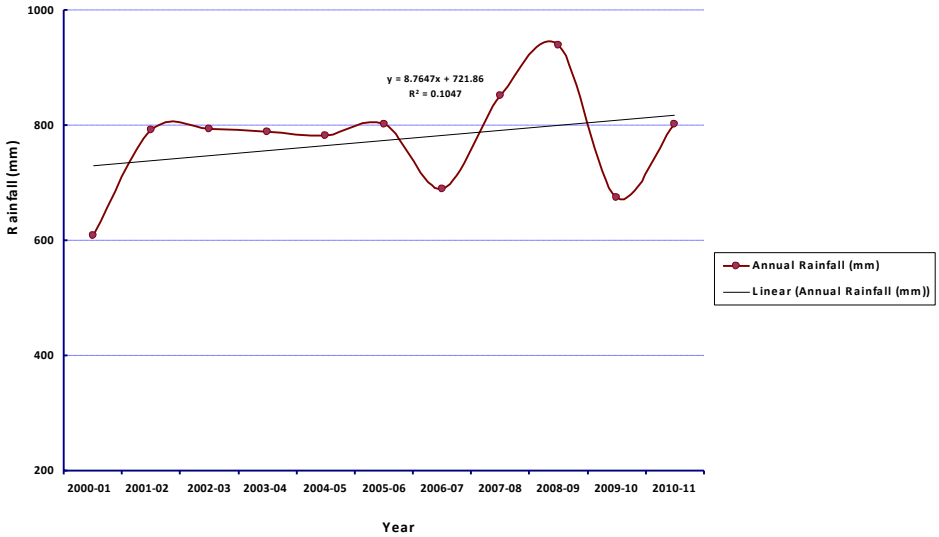

Figure 5: Time series actual rainfall data of IGP (2000-01 to 2010-11)

The geo statistical analysis of normal rainfall data for IGP was observed lowest rainfall in Trans Gangetic Plain region and higher rainfall in middle to lower Gangetic Plain Region (Figure 6). The overall current status of annual normal rainfall 993mm was observed in IGP. The Lower Gangetic plain region has maximum average rainfall 1530.5mm and Trans Gangetic plain region has lowest average rainfall 643.8mm (Table 3).

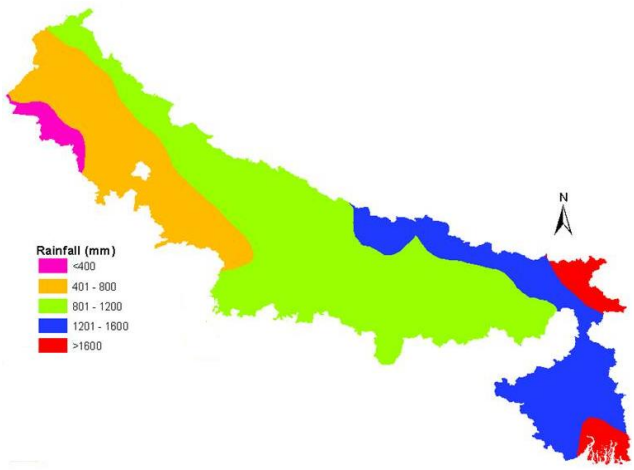

Figure: 6: Normal rainfall (mm) of IGP

Current Scenario of Rice-wheat system

The actual rainfall data were used for both rice and wheat crop yield for inter -relationship during ten years (2000to2010). Descriptive statistical analysis was made especially for the correlation, coefficient of variation and trend R^2. The statistical information on crop area, production and productivity form the backbone of agricultural statistical system. The Rice and wheat crop yield are dependent on climatic situation in India mainly on south west monsoon. The pattern of rainfall gives current scenario for production of both crops. It is easily to formulate and initiate appropriate policy measures if the data with regard to the trend of production in obtained and analyzed in advance.

Relationship between Rainfall and rice and wheat crop

The yearly rainfall data for the ten years were computed considering the crop growing season length based on planting and harvest dates. The developed model explained rainfall 10.4% and rice yield 70% of the variability in rainfall and rice yield (Figure 7). The analysis of rice yield with rainfall CV=0.10 was observed and coefficient of correlation between rainfall and yield was 0.44. The rice yield and rainfall was shown good correlation (Table 3). The current scenario of trend rice yield (70%) was observed with increasing trend of rainfall (10%). Although wheat is grown during non-monsoon months, its production shows a rather weak but significant correlation with monsoon rainfall is 0.16 for wheat.

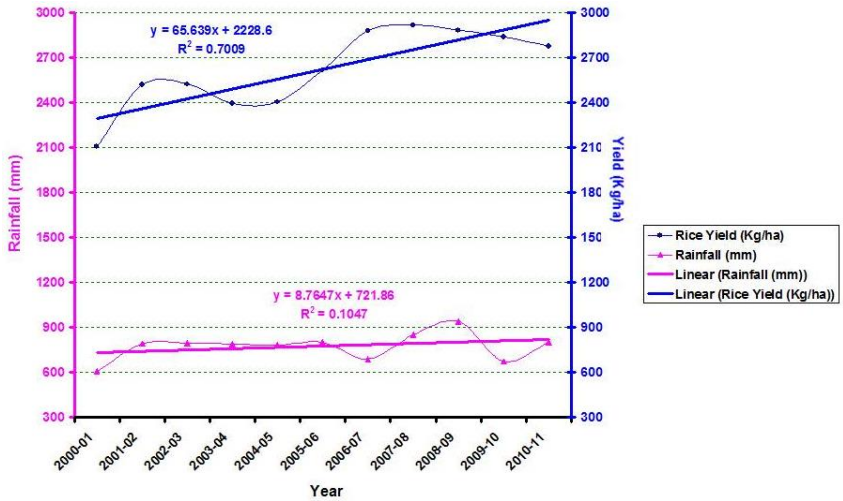

Figure 7: Relationship between average actual Rainfall (mm) and rice yield (kg/ha) (Year 2000-01 to-2010 -11)

The relationship between year wise rainfall and yield of wheat was computed which less than linear function is provided value of R^2 of 0.55, which is reasonably less indicating that 55% variation in wheat yield is explained by the yearly rainfall (Figure 8). The wheat crop yield CV=0.05 and coefficient of correlation between rainfall and yield was 0.16 observed. Rice crop is dependent on south-west monsoon rainfall but wheat crop is not dependent on rainfall in IGP.

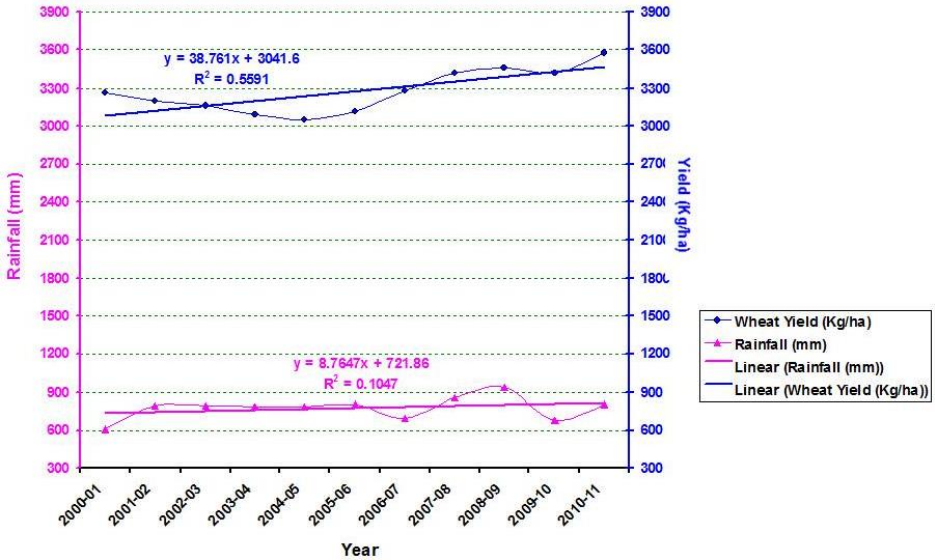

Figure 8: Relationship between average actual Rainfall (mm) and wheat yield (kg/ha) (Year 2000-01 to-2010 -11)

Table 3: Statistical relationship between 10 years rainfall: actual rainfall (mm), Rice & wheat yield (Kg/ha) of IGP

Year	Actual Rainfall (mm)	Rice Yield (Kg/ha)	Wheat Yield (Kg/ha)
2000	607.7	2106	3258
2001	791.6	2518	3197
2002	794.1	2523	3157
2003	788.9	2394	3091
2004	781.0	2404	3047
2005	800.9	2615	3119
2006	689.2	2878	3282
2007	851.9	2916	3416
2008	939.1	2882	3456
2009	673.6	2837	3414
2010	801.1	2775	3580
STANDARD DEV	89.84	259.93	171.90
MEAN	774.45	2622.55	3274.27
COFF. CORR.		0.44	0.16
CV	0.12	0.10	0.05

After analysis of ten years (2000-10) data for rice and wheat was observed current scenario of IGP (Table 4). The IGP percentage of area and production are contributes 42.7%, & 48.4% for rice and 65% &74.7% for wheat in India. The rice –wheat system is predominant cropping system. The crop area of wheat and rice is not very much increases because of farmers have not changing the cropping system pattern. The year-to-year variability of rice and wheat is increasing and lacks a strong association with monsoon rainfall in both season due to climate change and urbanization of agricultural land.

Table 4: Rice and wheat Contribution of IGP percentage in India

Year	Percentage of contribution in IGP		
	Area (In %)	Production (In %)	Yield (In %)
Rice	42.7	48.5	126.7
Wheat	65.0	74.7	119.0

Current scenario of Land utilization, Fertilizer, census and livestock

The plain's population density is very high due to the fertile soil for farming. The fast development of urbanization the agriculture land converting in to urban area. The 38.4% Indian population living in IGP states (Census, 2011).The IGP states have annual population growth rate 2% annually. The decadal IGP population rise 19.5% observed in year 2001 to 2011. The analysis current data of land use pattern of IGP were observed forest coverage area 5.4%, current fallow land 9.6%, net sown area 24.9% and geographical areas covered 15.8%. The IGP land is famous for rice-wheat cropping system has maximum coverage of net sown area. The rivers: Indus, Ganga, Brahmaputra and its tributaries provide irrigation facility to big plains area.

Livestock has important role to supply in food chain through many types of products like milk, eggs, meat and others. It is a anthropogenic source of methane emission to changing the climatic condition of IGP areas due to increasing of livestock population. Ruminants (cattle, sheep and goats) account for a large share of total livestock emissions, because they are less efficient in converting forage into useful products than monogastrics (pig & poultry) [33]. Livestock production is an important source of income and employment in rural sector [34]. The decadal data analyses of 16th to 18th livestock census were conducted in year 1997 to 2007 for collected data of different category of livestock. The major livestock in IGP are buffalo, cow, goat, poultry, pig and sheep. The Bhadawari & Murrah breed of Buffaloes, Holstein Friension & Jersey breed of cattle, Barbari & Jamnapari breed of goat and Merino & Exotic breed of Sheep are observed in district level. The overall livestock census data (1997 & 2007) analysis, the change percentage observed in pig population declined (-16.2%) and poultry population rise 86%. The small change percentage was observed in cattle population only 0.10%. The other decadal livestock change percentages were observed in buffalo, sheep and goat are 17.2%, 24.5% and 14.5% respectively. The total livestock change was observed 9.1%.

The analysis of major livestock census data (1997) was observed maximum contributed percentage (42.8%) of pig population and lowest contribution was sheep population only 12%. But analysis of livestock data (2007) observed maximum contribution buffalo and lowest sheep viz.40.4% and 5.3 % respectively. The large scale industrial production of animals especially dairy and poultry are rising in IGP states [35]. The most of the IGP's farmers are having small to medium land holing size. The integration of ruminant livestock in to small holder farming system giving profitable conversion of crop by products, increased use of manure and possibilities of regular cash income from dairying. The feed transport cost low than other states and easily available dry and green fodder due to rice-wheat cropping system. The dairy and poultry business are increase the proximity of major urban markets in IGP areas.

After analysis of nitrogen, phosphorous and potassic fertilizer consumption in IGP region are observed in kharif season 40.9%, 25% & 22.4% and in rabi season 50.2%, 43.7% and 31.2% respectively. The overall fertilizers consumption in kharif and rabi season were observed 34.5% and 40.9. The rabi crop (wheat) has more consumption of fertilizers than kharif crop (rice).

Current Scenario of SPOT VGT image analysis

For the major agricultural areas identified the rice-wheat crop calendars were identified using the SPOT VGT IMAGES. The images were classified in ERDAS Imagine using Density slicing classification (Un-supervised) algorithm. It is a form of selective one-dimensional classification [36]. The continuous gray scale of an image is sliced into a series of classes based on ranges of brightness values. This slicing takes place in raster attribute editor in IMAGINE. The class signatures were visually compared and generalized. The availability of the time series VGT images (2000to2012) also enabled the area of the range values and cropping pattern of the study area showing the development of vegetation over the year. Two-date SPOT-VGT data was used to prepare various land cover classes.

Density slicing based classification of SPOT VGT Image

The SPOT VGT images were downloading in grayscale image /single band converted into colour image due to in colour image easily identify the different crop areas. The pseudocolour tables in gray scale values are mapped to particular colour. Single colour assign single crop and different range divided in different color in to different crop. Slicing based analysis give the very clear view to dividing the image with arrange of values in to unique classes. Those classes are divided in three classes to identify the crop growth pattern in whole areas. This method is good for identification of distribution pattern of particular crop in overall IGP area.

Table 5: Overall tonal classification of SPOT VGT images (Rabi &Kharif) of IGP

Land cover Class (Agricultural areas)	**Pixel Range**	**Tone**
Low	<128	Pink
Medium	128-192	Yellow
High	>192	Green

Kharif

The major IGP states are Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal pattern showed high to low pattern of rice coverage area. The green and yellow tonal variation is too much indicating distribution of cropped area (Figure 9). The low range of pink tonal value observed in Eastern UP to West Bengal. The visual analysis of temporal images in year 2006, 2001&2002 are observed maximum coverage tonal patterns green, yellow & pink respectively. That are assigned in high, medium and low agricultural rice covered area.

Rabi

The analysis of Rabi season March is good for wheat crop growth and mainly grown in all over the parts of IGP region (Punjab, Haryana, U.P., Bihar & West Bengal). In the image analysis based on range of classification green, yellow and pink tonal values assigned high, medium and low agricultural areas (Figure 10). The visual analysis of overall temporal image are observed three data sets year 2008, 2003 & 2004 assigned maximum coverage of green, yellow and pink agricultural areas. It is also called Wheat belt of India. The time series image analyses are based on colour coding (DN values).

All Image data were processed using ERDAS IMAGINE version 8.5 [37], the colour ranges are directly based on DN value and grouped in together and dived in to ranges. The temporal image series classified based on processing the entire scene pixel by pixel. The analysis of kharif and rabi time series data; the overall analysis of total DN values are divide in three range classes viz. 128, 128-192 &192 assigned in pink, yellow and green, and re-classified in low, medium and high agriculture area. The overall DN values of kharif and rabi season average temporal data analysis are observed medium class (128-192) have 46.6% and 57.1% values coverage area and high coverage area having only 13% and 17.6 % respectively (Table 5). The observation of pixel data wheat area coverage more than rice area in low class but rice coverage area maximum (40.4%) than wheat area coverage (25.2%) in peak month of both season (Table 6). The Coefficient of variation observed in kharif season viz. 36%, 20.5% & 52.5 for low, medium and high agriculture area but rabi season observed 22.7%, 9.1 &31.7% respectively.

Table 6: Current scenario of average pixel distribution in classes of IGP in kharif & rabi season images

Class	**Pixel value**	**August**	**Distribution of Pixel**	**CV%**	**March**	**Distribution of Pixel**	**CV%**
Low	128	219736	40.4	36.0	127354	25.2	22.7
Medium	192	253413	46.6	20.5	288125	57.1	9.1
High	256	70983	13.0	52.5	89013	17.6	31.7
Total		**544132**			**504491**		

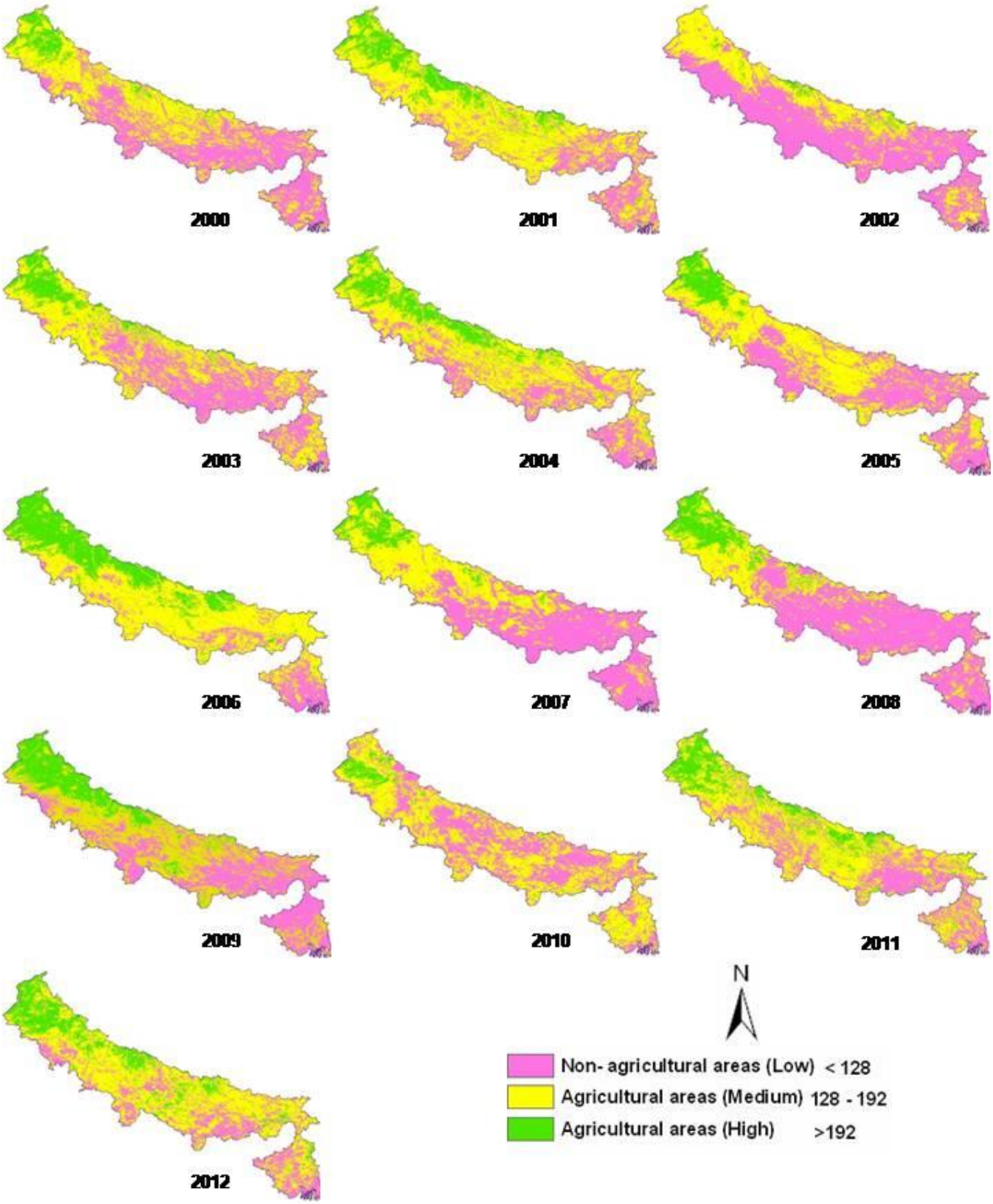

Figure 9: Kharif season map of IGP derived from multidate SPOT VGT data (August- 2000 to 2012)

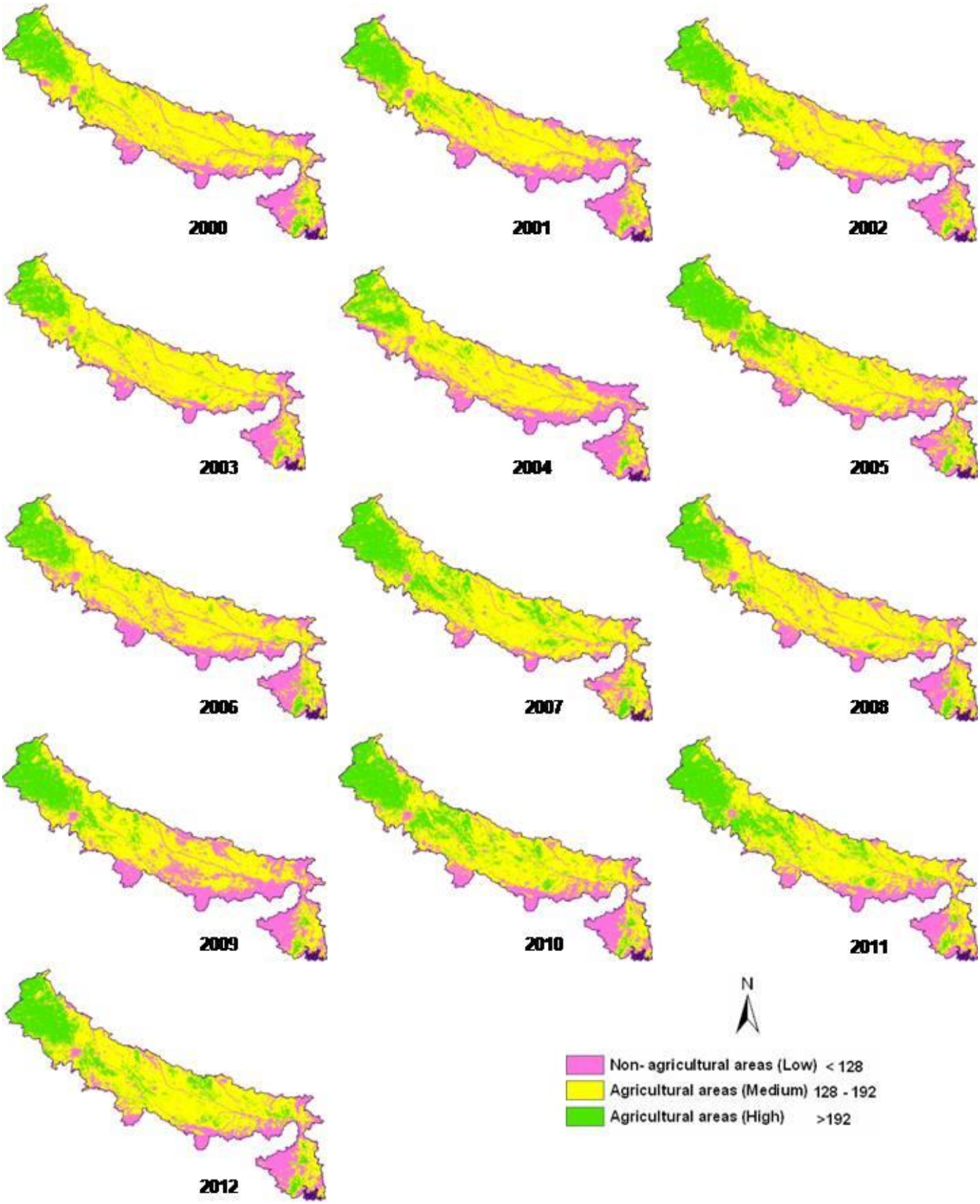

Figure 10: Rabi season map of IGP derived from multidate SPOT VGT data (March- 2000 to 2012)

IV. CONCLUSION

The rivers: Indus, Ganga, Brahmaputra and its tributaries provide irrigation facility to big plains area. The plain's population density is very high due to the fertile soil for farming. The decadal IGP population rise 19.5% observed in year 2001 to 2011. The IGP land is famous for rice-wheat cropping system has maximum coverage of net sown area. The average annual actual rainfall of ten years was estimated 759.2 mm was observed in IGP. The geo statistical analysis of normal rainfall data for IGP was observed lowest rainfall in Trans Gangetic Plain region and higher rainfall in middle to lower Gangetic Plain Region. The current scenario of trend rice yield (70%) was observed with increasing trend of rainfall (10%). After analysis of ten years (2000-10) data for rice and wheat was observed current scenario of IGP. The Contribution of IGP percentage area in India is 48.4% for rice and 74.7% for wheat. The rice-wheat system is pre dominant cropping system of IGP. The system covers all districts of IGP in Kharif and rabi season. The availability of the time series VGT images (2000to2012) also enabled the area of the range values and cropping pattern of the study area showing the development of vegetation over the year. The major IGP states are Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal pattern showed high to low pattern of rice coverage area. The analysis of rabi season March is good for wheat crop growth and mainly grown in all over the parts of IGP region (Punjab, Haryana, U.P., Bihar & West Bengal). The overall fertilizers consumption in kharif and rabi season were observed 34.5% and 40.9. The rabi crop (wheat) has more consumption of fertilizers than kharif crop (rice).The cropping intensity in the dominant states of the IGP increased from 137% (1976-77) to 158% (1999-2000) due to the turnover of more biomass to the soils (both as above ground and below-ground biomass) as evidenced from the increased SOC in fertilized areas of IGP. The current scenario of IGP observed the trend of rice and wheat yield have not much change. The coverage areas are shrinking due to urbanization pressure on agricultural land. The rainfall distribution is irregular pattern due to climate change. Indian agriculture is particularly vulnerable to impacts of climate change due to its large livestock population. Currently, India has first rank in the world for livestock population. In the IGP states U.P. has maximum methane (18.2%) emission in the India. The dry and green fodders are easily available due to rice-wheat cropping system.

The series of SPOT VGT images areas identified the distribution of crop pattern in whole areas based on tonal variation which are assign pink, yellow and green color are mentioned low, medium and high classes based on grouping of slicing of images. The temporal SPOT-VGT remote sensing data is good for identification of distribution pattern of particular crop in overall IGP area. The statistical analysis and remote sensing data analysis show the good correlation to develop yield as well as areas of rice and wheat crop. The rainfall has good correlation with rice but not with wheat yield. After the analysis of data observed current scenario of climate changes (global warming), rising of temperature, irregular pattern of rainfall, excess use of fertilizers and irregular pattern of irrigation decline fertilize lands. Rice- wheat crops are the backbone of IGP for food security. The remote sensing and GIS technology play an important role to control and management of problematic areas. The long term study of satellite data are help to monitor with latest technology for save fertilized crop land.

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Preparations and Photochemical uses of Cadmium Selenide Thin Films

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Abstract- A systematic study has done to investigate the thin films of chemically deposited CdSe and Tl doped thin films. The deposition has been carried out in an alkaline medium at 70 ^{0}C for about 90 minutes. Characterization of thin films were done using X-ray diffraction (XRD), scanning electron microscope (SEM) optical absorption, electrical conductivity and thermoelectric techniques. These study reveals that films are polycrystalline in nature with cubic structure. The electrical conductivity of the order of 10^{-5} $(\Omega\ cm)^{-1}$ and an optical energy gap of 1.55 eV to 2.01 eV with a direct allowed type of transitions have been noticed. The thermoelectric power measurements shows n-type conduction mechanism for pure CdSe and doped CdSe thin films.

Index Terms- A Chemical Bath Deposition. B CdSe Thin Films C Tl doped CdSe Thin films D Optical Properties

I. Introduction

Cadmium Selenide has studied extensively because of its use in photoelectron chemical solar energy conversion and optoelectronic applications [1-3]. Cadmium selenide single crystals have been shown to exhibit a conversion efficiency as high as 8 –12% in polysulphide solution, whereas crystalline cadmium selenide exhibits a lower efficiency [4-6]. The n-type cadmium selenide semiconductor (band gap 1.75 eV) has become quite interesting and important because of its major contribution to solar cells, photo detection, optoelectronics, light amplifiers, electrophotography, light emitting diodes and in the preparation of electronic elements based on existence of metal insulator – semiconductor structure. Most research so far has focused extensively on determining major features of electrical, optical and structural properties of CdSe compound[7,8]. However, doping effect on properties of CdSe thin films is still insufficient in previously reported literature. In this paper the attempt is made to dope Tl into CdSe thin films by simple chemical deposition techniques. This technique is economically viable, yields reproducible and more consistent characteristics than the other sophisticated techniques. Previously we have reported deposition of HgSe, CdHgS etc. compounds by this technique [9-11].

II. Experimental

Cadmium selenide thin films have been obtained onto glass substrate by chemical deposition method. For deposition 10 ml (1 M) $CdSO_4$ solution was taken in a beaker and 5 ml of triethanolamine (TEA) was added to form a stable complex. To this mixture 3 ml of NaOH (1 N) and about 20 ml (14 N) aqueous ammonia was added so as to adjust the pH of the reaction mixture equal to10.5 ± 0.1. The reaction mixture was then made upto 180 ml by adding a doubled distilled water.

Sodium selenosulphite (0.22 N) was obtained by refluxing selenium powder (5.0 gms) with anhydrous sodium sulphite (12.0 gms) in a 200 ml distilled water for about 9 hours. The beaker containing reaction mixture was then kept in oil bath whose temperature was controlled upto 60^{0}C. The glass substrate (micro slides of size 75 x 25 x 2 mm) was first cleaned with chromic acid and then degreased with acetone. For getting Tl doped CdSe films the Thallium Sulphate solution (0.01 M) was added directly to a reaction mixture in order to achieve 0.01 to 2.0 mole % doping concentrations. Throughly cleaned substrates were attached vertically perpendicular to each other and rotated in reaction mixture with 70 ± 2 r.p.m. speed. Sodium selenosulphite was then added slowly in the reaction mixture at a controlled rate by exterior arrangement. The deposition was carried out for 90 minutes. To obtain good samples, the conditions were optimized (pH = 10.6, temp 60 ^{0}C, time 90 min). After 90 minutes thin film samples were removed and washed 5 to 6 times with distilled water. The films were dried and preserved in a dark dessicator Uniformity of the film was examined by the measurement of thickness using weight difference density consideration method . The X-ray diffractogram was recorded using a Philips p.w. 1710 X-ray diffractrometer (XRD) with CuKα line in 2θ range from 10 – 100^0. The optical absorption spectra were obtained in the wavelength range from 350 to 900 nm by using Hitachi – 330 (Japan) Double Beam Spectrophotometer; at room temperature. A study of surface morphology of sample was done under scanning electron microscope, steroscan S 120, 250 M. K. III Cambridge,(UK).

A two probe point method was employed to measure the electrical conductivity of the sample in dark. The range of working temperature was from 350 to 500 K.
The film composition was determined using a Perkin Elmer 3030 Atomic Absorption Spectrophotometer.

III. Results and Discussions

3.1 Film growth.

To prepare a cadmium selenide thin film of maximum thickness of around 0.5 μm, the conditions are optimized. At about 60 ^{0}C temperature and time of 90 min the rate of

deposition is maximum. The kinetics of the film formation can be explained from the following reactions.

$$CdSO_4 + 2\ NaOH \longrightarrow Cd(OH)_2 + Na_2SO_4 \ldots\ldots\ldots\ (1)$$
$$Cd(OH)_2 + n\ (TEA) \longrightarrow [Cd(TEA)n]^{+2} + 2OH^- \ldots\ldots(2)$$
$$[\ Cd(TEA)_n]^{+2} + 2OH^- \longrightarrow + Na_2SeSO_3 \quad CdSe + Na_2SO_4 + H_2O + n(TEA) \ldots..(3)$$

The film formation is dependent on the initial nucleation step. The $Cd(OH)_2$ present on the substrate surface acts as the nucleation centre for the subsequent growth of CdSe film. The films are thin, uniform and orange red in colour, These are also highly adherent, smooth and reflecting. In the same way Thallium doped cadmium selenide thin films are obtained by adding various concentrations of Thallium sulphate solution. These films of Thallium doped cadmium selenide are some what distinct than the pure CdSe. They are more reflecting and orange reddish in colour. The thickness of the film was measured by a weight difference density method[12]. The thickness of pure CdSe thin film was found to be about 0.445

3.2 Structural Properties

The X-ray diffractogram of sample is displayed in Fig. 1. The no. of peaks increased upon increasing concentration of Tl. This clearly indicates that Tl becomes incorporated in lattice of CdSe[13]. The structural investigations showed polycrystalline natures in cubic lattice for CdSe as well as T1 doped thin films. At our experimental conditions CdSe films is found to be cubic nature having the lattice parameters a = 6.070 A (ASTM value is 6.077 A) which is in well agreement with ASTM (Card No. 19-119) data. As T1 doping concentration increases, the crystalinity of film is also increasing upto 0.07 mole% and thereafter the material tending towards amorphous nature. In order to evaluate the grain size, X-ray diffractogram and the following relation is used.

$$d = 0.9\ \lambda / B\cos\theta \text{ ----------(1)}$$

where λ wavelength = 1.5406 A, B is the angular width at half maximum intensity and θ is Bragg's angle. The grain size for various film structure are cited in Table No. 1 It is observed that the film with 0.07 % T1 doping concentration showed higher sized grains. The partial support of the above observations were given by scanning electron micrographs of cadmium selenide and Thallium doped cadmium Selenide [Fig. No. 2] The cell size evaluated from XRD pattern is also shown in Table No. 1. We observe a decrease in cell parameter upto 5.998 A for 0.07 mole % Tl concentration, thereafter it rises.

The decrease in cell parameter can be attributed to distortion of lattice as Tl being intersticially situated in the vacancies. Thallium is known to have lesser ionic redii than Cd ion therefore, CdSe lattice doped with substitutional Tl atoms may shrink and become distorted. In sample with 0.07 mole % Tl doping, it can be considered that almost all of the intersticial sites were occupied by Tl atoms, further increase in doping concentration simply dope Tl intersticially into the film.

The intersticial Tl atoms may be considered to act as donars,. For heavily doped film the lattice do not become distored. The similar type of behaviour is explained for other material by Mizuhashi(14).

From figure 2 it is clear that the grains of spherical size are uniformly distributed on the glass substrate. As the concentration of T1 increases upto 0.07 mol %, not only the grain size of film increases but also the compactness increases. For higher concentrations the few grains are aggregated and few scattered throughout the surface.

3.3 Optical properties :

The optical absorbance was measured for these samples. The absorption co-efficient was determined and found to be in order of 10^4 - 10^5 cm^{-1} for pure CdSe as well as T1 doped films (fig. 3). The energy band gap was estimated from the variation of $(\alpha h\nu)^2$ versus $h\nu$ (fig.4). The energy gap of 1.75 eV is of pure CdSe thin films and as the concentration of T1 increases the energy gap decreases upto 1.55 eV for 0.07 mole % and thereafter increases upto 2.01 eV (for 2 mole % Tl.). Such variation of Eg with T1 doping is shown in fig. 5. For higher doping concentrations the energy gap is more or less the same, we may attribute the decrease in band gap to the improved grain structure of the film owing to segregation of the impurity atoms along the grain boundaries. (15,21). The linear dependence of $(\alpha h\nu)^2$ on $h\nu$ indicates the presence of direct allowed type optical transition.

As suggested by values of absorption co-efficient (α) and straight line nature of the $(\alpha h\nu)^2$ Vs $h\nu$, especially on high energy side, the mode of optical transition in these films have also been confirmed by computing ln $(\alpha h\nu)$ versus ln($h\nu$-Eg) curve. For direct allowed type of transitions, this variation should yield a straight line with slope equal to 0.5 (16) The slope determined for all these films are cited in Table no. 1 The values of m nearly equal to 0.5 confirming the direct type of transition.

3.4 Electrical properties:

The electrical conductivity of good quality sample was measured in the temperature range of 350 to 500 K. The observed electrical conductivity at 458 K was calculated in terms of specific conductivity for all the samples and found in the range of 10^{-5} to 10^{-6} $(\Omega - cm)^{-1}$. The low value of conductivity can be due to small grain size, grain boundary discontinuity effect, lack of stoichiometry and an increased amount of disorder during growth process (17-23). The variation of electrical conductivity with 1/T is shown in fig. 6. The activation energy of an electrical conduction has been determined and found to be 0.82 eV for pure CdSe film. Activation energy decreases as doping concentration is increased upto 0.07 mole % and then increases for higher concentration of thallium doping. Slight increase in conductivity with Tl doping concentration can be considered due to improvement in the grain size that reduces the height of the grain boundry potential, thereby increasing the carrier concentration, mobility and electrical conductivity. The fact that the conductivity did not vary much can be understood by considering the poor donar action of substitutional Tl atoms in

the sample. From the thermoelectric power measurements[24] pure and doped CdSe shows n-type semi conductivity.

IV. Conclusions

Pure CdSe and Tl doped CdSe thin films were obtained by simple chemical deposition technique. The films are polycrystalline in nature with cubic structure. The optical study shows the energy gap decreased down to 1.55 as the T1 concentration increases upto 0.07%. There after it increases and saturate. The increase in grain size can also be seen from Scanning Electron Microscopic photographs. Similar observation were obtained for electrical conductivity. Pure as well as Tl doped CdSe film shows n-type conduction. Small amount of Thallium doping concentration changes the properties as desired for device application.

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Figure Caption

Fig. 1 : XRD pattern of CdSe thin film.
Fig. 2: S. E. M. Photographs of Pure CdSe and doped CdSe thin films.
Fig.3.:The variation of absorption coefficient Vs wavelength of CdSe thin film and Tl doped thin films.
Fig. 4 : The variation of $(\alpha h\nu)^2$ Vs $h\nu$ for various Tl doped thin films.
Fig. 5 : Variation of Band Gap (Eg) with [Tl].
Fig. 6 : Log σ Vs 10^3/ T for various films.

Table No. 1 : Composition dependent parameters of Tl doped CdSe thin films.

Sr. No.	Doping conc. (mole %) in CdSe		band gaps (eV)	Conductivity in $(\Omega\ cm)^{-1}$ at temperature 223K	Grain size (in ⊕)	Lattice parameter. ⊕	Power factor m
	In Bath	In Film					
1	0	0	1.75	7×10^{-6}	131	6.070	0.54
2	0.02	0.018	1.63	9×10^{-6}	151	6.062	0.62
3	0.05	0.048	1.58	1×10^{-5}	160	6.04	0.6
4	0.07	0.065	1.55	2.1×10^{-5}	177	6.01	0.66
5	0.2	0.18	1.85	3.5×10^{-5}	171	5.998	0.49
6	0.5	0.48	1.95	4.0×10^{-5}	--	6.11	0.47
7	2.0	1.8	2.01	6.0×10^{-5}	--	6.13	0.61

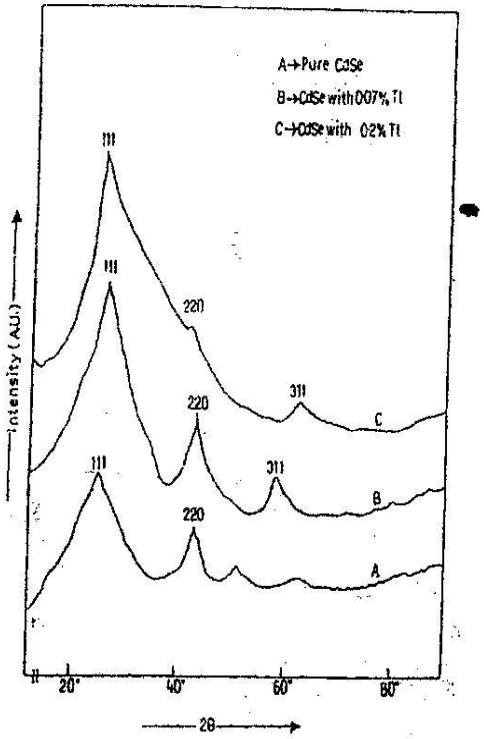


Fig.-1 : XRD patterns of pure and Tl(III) CdSe thin fim.

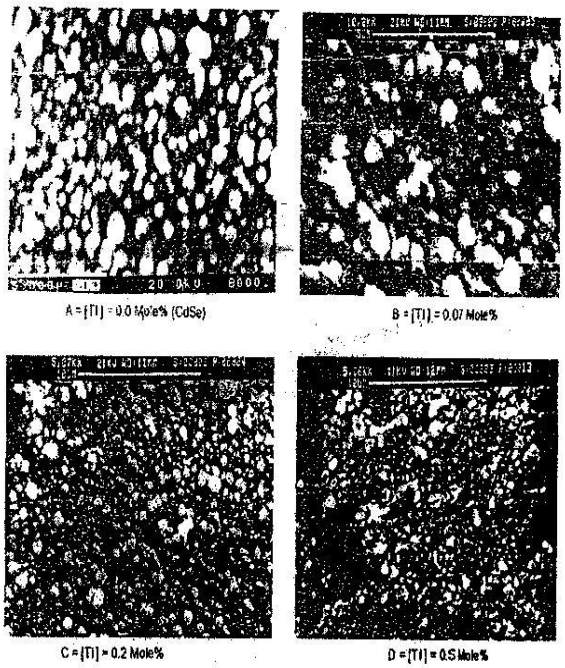
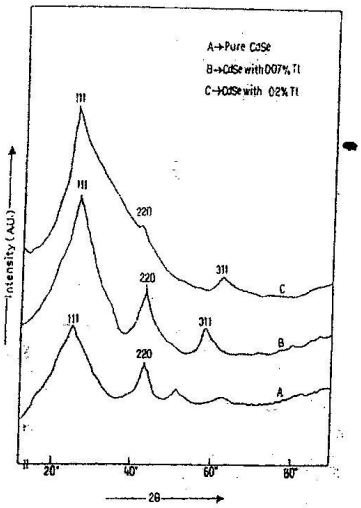


Fig.-2 : SEM photographs of pure CdSe and doped CdSe thin films.



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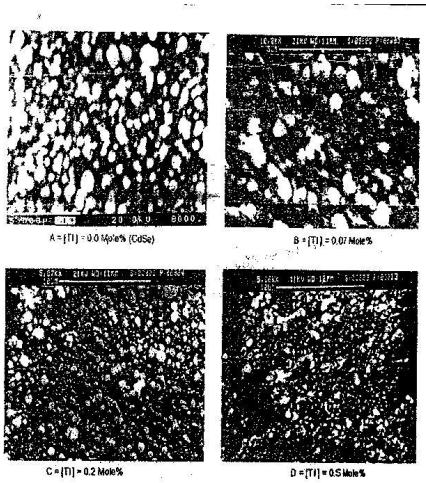

Fig.-2 : SEM photographs of pure CdSe and doped CdSe thin films.

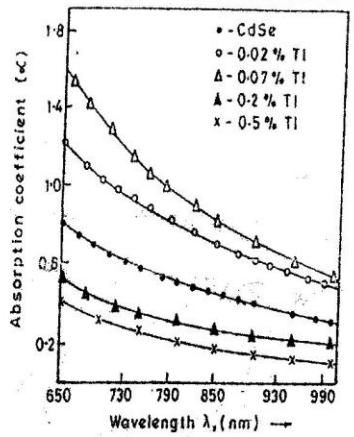

Fig.- 3 : The variation of absorption coefficient vs. wavelength of CdSe thin film and Tl(III) doped thin films.

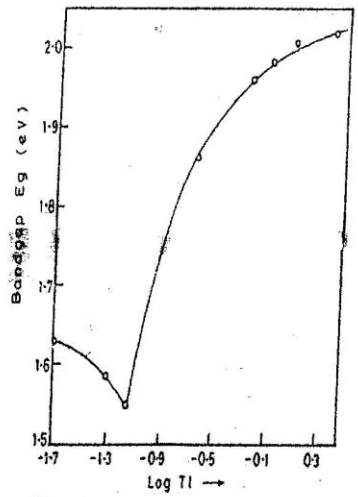

Fig.-5 : Variation of bandgap (Eg) with Tl(III) concentration.

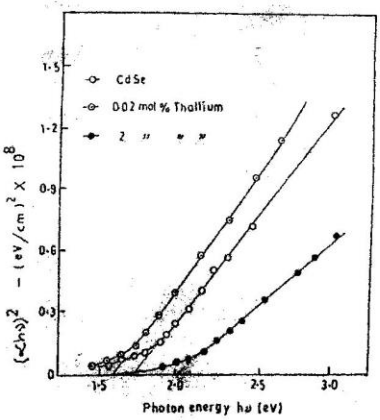

Fig.-4 : The variation of (αhv)2 vs hv for various Tl(III) doped thin fims.

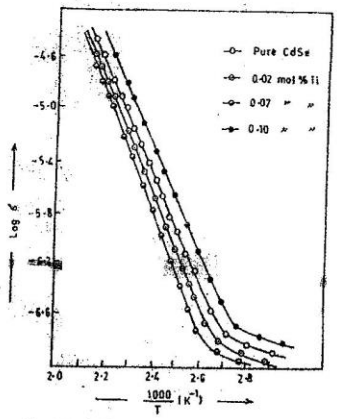

Fig.-6 : The logα vs 10^3 IT for various films.

Study of effective management of sand in foundry

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Abstract- One of the major problem that is faced by the casting foundarys is the availability of good quality of sand for the co2 sand casting process. Large castings are made by using co2 sand casting process. In order to create large moulds for casting a large quantity of sand is required. In co2 process once the sand is used for molding this sand looses the molding properties. As a result this sand can't be reused for molding. This increases the cost of production. As a result cost of casting also increases. This paricular study was conducted in a casting foundary in Kerala. In this study various alternatives wear studied. Out of the possible alternatives blending has been identified as the feasible option. New sand was blended with used sand after treatment. Various tests are conducted in the sand lab. Test result of blended sand shows acceptable properties. It also results in significant cost reduction.

Index Terms- Blending of sand, Conventional sand molding, Cost reduction, Sand reuse.

I. INTRODUCTION

The topic 'CO2 sand reclamation' is being made the subject of this particular study.-One of the major problem that is faced by the casting foundarys is the availability of good quality of sand for the co2 sand casting process. Large castings are made by using co2 sand casting process. In order to create large moulds for casting a large quantity of sand is required. In co2 process once the sand is used for moulding this sand looses the molding properties. As a result this sand can't be reused for molding. This increases the cost of production. As a result cost of casting also increases. This paricular study was conducted in a casting foundary in Kerala and the standards adopted are from the British Cast Iron Research Assosiation (BCIRA) broad sheet. This is an internationally accepted standard for foundries. . Currently company uses sand in its compound .But now the availability of new sand is very less .Company requires on an average of 9000MT of sand every year. Out of it 7000MT of the sand is used for co2 sand casting process. In this study various alternatives wear studied. Various alternatives are.

- Purchase sand from outside
- Adopt another process for large casting
- Blending of old sand with new sand

Out of the possible alternatives blending has been identified as the feasible option. Various tests are conducted in the sand lab. Test result of blended sand shows acceptable properties. It also results in significant cost reduction.

II. MATERIALS AND METHOD

I. . Description of case study plant

This study was carried out in a casting unit located in India. The case study plant is a public sector undertaking under the Government of Kerala, India. There are approximately 450 employees working at 10 departments of the plant. The firm have manufacturing facilities like pattern shop, core making section, hand and machine molding section, furnace, in house maintenance, fettling and inspection facilities. company requires on an average of 9000MT of sand every year. Out of it 7000MT of the sand is used for co2 sand casting process. Once sand is used this sand cant be reused because of the formation of water glass. Currently company uses sand in its compound .But now the availability of new sand is very less. So company need to find out possible alternatives to proceed the co2 process.

B. Description of conventional sand molding process

Sodium silicate bonded sand is by far the most common foundry molding system. A finely graded dry SILICA refractory sand is used for this process For molding, the sand is mixed with a proportional quantity of a sodium silicate binder, also known as WATERGLASS, this is essentially a water soluble vitreous material suspended in SODA (a strong alkaline), sodium silicate for foundry molding is supplied as a thick viscous syrup. The most efficient method of mixing sand with the binder is with a SAND MILL. After the foundry molder has completed a given section of the mould, a needle like probe is inserted into the still pliable sand to form one or more inlets. Carbon dioxide gas is supplied to a gas gun via a cylinder and regulation– broadly similar to the flow control system found in gas welding processes. The gas gun is then inserted into each vent on the sand piece and carbon dioxide released at a specified pressure for a pre-determined period of time – variable according to the volume of the sand in the mould. Large volumes of sand are sometimes needle vented all over, then enclosed with a flask cover plate, enabling the enclosed mass to be gassed off by a single CO2 injection. By repeating the gassing off process for each molded section, the individual elements of the mould can be hardened to a degree that allows them to be removed or stripped from around the pattern without breaking. The hardness of fully set foundry sand can be close to that of some naturally occurring sand stones. As a consequence, large blocks of sand can be very robust and difficult to break up. Indeed, such is the strength of many artificially bonded sands that it is quite possible to make a , where molded sand pieces are simply glued together and/or reinforced with a steel pallet strapping, thus dispensing totally with an outer containing flask. Sections of spent sand can be exceptionally difficult to remove from around a formed metal cast during the knock out stage; this can cause problems especially when clearing sand from an internal core mass Potentially problematic sections like cores often have an added ingredient called a breakdown powder processed into the sand during milling operations. Breakdown powder (colored for easy identification), contains an organic compound which in the case of sodium silicate bonded sands is a sugar (DEXTROSE) based substance. Breakdown powder reacts with the heat evolved in the mould after a metal pour to degrade the chemical bond between the sand and binder. This reaction makes the removal of refractory sand cores far easier than might otherwise be the case.

C .Methodology used

Blending was selected as the feasible option. Sample of new and used sand are collected. Blending of new and used sand at various ratio . Properties are tested in lab and test results are compared

D .Test procedure

Sample of new and used sand was collected from sand yard. Sand was washed and dried in a electric oven at 100 degree Celsius for about one hour. Sand is then passed through a primary sieve. Sieve analysis was conducted on used sand and new sand to find out whether the sample have grain size which are required for molding according to the foundry standard. Sand muller of capacity two kg is used to mix sand with sodium silicate. Two kg of sand was measured and added to the muller . Sodium silicate was accurately measured and added to the sand. Sand muller was operated for three minutes in order to get a proper mixing of sodium silicate with the sand. 50 gram of molding sand was measured and filled in to the specimen tube. By using a sand rammer. Then CO2 gas is passed to both sides of the specimen for about one minute in order to form a good bond between the sand grains. Sand strength testing equipment is used to test the dry shear strength (DSS) and dry compression strength (DCS). The permeability is tested to see if it is correct for the casting conditions. The permeability number, which has no units, is determined by the rate of flow of air, under standard pressure, through a rammed cylindrical specimen. DIN standards define the specimen dimensions to be 50 mm in diameter and 50 mm tall, while the American Foundry Society defines it to be two inches in diameter and two inches tall. rammed cylindrical specimen. 20 to 50gms of prepared sand is placed in the pan and is heated by an infrared heater bulb for 2 to 3 minutes. The moisture in the molding sand is thus evaporated. Molding sand is taken out of the pan and reweighed. The percentage of moisture can be calculated from the difference in the weights, of the original moist and the consequently dried sand samples. Tested results are compared and most suitable ratio is selected.

III. WORK DONE

A. *New sand sieve analysis*

SIEVE NO	Total sand retained	Retained in each	(Retained in each)*2	(SIEVE NO) *(retained in each) * 2
10	nil	nil	nil	nil
12	nil	nil	nil	nil
20	1.2	1.2	2.4	28.8
30	5.8	4.6	9.2	184
40	22.6	16.8	33.6	1008
50	38.4	15.8	31.6	1264
70	48.3	9.9	19.8	990
100	49.4	1.1	2.2	154
140	49.8	0.4	0.8	80
200	49.9	0.1	0.2	28
270	50	0.1	0.2	40
PAN	nil	nil	nil	nil

AFS NO – 37.76

Result of new sand sieve test shows that selected sample is with in the acceptable range. The acceptable range is between 35 to 45.

B. Used sand sieve analysis

SIEVE NO	Total sand retained	Retained in each	(Retained in each)*2	(SIEVE NO) *(retained in each) * 2
10	nil	nil	nil	nil
12	nil	nil	nil	nil
20	1.2	1.2	2.4	28.8
30	5.5	4.3	8.6	172
40	25.9	20.4	40.8	1224
50	40.2	14.3	28.6	1144
70	48.2	8	16	800
100	49.3	1.1	2.2	154
140	49.8	0.5	1	100
200	49.9	0.1	0.2	28
270	50	0.1	0.2	40
PAN	nil	nil	nil	nil

AFS NO – 36.90

Result of used sand sieve test shows that selected sample is with in the acceptable range. The acceptable range is between 35 to 45.

C. Properties of new sand

Properties	Unit	Min	Max	Sample 1
Moisture	%	2	2.5	2
Permeability	no	200	400	220
DCS	psi	180	240	237
DSS	psi	40	80	48

D. Properties of used sand

Properties	Unit	Min	Max	Sample 1
Moisture	%	2	2.5	2.1
Permeability	no	200	400	210
DCS	psi	180	240	153
DSS	psi	40	80	33

Various properties of new and used sand was tested and found out that used sand have low properties. Such sand can't be directly used for molding. Blending of new sand and used sand at various ratio was conducted and for each ratio various properties are tested and among them most acceptable ratio was selected.

E. New sand 10% and old sand 90%

Properties	Unit	Min	Max	Sample 1	Sample 2	Sample 3
Moisture	%	2	2.5	2.1	2.1	2.2
Permeability	no	200	400	240	220	240
DCS	psi	180	240	138	129.7	133.9
DSS	psi	40	80	42	46.4	33.8

F. New sand 20% and old sand 80%

Properties	Unit	Min	Max	Sample 1	Sample 2	Sample 3
Moisture	%	2	2.5	2.1	2.1	2
Permeability	no	200	400	230	240	240
DCS	psi	180	240	148	153	140
DSS	psi	40	80	37.5	42	39

G. New sand 30% and old sand 70%

Properties	Unit	Min	Max	Sample 1	Sample 2	Sample 3
Moisture	%	2	2.5	2.1	2	2.1
Permeability	no	200	400	220	220	210
DCS	psi	180	240	163	159	167
DSS	psi	40	80	51.3	50.73	48

H. New sand 40% and old sand 60%

Properties	Unit	Min	Max	Sample 1	Sample 2	Sample 3
Moisture	%	2	2.5	2	2	2
Permeability	no	200	400	220	230	220
DCS	psi	180	240	179	171	178.7
DSS	psi	40	80	50.73	55	49.9

I. New sand 50% and old sand 50%

Properties	Unit	Min	Max	Sample 1	Sample 2	Sample 3
Moisture	%	2	2.5	2.1	2.2	2.2
Permeability	no	200	400	210	200	210
DCS	psi	180	240	218	210	200
DSS	psi	40	80	61.32	57	55

IV. RESULT AND DISCUSSION

The company can reduce the dependence on new sand by at least 50 percentages.

- 50:50 ratio can be used as the facing sand
- 60:40 ratio can be used as packing sand

But for the reduction in new sand we need additional investments in the form of a sand reclamation plant. An initial investment cost of Rs 14000000 is required to set up a sand reclamation plant of capacity 10 metric ton per hour.

V. CALCULATION FOR PAYBACK PERIOD

- New sand required for CO_2 process = 6971 MT
- Cost of purchasing sand = 1700 Rs/MT
- Reduction in new sand = .5*6971= 3485.5 MT
- Cost saved due to sand reclamation=5925350 Rs/year
- Cost of equipment=14000000 Rs
- Electricity consumed=140 units/Hr
- Electricity charge per unit=6.8 Rs
- Working capacity of equipment=10 MT/Hr
- No of hr equipment should run=3485/10=349 Hr
- Total electricity consumed =349*140=48860 units
- Total electricity cost =332248 Rs/year
- Total maintenance cost = 280000 Rs/year
- Total running cost=332248+280000=6122248 Rs/year

Year	Cost saved On sand	Running cost	Depreciation cost	Running +depreciation cost	Total savings
1	5925350	612248	1447600	2059848	3865502
2	5925350	612248	1297918	1910166	4015184
3	5925350	612248	1163713	1775961	4149389
4	5925350	612248	1043385	1655633	4269717

- Total savings with in 4 year = 16299792 Rs
- Equipment cost can be covered in the 4th year

VI. CONCLUSIONS

Conventional molding line is facing a huge problem of sand scarcity. company requires on an average of 9000MT of sand every year. Out of it 7000MT of the sand is used for co2 sand casting process. Once sand is used this sand cant be reused because of the formation of water glass. Currently company uses sand in its compound .But now the availability of new sand is very less . Out of the possible alternatives blending has been identified as the feasible option. Test result of blended sand shows acceptable properties. It also results in significant cost reduction. The company can reduce the dependence on new sand by at least 50 percentages. But for the reduction in new sand we need additional investments in the form of a sand reclamation plant. An initial investment cost of Rs 14000000 is required to set up a sand reclamation plant of capacity 10 metric ton per hour. From the payback period calculation it was found that equipment cost can be covered in the 4th year.

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Emerging role of Recruitment Process Outsourcing in MNCs

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Abstract- With growing diversity in business organisations, it has become mandatory to outsource the non-core activities and focus more on core functions, because only those organisations succeed which have core competency in conducting and managing their business. A major concern is to manage diversified human resources since, human resources are the most valuable resources for every organisation and optimal utilization of this resource helps to meet individual, organizational and societal objectives. This concern paved way for growth of agencies which specialize in providing right people for the right job, at the right time and in right number. Such agencies are called as Recruitment Process Outsourcing agencies, with whose help organisations get the right type of people to work in their organisation. The purpose of this paper is to communicate Human Resource Management needs to industries across the globe so that the organisations which are not aware get awareness about latest trends in recruitment outsourcing and avail benefit with its services.

This paper will enable us to get answers to questions like, what it is, how it functions, is it useful, how companies are currently using it, what is the future scope of Recruitment agencies, how it is linked to both individual and organizational goals.

Index Terms- Core Competency, Human Resource Management, Outsourcing, Recruitment process Outsourcing (RPO)

I. Introduction

"Recruitment Process Outsourcing means an agency or third party which carries out the recruitment process on behalf of the company."

RPO is the service provider to which the company can outsource its recruitment process for a nominal fee. The core competency of RPO helps the companies to select the best candidate out of the entire pool of applicants by carefully sorting, selecting and analyzing the applications. The RPO Alliance, a group of the Human Resources Outsourcing Association (HROA), says, "Recruitment Process Outsourcing (RPO) is a form of business process outsourcing (BPO) where an employer transfers all or part of its recruitment process to an external service provider. An RPO provider can provide its own or may take help from the company's staff, technology, methodologies and reporting." So, Recruitment Process Outsourcing is the third party to which an organisation outsources its recruitment for certain fees.

II. Functioning of Recruiment Process Outsourcing Agencies

RPO service providers claim to have lower costs because of the economies of scale with big staff of recruiters, databases of candidate resumes, and investment in recruitment tools and networks. They also lower the costs and fixed expenses of the client by reducing need of Human resource Managers in their organisations and the resources needed for recruitment process. They also claim to have higher quality, because the commercial relationship between an RPO service provider and client is based on specific performance targets. In most cases the fees of RPO is based on the effectiveness of its recruitment process.

In the UK, James Caan was the first to develop RPO in the 1990s and offers global RPO solutions with his business partners Jon Bennett and Rachel McKenzie through his company, HB Retinue. The Outsourcing institute awarded Accolo, an RPO, for best RPO services for General Services Capability and Value for fees out of a field of over 40 RPO providers worldwide. Accolo screens out over 70% of unqualified candidates with a focus on hiring the top candidates.

Many RPO agencies say that, *"RPO= Hire Capability+ Hire Value".*

III. Latest Projections for RPO in the Coming Years

Recruitment is not just filling the manpower gap in the organisation now, but, emerged as a high- stake competition to foresee economic, political, technological, demographic, socio-cultural factors at the one end and business projections, talent gaps at the other.

- As per the recent report of KellyOCG, the recruitment outsourcing agency through its survey reported an anticipated increase in hiring senior managers from small, medium and large organisations from the America, Europe, Middle East and Africa and the Asia Pacific region to 73% for internal full time recruitment and 57% increase in contingent hiring. Where only 46% are familiar with RPO and out of this only 26 % are currently outsourcing.

Thus, despite substantial increase in recruitment outsourcing there are number of firms who are still unaware of the RPO agencies. Thus a great scope lies in the RPO industry for the coming years in the unexplored areas. However, according to recent studies the biggest challenge for HR professionals today is recruiting quality talent.

- The 2013 PWC survey reported that more than half of US CEO's say shortage of skills is a potential threat to growth this year. Saeten, a Chicago –based RPO based on customer – focused approach of service delivery operating under various brand names like PeopleScout & StudentScout reported an existing client expansion and new client engagements for the coming year.

Thus the customer focused approach of RPO's will further widen the growth in near future and more companies will outsource its HR areas. Another result for KeneXa, an IBM Company which recruits especially for call centers using its leverage technology and sourcing techniques to uncover hidden talent of the people projected an increase in focus on project – based recruitment in 2015 for its major clients. As per HFS Research, the global HR BPO market is valued at $42 billion as of 2013 with the Asia Pacific market at $3 billion.

- As per a recent survey conducted on a sample of 36 top managers from Egyptian and Non-Egyptian companies operating in various fields in Egypt discovered that 55% of these companies were involved in recruitment outsourcing. A contrary to logic result found that the cost reduction factor was not perceived by Egyptian managers as a valuable reason to outsource their recruitment function.

The results of the survey override the lower cost advantage of using RPO agencies. One of the reasons could be that RPO service providers exaggerate the price of their services and charges at least one monthly salary for each hired employee from the companies.

For example, a security labor hired through an outsourced service provider will cost higher, on an average from 8% to 15%, in comparison to security labor hired through walk-in interviews. Therefore, Cost saving alone is not the only reason for outsourcing recruitment since organizations want to increase their recruiting effectiveness by delivering better-quality candidates to hiring managers. Thus, hiring appears robust for the coming year as per the projections.

- The recent acquisition of HRX, a leading RPO by Seaten, a Chicago –Based Company proved further that the spectrum of RPO is increasing as more and more companies are joining hands together with the urge to recruit the best candidates for their organisations. "The combination of our PeopleScout division and HRX will bring tangible benefits to RPO clients in the form of enhanced sourcing technology, expanded service offerings, and additional global reach," commented Patrick Beharelle, Seaton CEO.

Thus, it's no doubt that recruitment outsourcing has become a fashion for the companies now. The brand building of the RPO will further boost its growth and more companies are likely to use RPO services in coming years.

Table 1: Trends in RPO service agencies

Last 10 years	Current Scenario	Projection for coming years
RPO gained momentum in big and medium sized companies.	RPO gained momentum in all types of companies.	RPO shall gain momentum beyond companies, i.e. will be used by business houses as well.
Main reason for RPO is cost and time benefit for Companies.	Main reason is cost and time benefit along with benefit of specialisation and right candidate for the right job.	Main reason will not be cost since companies are focusing more on talent hunt and ready to pay any price.
RPO size was small, since, it was provided by individual vendors.	RPO size increased in volume and brand since companies joined hands with RPO.	RPO service agencies size to increase substantially, due to, reported mergers and acquisitions.
RPO was popular among developed nations only to provide recruitment solutions to its clients.	RPO diversified to other countries across globe to provide customized recruitment solutions to its clients.	RPO shall diversify to other areas of HR not just recruitment but compensation, development, integration & maintenance of employees.

IV. INDIA AS A HOTSPOT RPO IN COMING YEARS

In a bid to cut costs, corporate giants based in the United States and the UK are looking for RPO services from emerging market locations like India, a survey says. According to global consulting and research firm Everest Group, increasing cost pressures in the current economic environment has led North American and UK buyers to start receiving the back-office RPO services from offshore location such as India.

"The value proposition of RPO is still resonating with buyers that are looking for a cost-effective option to withstand the current turmoil and at the same time create an efficient talent acquisition process that can be scaled up quickly when business environment improves," Everest Group Principal and Country Head Gaurav Gupta said.

Indian suppliers such as Infosys, Wipro and Caliber Point have already entered the league of RPO's in the past two years, while Western suppliers such as Momentum and PeopleScout are also leveraging India for delivering RPO services.

V. MAJOR RPO ACQUISITIONS TILL NOW

- IBM acquired Kenexa
- ADP acquired The RightThing
- Legacy staffing firms (Kelly, AppleOne) continue to grow their RPO practices and are marketing customized solutions.
- Small & medium sized RPO firms are partnering more to be competitive. PierPoint is a small, tech-focused sourcing company that has evolved as a RPO with high technology.
- In another tie-up "Serco has been chosen as an exclusive partner and will act as a talent acquisition and transformation partner. Under the arrangement, Serco will deploy over 350 personnel across 11 locations in India in the next four months," the company said in a statement.
- Recently, Seaton, a Chicago-based outsourced provider of human capital management, announced it has acquired HRX, a leading recruitment process outsourcing (RPO) provider headquartered in Sydney, Australia. HRX will join Seaton's operating brands, which include Staff Management, PeopleScout and StudentScout and will be known as HRX, a PeopleScout Company.

VI. CONCLUSION: SATISFACTION LEVEL OF EMPLOYER AND EMPLOYEE

Recruitment process outsourcing is a powerful strategy used by many organizations globally which helps to save the cost, time and improves the quality of recruitment. Outsourcing HR, specially recruitment process is a strategy used by many organizations all across the world but the human side of HR has suffered from it along with the profitability because the external agencies are not well aware with the structure, culture, values and system of the organization and therefore fail to nurture commitment and loyalty among employees.

But, despite all RPO has increasingly gained momentum and will continue due to growing global competition and scarcity of talented people in the organisation. The following are the benefits which RPO offers to its clients and their employees.

For client/employer:

- Measurable result
- Lowered cost & shared risk
- Reduced time to fill
- Compliance - Adherence to all necessary compliance measures within the sourcing, recruiting, and hiring process
- Uniformity
- Elite talent - Global bandwidth and high-touch approach attract top talent
- Quality- Utilizing a team of experienced, professional recruiters can increase the quality of hire and the speed with which you fill open positions.

For employee:

- Right match with right job
- Increases scope of future growth
- Better compatibility
- Greater satisfaction
- Far reach
- More options to explore
- Better assurance

Thus, Recruitment Process Outsourcing is both a tool and a safeguard used by the organisations to fight the scarcity of talented people to work with them at the right time, at right cost, at right place and in right number to satisfy both individual and organizational objectives.

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Emotional, Social and Educational Adjustment of Visually Handicapped Students of Special Schools students

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Abstract- The objectives of the present investigation is to the educational, social and emotional adjustment of boys and girls of visual handicapped Students of special school of Faridabad. Samplings were selected through random sampling techniques. Data was collected with the help of adjustment inventory (standardized) by Dr. A.K.P Sinha (Patna) and Dr. R.P Singh (Pune) (AISS). two special blind school from in and around Faridabad division of Haryana State. By the application of mean, standard deviation, and t-test indicated is no significant difference between the educational social and emotional adjustments of special school Students belonging to boys and girls.

I. Introduction

Adjustment is as old as human race on earth. During early days the Concept was purely biological and Darwin used the term as adaptation strictly for physical demands of the environment but Psychologists use the term adjustment for varying conditions of social or interpersonal relations in the society. The term 'adjustment' can be defined as the process of finding and adapting modes of behavior suitable to the environment or to change the environment.

Adjustment can be viewed from two angles. The first view being 'adjustment as an achievement' means how efficiently an individual can perform his/her duties in different circumstances such as military, education, business and other social activities. The second view is 'adjustment as a process', which is of major importance to psychologists, teachers and parents. The process of adjustment starts from birth of the child and continues till death. Thus, we see that adjustment means reactions to the demands and Pressures of social environment imposed upon the individual. The demands may be external (social and educational) or internal (emotional) to which the individual has to react. These two types of demands sometimes clash with each other and consequently make the adjustment a complicated process for the individual.

Psychologists have interpreted adjustment from two important points of views. One adjustment as an achievement and another adjustment as a process. Piaget (1952) used the term accommodation and assimilation to represent the alterations of oneself or environment as a means of adjustment. "Adjustment is the process by which a living organism maintains a balance between its needs and the circumstances that influence the satisfaction of these needs."(Shaffer, 1961). Ark off (1968) view that "Adjustment is the interaction between a person and his environment. An individual is adjusted if he is adjusted to himself and to his environment." "Adjustment would be a harmonious relationship of an individual to his environment which affords him comfortable life devoid of strain, stress, conflict and frustration."

Adjustment of a student is related to arrive at a balanced state between his needs and satisfaction. Needs of the individual are multidimensional. Students have good adjustment in all the aspects of their life if there is balance between their academic, intellectual, emotional, social and other needs and their satisfaction. The situation that offers few barriers makes the person struggle to overcome them. The adjustment process is affected and modified by the individual's experiences.

There is a continuous struggle between the needs of the individual and the forces outside his environment. It consists in the reduction of inner needs, stances and strains. Individual needs differ from person to person and from time to time. Accordingly he adjusts himself in the immediate environment to meet his needs. This leads to lack of control over emotions and it results in emotional instability. Adequate emotional adjustment and willingness to learn to meet the requirements of the environment are fundamental success in life.

Adjustment consists of two types of processes. The first one is fitting oneself into given circumstances and the second one is changing circumstances to fit one's needs. Hence adjustment is important in one's life.

Adjustment during the period of adolescence will determine to a large extent what he or she will be as a person as an adult. Adjustment implies a constant interaction between the person and his environment, each making demands on the other. Sometimes adjustment is accomplished when the person yields and accepts conditions, which are beyond his power to change. Sometimes it is achieved when the environment yields to the person's constructive activities. In most cases adjustment is a compromise between these two extremes and maladjustment is a failure to achieve a satisfactory compromise."

To develop an adequate understanding of psychological concept of adjustment, it is necessary to adopt some more of less consistent view point concerning basic human nature under three headings the moral view the phenomenological and behavioural or social learning view.

II. Visually impaired childern

Child's nature is multifaceted and flexible; the same potential may have different results depending on whether the environment encourages or discourages it. It is an accepted

notion that every child is like every other child and every child is unlike every other child. Each child has its own unique traits, which present it as a separate individual from others. Exceptional children too cannot be excluded from this.

All exceptional children have been classified into four main categories, for practical purposes, in the field of education. They are (1) Physically handicapped(2) Mentally retarded (3) Educationally handicapped and (4) Socially handicapped (Bhargava 1994). Further Visually handicapped Impaired Children fall into the bracket of sensory disabled children who are physically handicapped.

Educationally defined, the Visually Impaired Children are those whose visual loss Indicates that they should be educated chiefly through the use of Braille tactile and auditory materials. The partially seeing child is defined as one who has some remaining useful visual and some remaining useful visual materials as part of the educational programme. Education is the present day is a powerful force in bringing about development changes in the society. Similarly the role of education in physical, mental, social and emotional development of an individual is of paramount importance. Special education refers to the system of educational programmmes and services, which provide assistance to handicapped or disabled persons to develop their potential. The Special residential school concept is an accepted phenomenon all over the world even today. The issue of the residential schools at present as well as of the future could be justified through there is a baseless fear that the newly introduced concept of integrated education would replace residential type of education for the Visually Impaired Children.

Integration refers to the inclusion of the Visually Impaired Children in the general educational process. Most Visually Impaired Children are educated in regular classes with part-time special service. Adjustment is a part and parcel of life and is often considered as a continuous process where in every moment the Visually Impaired Children are subjected to situations where they have to make an adjustment.

A Visually Impaired Child who is capable of adopting itself to the existing situations and makes the best use of the opportunities available to it at school and with its peer group strives well in school settings such as classroom situation, peer circle/setting, and later in life. Friendship is the wrap and woof of the social fabric. It is defined as the set of certain characteristics. Each of these has boundary points that cannot be exceeded if the relationship has to be recognized as a genuine instance of friendship. It does not merely blind society together but provides essential emotional substance, buffering and individual against stress and preserving mental health.

Therefore the success with which a school is able to work with students who have special needs depends a great deal on the attitude of the teachers, school environment and peer group. The challenge posed by the expansion of facilities for education and training of Visually Impaired Children is greater today than it was a few decades ago. It is a challenge not only to encourage but also to improve the personality development of the Visually Impaired Children so that when they leave the school they are able to take place in a highly competitive and complex society where inefficiency and poor training will not be condoned.

Hence the present study was undertaken to know the peer adjustment pattern of the Visually handicapped Children attending special schools.

III. Need and Justification of the Study

Children need security and feeling of confidence that comes from teacher's side. Encouragement and motivation given by teachers help child in achieving higher goals and in shaping destiny. This study will enable teachers to know the response of handicapped students will regard to their involvement and with participation in their academic life. This study aims at sensitizing teachers with respect to Children's need and expectation. This would be further of great help to the teachers to understand how to monitor their special chidern's behaviour.

On the above discussion investigator found that various studies conducted on adjustment in relation to academic achievement, socio-economic status, adolescent's problem and home adjustment of school students. The study will be contributed towards human development in our society of which students are the future. Sometimes Students have to face many changes physically, mentally and socially and they find it difficult to tackle these changes it is the moral duty of teachers that they understand the problems of these students and give them orientation accordingly. The emotionally, socially and educationally well-adjusted students are an asset to the society and may lead to the evolution of much sought after model The study may add to the knowledge of the teachers and social workers in improving the student's faith, confidence and emotions. therefore the investigators study the emotional, social and educational adjustment of special school students of Faridabad.

Objectives :

1. To study the educational adjustment of boys and girls of visual handicapped Students of Special School.
2. To study the social adjustment of. Boys and girls of visual handicapped Students of Special School.
3. To study the emotional adjustment of boys and girls of visual handicapped Students of Special School.

Hypothesis :

1. There is no significant difference between the Educational adjustments of boys and girls of visual handicapped Students of Special School.
2. There is no significant difference between the Social adjustments of boys and girls of visual handicapped Students of Special School.
3. There is no significant difference between the Emotional adjustments of boys and girls of visual handicapped Students of Special School.

Method:

The descriptive survey method is used in the present investigation..

Sample:

The sample of the study consisted of 100 Students (50 from boys area and 50 from girls area) studying in class VI to VIII

They were selected randomly from two Special blind Institutes of Faridabad area affiliated to Haryana. Purposive sampling was used in this study.

Tool :

Adjustment inventory (standardized) by Dr. A.K.P Sinha (Patna) and Dr. R.P Singh (Pune) (AISS).`

Statistical Techniques:

Mean, Standard Deviation and t-test .

TABLE – 1

Mean, S.D. and the t-value of the scores of Educational Adjustment, Social Adjustment and Emotional Adjustment Emotional Adjustment of Special School students belonging to boys and girls :

Sr,No.	Adjustment Dimension	Variables	N	Mean	SD	't' Value
1.	Educational Adjustment	Boys	50	2.6	1.57	0.30
		Girls	50	3.2	1.16	
2.	social Adjustment	Boys	50	4.16	1.4	4.04
		Girls	50	5.88	1.61	
3	Emotional Adjustment	Boys	50	1.6	1.49	0.25
		Girls	50	2.68		

Level of Significance	Value
t 0.05	2.01
t 0.01	2.68

Not significant at .01 and .05 level.

The table 1 represents the mean, Standard Deviation and Significance of difference in mean scores of respondents of educational adjustment of Special school students belonging to boys and girls The mean value of educational adjustment of Special school students belonging to boys is 2.6. The mean value of students belonging to girls is 1.16.Similarly the S.D. value of educational adjustment of Special. School students belonging to boys are 1.57. The S.D.value of Special. School students belonging to girls is 1.16 respectively. The t-value is 0.30. It is not significant at 0.01 & 0.05 level. So we can say the null hypothesis H01. There is no significant difference between the educational adjustments of special school students is accepted.

whereas the mean, Standard Deviation and Significance of difference in mean scores of respondents of social adjustment of Special. School students belonging to boys and girls. The mean value of social adjustment of Special school students belonging to boys is 4.16. The mean value of students belonging to girls is 5.88. Similarly the S.D. value of emotional adjustment of Special. School students belonging to boys are 1.4. The S.D. value of Special School student belonging to girls is 1.61 respectively. The t-value is 4.04. It is significant at 0.01 & 0.05 level. So we can say the null hypothesis H02. There is significant difference between the social adjustments of special school students is rejected

While the mean, Standard Deviation and Significance of difference in mean scores of respondents of emotional adjustment of Special. School students belonging to boys and girls. The mean value of emotional adjustment of Special school students belonging to boy's is1.6. The mean value of students belonging to girl's is 2.68. Similarly the S.D. value of emotional adjustment of Special. School students' belonging to boys is 1.49. The S.D.value of Special School student belonging to girls is 1.32. respectively. The t-value is 0.25. It is not significant at 0.01 & 0.05 level. So we can say the Null Hypothesis H03. There is no significant difference between the emotional adjustments of special school students is accepted.

IV. Conclusions

From the above discussion and findings of the present investigation, come to the conclusion that the special school students get more adjustment.

From The Above Analysis Investigator Come To the Conclusion That:-

1.Educational Adjustment

There is no significant difference between educational adjustment of the special school students belonging to boys and girls thus the hypothesis no. 1 is accepted.

2.Social Adjustment

There is no significant difference between social adjustments of the Special. school sdents belonging to boys and girls. Thus the hypothesis no. 2 is rejected.

3. Emotional Adjustment

There is no significant difference between the emotional adjustments of special school Students belonging to boys and girls. Thus the hypothesis no. 3 is accepted.

Education implications:

On the basis of the following conclusions drawn in the present investigation

The following implications emerge:-

1. To educate visually impaired children are educated in regular classes with part-time special service.
2. To make the use of the devices and equipment that are helpful in increasing the visual access to printing material of other visionary objects for gaining desired information like magnifiers (hand-held, stand magnifier or spectacles magnifier) close circuit television and computers.
3. To make the visually impaired to learn number, concepts and making calculations especially in terms of counting, adding and subtracting etc. The help of a special mathematical aid name as "Cranmer abacus" may be taken.
4. To train the visually impaired children to make the use of speech plus talking calculator.
5. To make use of devices and equipment that may prove help to the visually impaired in their safe, smooth and efficient orientations and novelty with regard of the day to day living and work environment.

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Performance Analysis of High Pass Filter and Band Pass Filter Using DGS

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Abstract- The performance of a high pass filter (HPF) and a band pass filter (BPF) with and without defected ground structure (DGS) was analyzed in this specific work. The Defected ground structure includes rectangular and circular etched shapes in ground plane. Calculation and comparison of the response of both filters was done separately. Parameters of the proposed configuration were calculated at the centre frequency of 1.5 GHz and also proposed designs were fabricated with dielectric constant of 4.4, loss tangent of 0.02 and substrate height of 1.6mm. Results were simulated using computer simulation technology software (CST) and fabricated structures tested on a spectrum analyzer. The undesired sidebands and fluctuations of response were reduced by using defected ground structure (DGS). Also the cut off point of the high pass filer is shifted to a higher frequency and an improvement in selectivity is achieved in the case of band pass filter (BPF).

Index Terms- High Pass Filter (HPF), Band Pass Filter (BPF), SMA (submarine version-A) Connector, Defected Ground Structure (DGS), Computer Simulation Technology Software (CST), Printed Circuit Board (PCB), Spectrum Analyzer.

I. Introduction

For designing high performance and compact filters, a defected ground structure has been widely used. A Defect on ground can change the propagation properties of a transmission line by changing the current distribution and applied field between the ground plane and upper surface. There are various different structures for implementing DGS [1]. By using these different DGS structures filters, power divider, power amplifier etc was implemented [2]-[9]. PBG (photonic bandgap) and EBG (electromagnetic bandgap) structure are also a type of DGS, which is created by etching different periodic shapes in the ground plane. However, it so difficult to use PBG structure for the design of the microwave or millimetre wave components due to the difficulties of the modulating and radiation from the periodic etched defects.

So many etched shapes for the microstrip could be used as a unit DGS. An LC unit circuit can represent the unit DGS circuit. They provide inductive and capacitive elements connected in series [10]. Which remove undesired output response fluctuations; move the high pass filer frequency limit to a higher value and the selectivity of a particular band is also improved in the case of BPF [11]. DGS has property of rejecting electromagnetic wave in certain frequency and direction, and most important function of these structures is the filtering of frequency bands, and harmonics of the filter in microwave circuit. In this proposed work an arbitrary shape of DGS is used to improve the parameters of the filters like return loss, transmission coefficient etc. And also the dimension of these different shapes varies to find efficient response. A lot of different shapes of DGS were tested and the more efficient one is introduces in this work.

II. Implementation of 6th Order High Pass Filter

The proposed high pass filter (HPF) consists of shunt short circuited stubs of electrical length Θ_c at some specified frequency f_c (usually the cut off frequency of HPF). These elements were separated by unit elements (UE) of length $2\Theta_c$ shown in the figure 1 [12]. In theory this type of filter has very wide band response for small Θ_c but this requires a high value of impedance in the short circuited stub (SC-Stub).

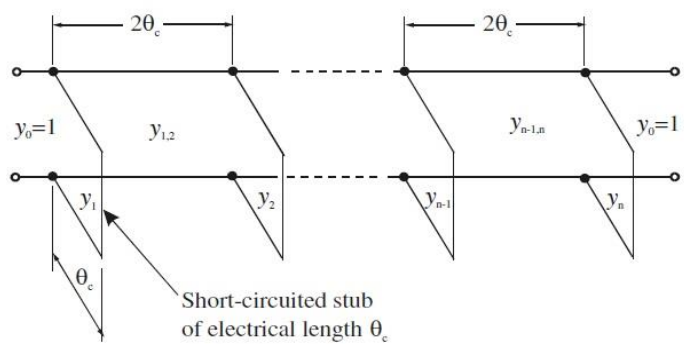


Figure 1: Optimum distributed highpass filter [12].

To design high pass filter let us consider the cut off frequency f_c=1.5GHz and 0.1dB Ripple in passband up to 5GHz. As in figure the electrical length Θ_c can be determined by equation (1) [12]:

$$\left(\frac{\pi}{\theta_c} - 1\right) f_c = 5 \quad (1)$$

By this, $\Theta_c = 30^0$ and for proposed 6th order filter shown in figure 2 have element values given in table 1. For given terminating impedance Z_0 the associated impedance values can be determined by equation (2) and (3) [12]

$$Z_i = Z_0/Y_i \quad (2)$$

$$Z_{i,i+1} = Z_0/Y_{i,i+1} \quad (3)$$

For i=1, 2.....6

Synthesis of *W/h* [12]

$$\frac{W}{h} = \frac{8\,e^{A}}{e^{2A}-2} \quad (4)$$

With $$A = \frac{Z_c}{60}\left[\frac{\varepsilon_r+1}{2}\right]^{0.5} + \frac{\varepsilon_r+1}{\varepsilon_r+1}\left[0.23 + \frac{0.11}{\varepsilon_r}\right]^{0.5}$$ (5)

Where

Zc = Zo = 50Ω and ε_r (dielectric constent) = 4.4, W= width, h = height of dielectric which is taken as 1.6mm.

Effective dielectric constant of dielectric material given by equation (6) and (7) [12]

For $W/h \leq 1$:

$$\varepsilon_{re} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left(1+12\,\frac{h}{w}\right)^{-0.5} \quad (6)$$

For W/h>1

$$\varepsilon_{re} = \frac{\varepsilon_r+1}{2} + \frac{\varepsilon_r-1}{2}\left[\left(1+12\,\frac{h}{w}\right)^{-0.5} + 0.04\left(1-\frac{w}{h}\right)^{2}\right] \quad (7)$$

Whereas guided wavelength is given by equation (8)

$$\lambda_g = \frac{300}{f(\mathrm{GHz})\sqrt{\varepsilon_{re}}} \quad (8)$$

ε_{re} = Effective dielectric constant , f= 1.5 GHz

Lengths of the elements (l) were determined by equation (9) [12]

$$\Theta_c = \beta * l \quad (9)$$

Where β is the phase constant.

For designing HPF use of circular and rectangular shape DGS were proposed. The radius of circle is taken as 7.5 mm and length and width of rectangle is taken as 5mm and 14mm respectively.

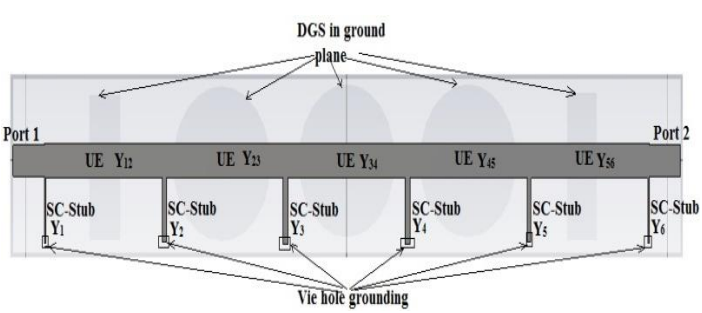


Figure 2: Proposed 6th order high Pass Filer with DGS.

Table 1: Element values of the proposed configuration.

s.no.	Element	Admittance values In mho	Impedance values In ohm	Length of the element (mm)	Width of the element (mm)
1	Unit element (UE)	$Y_{1,2}=Y_{5,6}=$ 1.0672, $Y_{2,3}=Y_{4,5}=$ 1.04395, $Y_{3,4}=$ 1.03794	$Z_{1,2}=Z_{5,6}=$ 46.85, $Z_{2,3}=Z_{4,5}=$ 47.895, $Z_{3,4}=$ 48.172	$l_{1,2}=l_{5,6}=$ 18.186, $l_{2,3}=l_{4,5}=$ 18.213, $l_{3,4}=$ 18.2195	$w_{1,2}=w_{5,6}=$ 3.4016, $w_{2,3}=w_{4,5}=$ 3.2828, $w_{3,4}=$ 3.25456
2	Short Circuited Stub	$Y_1=Y_6=$ 0.35346, $Y_2=Y_5=$ 0.46383, $Y_3=Y_4=$ 0.52615	$Z_1=Z_6=$ 141.46, $Z_2=Z_5=$ 107.798, $Z_3=Z_4=$ 95.03	$l_1=l_6=$ 9.8141, $l_2=l_5=$ 9.64, $l_3=l_4=$ 9.554	$w_1=w_6=$ 0.22672, $w_2=w_5=$ 0.57184, $w_3=w_4=$ 0.8144

III. Implementation of 5th Order Band Pass Filter

The bandpass filter can be design using short circuited stub shown in figure 3 [12]. The shunt short-circuited stubs are $\frac{\lambda_{go}}{4}$ long with connecting lines which are also $\frac{\lambda_{go}}{4}$ long. λ_{g0} is the guided wavelength in the medium of propagation at the midband frequency of f_0. The performance of an n degree filter depends on the characteristic admittances of short circuited stubs Y_i (i=1 to n) and also on the connecting line characteristic admittances $Y_{i,i+1}$ (i=1 to n-1).

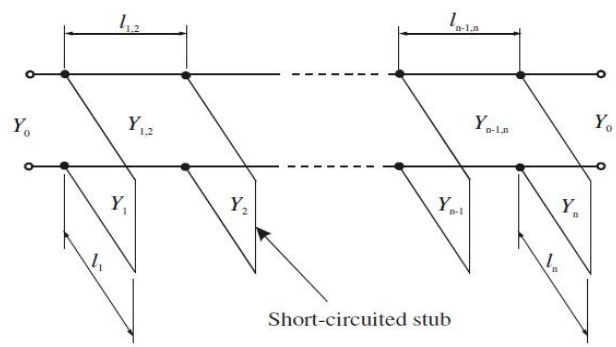


Figure 3: Bandpass filter with quarter-wavelength short-circuited stubs [12].

The bandpass filter (BPF) was designed with centre frequency of f_0=1.5GHz. Electromagnetic equations [12] used for the design of BPF are mention below-

The fractional bandwidth (FBW) of the BPF is given by equation (10)

$$FBW = \frac{f_2 - f_1}{f_0} \quad with \quad f_0 = \frac{f_1 + f_2}{2} \qquad (10)$$

where f_0=1.5GHz, f_1=1GHz, f_2=2GHz and also constants are given by equation (11)

$$\theta = \frac{\pi}{2}\left(1 - \frac{FBW}{2}\right) \text{ and } h=2 \qquad (11)$$

Calculation of admittances are given by following equations (12-19)

$$\frac{J_{1,2}}{Y_0} = g_0\sqrt{\frac{hg_1}{g_2}} \qquad (12)$$

$$\frac{J_{n-1,n}}{Y_0} = g_0\sqrt{\frac{hg_1g_{n+1}}{g_0g_{n-1}}} \qquad (13)$$

$$\frac{J_{i,i+1}}{Y_0} = \frac{hg_0g_1}{\sqrt{g_ig_{i+1}}} \qquad (14)$$

For i= 2 to n-2

$$N_{i,i+1} = \sqrt{\left(\frac{J_{i,i+1}}{Y_0}\right)^2 + \left(\frac{hg_0g_1\tan\theta}{2}\right)^2} \qquad (15)$$

For i= 1 to n-1

$$Y_1 = g_0Y_0\left(1 - \frac{h}{2}\right)g_1\tan\theta + Y_0\left(N_{1,2} - \frac{J_{1,2}}{Y_0}\right) \qquad (16)$$

$$Y_n = Y_0\left(g_ng_{n+1} - g_0g_1\frac{h}{2}\right)\tan\theta + Y_0\left(N_{n-1,n} - \frac{J_{n-1,n}}{Y_0}\right) \qquad (17)$$

$$Y_i = Y_0\left(N_{i-1,i} + N_{i,i+1} - \frac{J_{i-1,i}}{Y_0} - \frac{J_{i,i+1}}{Y_0}\right) \qquad (18)$$

For i= 2 to n-1

$$Y_{i,i+1} = Y_0\left(\frac{J_{i,i+1}}{Y_0}\right) \qquad (19)$$

For i= 1 to n-1

Equations (5) to (8) were used for the calculation of width of the impedance and guided wavelength.

Length of the admittances were given by equation (20)

$$l = \frac{\text{guided wavelength}(\lambda g0)}{4} \qquad (20)$$

Where g_i are the element values of a ladder-type lowpass prototype filter, given for a cut off Ω_c =1. h is a dimensionless constant which may be any value for proper admittance level. To design such type filter take order of the filter as 5 shown in figure 4. The prototype parameters were - $g_0=g_6=1$, $g_1=1.1468$, $g_2=1.3712$, $g_3=1.9750$, $g_4=1.3712$, $g_5=1.1468$. Fractional bandwidth (FBW) =0.67 (obtained from equation (9)) and a 50 ohm terminal line impedance were chosen. The computed design parameters are summarized in Table 2.

For designing BPF use of circular and rectangular shape DGS were proposed. The radius of circle is taken as 13.5 mm and length and width of rectangle is taken as 11mm and 26mm respectively.

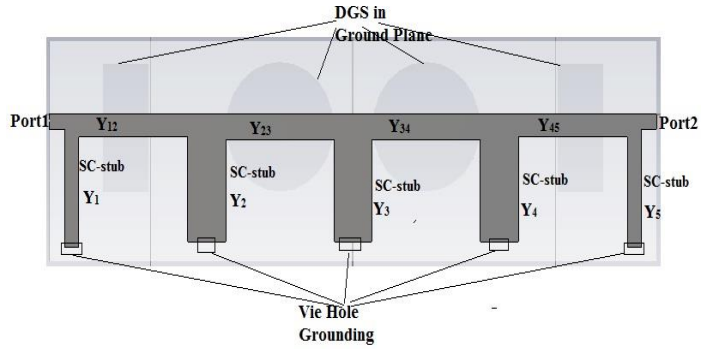


Figure 4: Proposed 5th order BPF with DGS.

Table 2: Microstrip design parameters for 5th order Band Stop Filter.

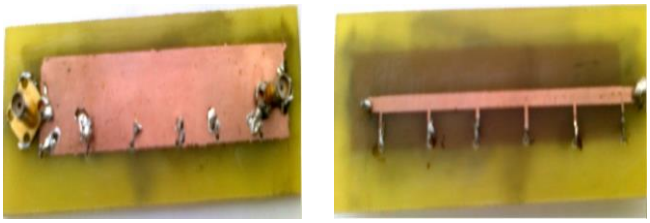
s.no.	Element	Admittance values In mho	Impedance values In ohm	Length of the element (mm)	Width of the element (mm)
1	Connecting lines	$Y_{1,2}=Y_{4,5}$= 0.0258, $Y_{2,3}=Y_{3,4}$= 0.02787	$Z_{1,2}=Z_{4,5}$= 38.66, $Z_{2,3}=Z_{3,4}$= 35.87	$l_{1,2}=l_{4,5}$= 26.9332, $l_{2,3}=l_{3,4}$= 26.8028	$w_{1,2}=w_{4,5}$ = 4.585, $w_{2,3}=w_{3,4}$ = 5.1273
2	Short Circuited Stub	$Y_1=Y_5$= 0.02156, $Y_2=Y_4$= 0.0422, Y_3= 0.0413	$Z_1=Z_5$= 46.365, $Z_2=Z_4$= 23.68, Z_3=24.2060	$l_1=l_5$= 27.261, $l_2=l_4$= 26.076, l_3=26.1145	$w_1=w_5$= 3.46, $w_2=w_4$= 9.455, w_3=9.15

IV. Results

1. 6th order High Pass Filter

The fabricated layout of the 6th order high pass filter is shown in the figure 5 and figure 7. FR4 lossy material with dielectric constant of 4.4, substrate height of 1.6mm and loss tangent 0.02 were used for the fabricated design. The graphs obtain after the simulation (CST Software [13]) and measured value (spectrum analyzer) of the HPF without using DGS are shown in figure 6. CST Microwave studio is software for electromagnetic analysis and design in high frequency range. The most flexible tool of CST is the transient solver, which is used to simulate any design. And spectrum analyzer is a practical instrument which is used to test the PCB layout in 0 to 3 GHz frequency range. So the results were calculated in 0-3GHz frequency range only. Above this frequency range the results were calculated only CST software.

The graph shown in figure 6 shows the cut off frequency is at 1.5GHz means that the signals were passing after this frequency. Also before 1.5 GHz the signal shows attenuation of -35dB to -40dB (means perfect stop band). Return loss after 1.5GHz is below -10 dB which shows perfect impedance matching after that frequency.



(a) (b)

Figure 5: (a) Bottom view of the HPF (b) Top view of HPF.

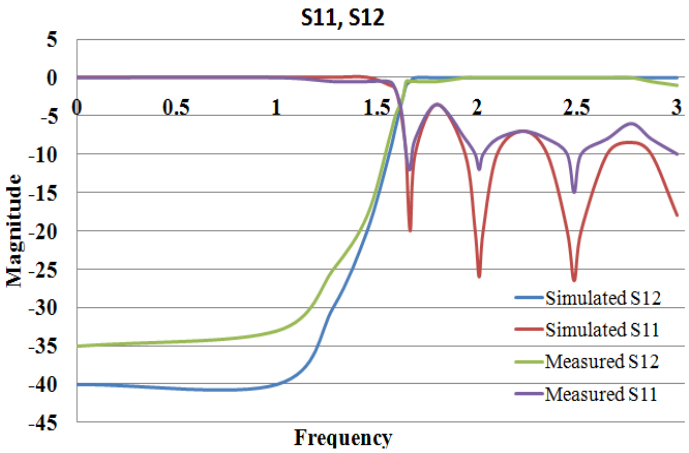
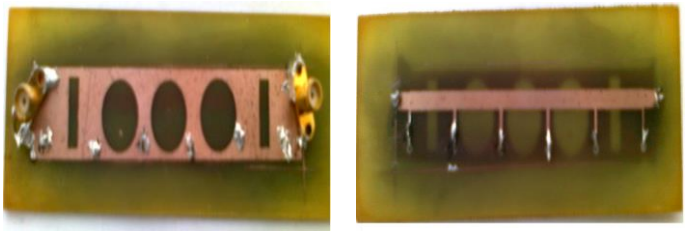


Figure 6: Graph of the HPF without DGS.

Another layout which is made by using DGS (etched rectangular and circle shape on ground plane) is shown in figure 7 and the graph of this proposed configuration is shown in figure 8. The graph shown in figure 8 after applying DGS the cut off point has been shifted to a higher frequency near 2 GHz, which shows that the signal above 2 GHz were passed with negligible attenuation and signals below 2GHz is attenuation by up to 40 dB. By comparing both the results (figure 6 and figure 8), it has been found that the cut off point changes after applying DGS and also reduced sidebands and fluctuation of the output is achieved. So for the application where we require to increase in passband using same size filter the use of DGS is advantageous. It shows that further improvement in the cut off point will be achieved by using DGS in this design of high pass filter.



(a) (b)

Figure 7: Layout of the fabricated device (a) Bottom view with DGS on ground plane (b) Top view of the HPF

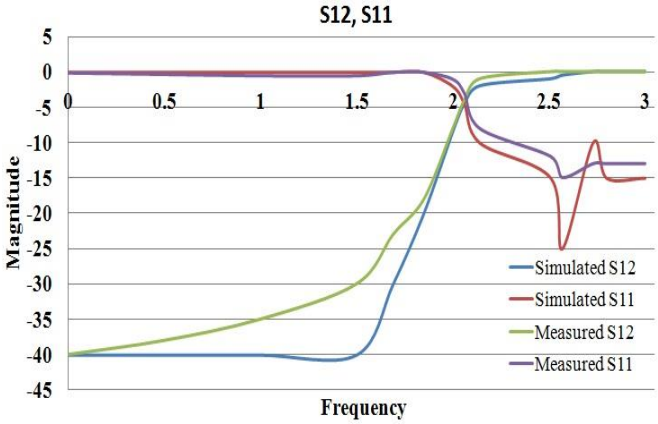
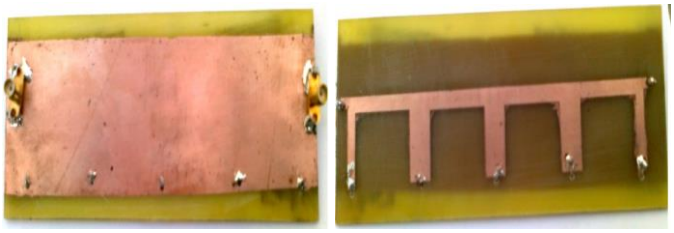


Figure 8: Graph of the HPF with DGS.

2. 5th Order Band Pass Filter

The fabricated layout of the BPF without DGS is shown in the figure 9. It uses same material as used in HPF. The graphs obtained after the simulation (CST Software [11]) and measured values (spectrum analyzer) are shown in figure 10. The graph shows the pass band of 0.85GHz to 1.88GHz is achieved. Attenuation in that range is 0 db and return loss is below -10 dB showing that the filter is efficiently working in this range. Except this band the filter is having stopband in which the attenuation is below -40 dB and return loss is near 0 dB axis.



(a) (b)

Figure 9 (a) Bottom view of the BPF without DGS (b) Top view of BPF.

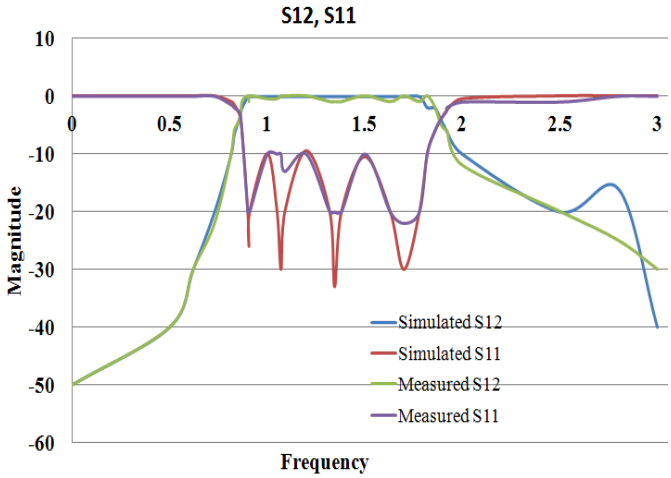


Figure 10: Graph of the BPF without using DGS.

The same configuration was designed with DGS as shown in figure 11 (etched circle and rectangle in ground plane). The graph obtained on CST and Spectrum Analyzer shown in figure 12. The graph shows the pass band of 1.05 GHz to 1.4 GHz is

achieved. Attenuation in that range is nearly -2 db and return loss is below -10 dB showing that the filter is efficiently working in this range. Except this band the filter is having stopband in which the attenuation ranges in between -10 dB to -40 dB and return loss is near 0 dB axis.

By comparing both the results (figure 10 and figure 12), it has been found that the passband has been reduced, meaning that the selectivity of the filter was improved for this particular band. So in communication ware large number of channels are used to transmit data; the effect of inter channel interference reduces the quality of receive data in large band. In that case the use of DGS in filters implementations is necessary to avoid large band. A particular band is selected by using DGS. By this it is found that for designing a filter to pass a particular band the use of DGS will be advantageous.

(a) **(b)**

Figure 11: Layout of the proposed design (a) Bottom with etched circle and rectangle (b) Top view of the BPF

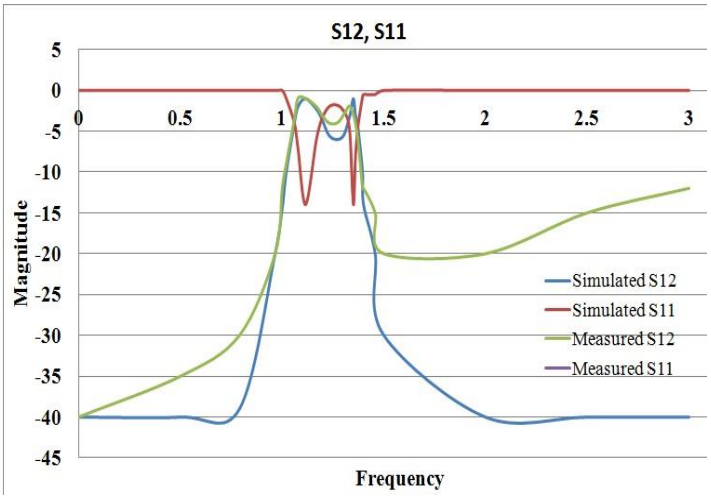


Figure 12: Graph of BPF with DGS.

V. CONCLUSION

The proposed design was implemented and analyzed at the centre frequency f_c=1.5GHz (same for HPF and BPF), and passband frequencies of f_1=1GHz, f_2=2 GHz (for BPF). It has been found that measured results are in good agreement with the simulated value. In the case of the HPF the cut off point has been shifted to a higher frequency and sideband fluctuation was removed. In the case of the BPF with DGS the reduction in passband as compared to a filter implemented without using DGS was also achieved. So for the application where shifting of cut off, reduced level of fluctuation of response (in case of HPF) and reduction in passband (in case of BPF) is needed , then use of DGS for designing filter should be proposed.

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Health Risks Analysis of Lead due to the Consumption of Shellfish (Anadara. Sp) among the Coastal Communities in Makassar City

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Abstract- Lead is a highly toxic metal and has a very strong poison. The aim of the study is to determine the health risk of the lead exposure in *Anadara* sp to the coastal society of Makassar City. The method of the research is an observational study with a draft analysis of environmental health risks. The research was conducted from November 20, 2102 to May 28, 2013 in the coastal area of Makassar City. Shellfish samples taken in five districts, then lead content were measured with AAS (*atomic absorption spectrophotometer*) meanwhile body weight, intake rate, and frequency of exposure are quantitatively measured through questionnaires application interview. The analysis indicated that the highest lead concentration in Tallo was 275,97 µg/kg and the lowest concentration in Biringkanaya was 30.56 µg/kg. The results also revealed that for the Lead RQ (risk quotient) carcinogens was 42,20 % had an average of RQ < 1 and 57,80 % of respondents had RQ > 1. For Non-Carcinogenic RQ 8,90 % of respondents had an average of < 1 and 91,10 % had RQ value >1.

Index Terms- Health risk analysis, Lead, *Anadara* sp

I. Introduction

Lead is a highly toxic metal and a very strong poison. Lead is commonly found in the environment, especially near roads, mining areas, industrial sites, near power plants, incinerators, landfills, and hazardous waste disposal site. People who live near hazardous waste sites may be exposed to chemicals that contain lead through air, drinking water, eating food, and swallowing dust or dirt that contains lead (ATSDR, 2007).

Lead accumulation is the result of anthropogenic activity that has been concentrated the lead throughout the environment. Because lead is so widely spread throughout the environment, it can be found in everyone 's body today. The magnitude of lead levels found today in most of people are greater than those of ancient times (Flegal, 1995). These levels are within an order of magnitude of levels that have resulted in adverse health effects (Budd et al. 1998).

Since lead is a neuro toxic accumulative, in young children lead can cause a decrease in the ability of the brain, whereas in adults exposure of lead can generate disorders of high blood pressure, as well as poisoning the other tissue. Some evidence of lead study since 1991 suggested that children's intellectual ability is adversely affected at blood lead concentrations < 10 mg / dL (Bellinger and Needleman 2003; Canfield et al., 2003a, 2004; Chiodo et al. , 2004; Lanphear et al., 2000, 2005; Schnaas et al., 2006; Schwartz 1994; Surkan et al., 2007; Tellez - Rojo et al., 2006). Any increase in blood lead concentrations of 10 ug / dl potentially led to a decrease in IQ of 2.5 points, or 0.975 IQ scores (Widowati et al., 2008)

II. MATERIAL AND METHODS

2.1 Study area and Research design

This study was conducted at the coastal areas of Makassar. Site selection was done in five coastal districts such as districts of Tamalate, Mariso, Ujung Tanah, Tallo and Biringkanaya. These districts represent nine coastal districts in the city of Makassar which indicated exposure to heavy metals lead, Figure 1. We applied an observational study using an environmental health risks design analysis. This study was conducted in November 2012 - May 2013.

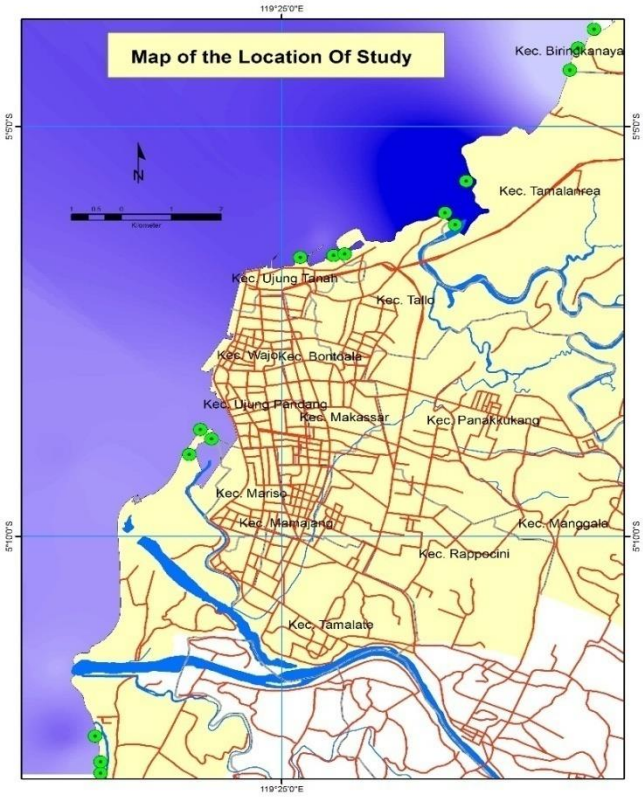

Figure 1. Map of sampling location

2.2 Population and sample

All Shellfish (*Anadara*.sp) were collected from three stations in each sub district with three replication whereas elementary school children from five districts at those Makassar coastal areas were interviewed. All sampling process in this study was done in non-random sampling with large sampling using purposive sampling, with a set criteria as follow:

1. Children living and settled in the selected five districts of coastal region of Makassar
2. Children who frequently consume shellfish of *Anadara* sp.
3. Those children agreed to be interviewed. The approval was based on the recommendations of Ethics committee of the Faculty of Medicine, University of Hasanuddin

2.3 Lead Analysis

Shellfish samples taken by hand picking sampling where the locations have been determined using the Global Positioning System (GPS), three stations with three repetitions in five districts. Shellfish samples in sterile plastic insert into the 10-15 tails . Then further examined the levels of lead using AAS method in laboratory BPTP Maros.

2.4 Data collection

Primary data collection done by taking a sample from a field sample of *Anadara* sp mussels, then anthropometric data were collected by direct measurement and questionnaire application for gathering data of respondents characteristics. frequency of exposure, duration of exposure and the rate of consumption, while the secondary data are taken from the related agency area covers research sites. The method of analysis was environmental and health risk analysis, with univariate analysis by Kolmogorov-Smirnov test and SPSS in calculating the potential health risks.

2.5 Data analysis

The health risk analysis has a formulation of data analysis, the environmental health risk analysis was conducted to determine the level of exposure of respondents (Intake) and the respondents' level of risk (Risk Quotient/RQ), (Rahman,2007). The calculation of the level of exposure (intake) (ATSDR, 2005):

$$Ink = \frac{C \times R \times f_{\mathrm{E}} \times D_{\mathrm{t}}}{W_{\mathrm{b}} \times t_{\mathrm{avg}}}$$

where

Ink : intake, the amount of risk that is acceptable by individual agent per body weight per day (mg/kg / day), C : risk agent concentrations (mg/kg) or (mg/L), R : rate of intake (g / day) or (L/day), FE : annual exposure frequency (days / year), Dt : exposure duration (years), Wb : body weight (kg), Tavg : the average period of time (70 years x 365 days / year) for carcinogenic effects.

To determine the level of health risk that would occur from each individual, thus the calculation is done according to the following RQ equation (ATSDR, 2005):

$$RQ = \frac{\mathrm{Ink}}{\mathrm{RfD}} \qquad (2)$$

RQ calculation results can indicate the level of public health risk due to consuming of *Anadara* sp containing Lead. If RQ ≤ 1 indicates exposure remained below normal limits and people who consume *Anadara* sp is still within safe limits of the risk of suffering from the disease throughout his life. Meanwhile, when RQ > 1 indicates exposure above the normal limits and people who consume the mussels *Anadara* sp risk of developing the disease throughout his life.

2.6 Analysis of risk reduction management

This analysis is useful to assess the management of health risks from exposure reduction of Lead in mussels *Anadara* sp on society. Management of risk reduction that can be used is to lower the concentration, reduce the rate of consumption, and limiting the duration of exposure (Rahman, 2007).

III. RESULT AND DISCUSSION

3.1 Risk Analysis

After measurement of lead concentration in *anadara* sp. and intake rate for those respondent who consumed the shellfish, results indicated that respondent No. 31 has a value of RQ > 1 (1.29) for the risk of exposure of carcinogens and RQ of 3.03 for

non- carcinogenic risk. It can be concluded that the respondent included in the risk group to the effects of carcinogens and non-carcinogens disease. RQ value calculation Lead in shellfish for carcinogen risk (exposure 70 years) and non-carcinogenic risk (exposure 30 years). While the RQ distribution of Lead in shellfish for carcinogen risk (exposure 70 years) and non-carcinogenic risk (exposure 30 years) on respondents can be seen in Figure 2.

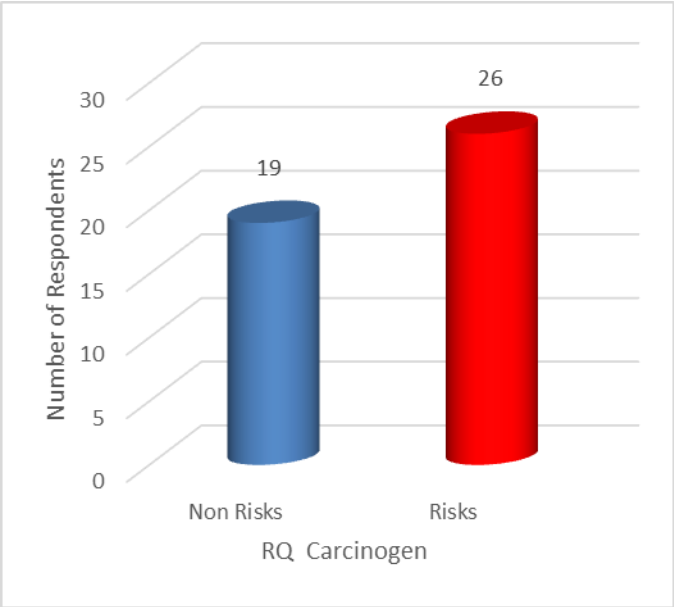

Figure 2 Distribution of Exposure RQ Lead for carcinogens disease risk in five respondents in the Coastal District of the city of Makassar in 2013

Figure 2 shows that the highest RQ respondents carcinogens to carcinogens disease were 20 respondents in RQ from 1.10 to 2.0 and the lowest RQ as much as 6% of respondents in RQ> 2. From Figure 2, with the health problems experienced last three months include headache, cough, and nervous system disorders. Group with RQ values ≤ 1 categorized as a safe group, while the group with RQ values > 1 are called risk groups to the effects of carcinogens.

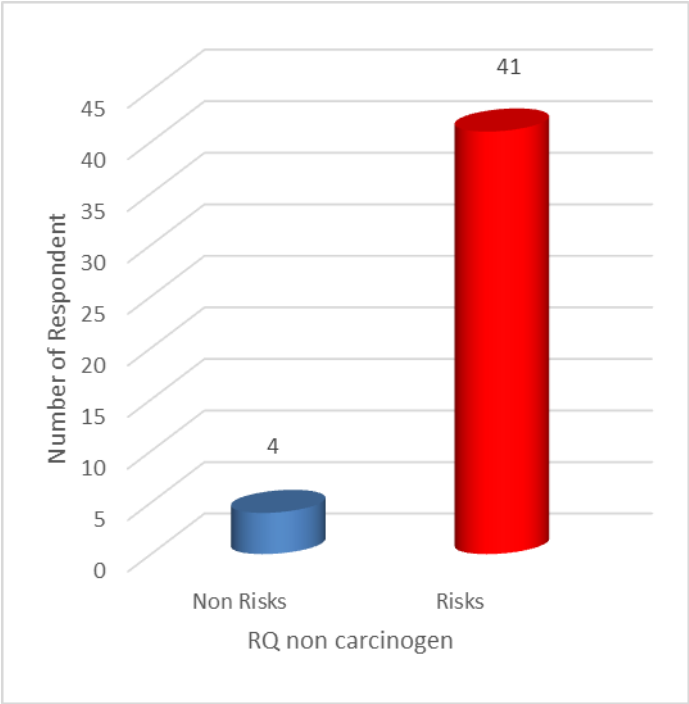

Figure 3. Distribution of exposure lead RQ for non-carcinogenic risk in five respondents in the Coastal District of the city of Makassar in 2013.

Figure 3 shows that the highest RQ values respondents for non-carcinogens disease were 23 respondents in RQ > 3 while the lowest RQ were 4 respondents at 0.00 to 1.00. Group with RQ values ≤ 1, categorized as a safe group, whereas the group with RQ > 1 is called a group at risk for non- carcinogenic effects of the disease.

3.2 Risk Management

Based on the characterization of risk, the result can be formulated use risk management options to minimize the RQ values that equal or smaller than 1, by manipulating or changing the value of the exposure factors included in equation (1) such that the intake values (Ink) become smaller or equal in value to the reference dose (RfD) toxicity. There are three options how to equalize the value of Ink with RFD agent that lowers the risk of concentration (C), reducing the amount of consumption (R) or reduce the exposure duration (Dt). This means that only the variables in equation (1) such that could be changed or adjusted value (Rahman, 2007).

a. Decreasing the concentration of Lead in Shellfish

The decrease in the concentration of Lead is essentially different for each respondent. It is influenced by the pattern of exposure and anthropometric characteristics of each different respondents. Here's an example of the calculation of the concentration decrease of Lead in Shellfish for carcinogen risk (exposure 70 years) consumed by respondents with 30 kg body weight, 11 year exposure duration, exposure frequency of 144 days/year, the rate of consumption of 21 g/day, and the value of RfD = 0.004 mg/kg/day. RFD = Ink, then the formula becomes;

$$Rfd = \frac{C \times R \times f_E \times D_t}{W_b \times t_{avg}}$$

0.004 = (C x 7 gr / hr x 144 hr / yr x 11 years) / (30 kg x 25550)
C = 0.115

Concentrations of lead 0.115 mg/kg is a safe concentration of the carcinogen risk for respondents with a body weight of 30 kg and shellfish consumed 21 g/day for consumption continuously for 11 years with a frequency of 144 days/year. Based on the above calculation, the value of C Lead in the shellfish were safe to consume for non- carcinogenic risk (exposure duration of 30 years) is 0,115 mg/kg. Complete calculation of the reduction of the concentration of risk management lead in mussels can be found in table 1. The description of the concentration of Lead in shellfish were safe to be consumed by the respondent against the risk of carcinogens and non- carcinogens based risk weight group can be seen in Table 1 below.

Table 1. Concentrations of Lead in the shellfish were safe for consumption by the group of respondents with various body weigh to the risks of carcinogens and non- carcinogens in the coastal areas of the city of Makassar 2013.

Body weight (kg)	Lead concentration in shellfish for risks carcinogenic (mg/kg)	Lead concentration in shellfish for risks non -carcinogenic (mg/kg)
20	0.0768	0.0988
25	0.0960	0.1234
30	0.1152	0.1481
35	0.1344	0.1728
40	0.1536	0.1975
45	0.1728	0.2222
50	0.1920	0.2469
55	0.2112	0.2716

Source: Primary data, 2013

Table 1 shows the results of calculation of the concentration of Lead in mussels are safe to take on the risk of carcinogens and non-carcinogens to the frequency of exposure 144 days/year, 11-year exposure duration, and the rate of intake of 21g/day based on body weight groups. From the table above shows that the higher the weight the bigger the concentration of respondents Lead in shellfish were safe to eat respondents to the risk of carcinogens and non-carcinogens disease. In addition, it also shows that the concentration of Lead in shellfish were safe to eat respondents higher in risk than the risk of non-carcinogenic carcinogens.

b. Reduction in the amount of consumption

Other efforts that can be done to reduce or manipulate the value of the intake to match the RFD is reducing the amount of consumption, or in other words, lowering the rate of intake. For example, the calculation of the rate of decrease in the intake of Lead in shellfish for carcinogen risk among respondents with 30 kg body weight, exposure frequency of 144 days / year, 11 years duration of the exposure concentration of Lead in Shellfish 0.157 mg/kg, and the value of RFD = 0.004 mg/kg/day. RFD = Ink, then the formula becomes:

$$Rfd = \frac{C \times R \times f_E \times D_t}{W_b \times t_{avg}}$$

0.004 = (0.157 mg / kg x R x 144 hr / yr x 11 years) / (30 kg x 2550)
R = 15.41 g / day

The rate of intake of 15.41 g / day is a safe amount to carcinogen risk for respondents with a weight of 30 kg, the duration of exposure of 11 years, the frequency of 144 days / year, and the concentration of Lead 0.157 mg / kg. Based on the calculation above, the obtained value of R (the rate of intake) Lead in Shells for non-cancer risk (exposure 30 years) was 6.60 g/day.

Table 2. The intake rate of Lead in shellfish were safe for consumption by the group of respondents with various body weigh to the risk of carcinogens and non carcinogen in Five Coastal District of the city of Makassar in 2013

Body weight	Intake rate of shellfish for carcinogenic risk (gr/hr)	Intake rate of shellfish for non-carcinogenic risk (gr/hr)
20	10.27	4.40
25	12.84	5.50
30	15.41	6.60
35	17.98	7.71
40	20.55	8.81
45	23.12	9.91
50	25.68	11.01
55	28.25	12.11

Source: Primary data, 2013

Complete calculation of the rate of reduction in the risk management intake Lead in mussels can be found in table 2. The description of the rate of intake of Lead in shellfish were safe to be consumed by the respondent against the risk of carcinogens and non- carcinogens by weight group can be seen in Table 2.
The results of calculation of the intake rate of Lead in mussels are safe to take on the risk of carcinogens and non - carcinogens to the frequency of exposure 144 days/year, 11 year exposure duration, and lead concentration of 0.157 mg / kg based on body weight groups. From the table above shows that the higher the weight the higher the rate of responders safe intake on the risk of carcinogens and non-carcinogens. Table 2 also shows that the rate of intake of Lead in shellfish were safe to eat by respondents higher in carcinogen risk than the non- carcinogenic risk.

c. Reduction of the duration of exposure

Another efforts to reduce or manipulate the value of the intake to match the RFD is reducing the duration of exposure to Lead. For example, a decrease in the duration of the exposure calculation Lead in Shellfish for carcinogen risk among respondents with 30 kg body weight, exposure frequency of 144 days/year, the concentration of lead in shellfish 0.157 mg/kg, and the value of RFD = 0.004 mg/kg/day. RFD = Ink, then the formula becomes:

$$Rfd = \frac{C \times R \times f_E \times D_t}{W_b \times t_{avg}}$$

0.004 = (0.157 mg / kg x 21 g / day x 144 hr / yr x Dt) / (30 kg x 25550)
Dt = 8.1 years

The duration of exposure was 6.8 years was safe exposure to carcinogen risk for respondents with a body weight of 30 kg, the frequency of exposure to 144 days / year, the rate of intake of 21 g / day and the concentration of Lead 0.157 mg / kg. Based on the above calculation, the obtained value of Dt (exposure duration) Lead in shellfish for non- cancer risk (exposure 30 years) was 10.4 years. Complete calculation of the reduction of the duration of exposure to the risk management of Lead in mussels can be found in table 3. The description of the duration of exposure to Lead in clams were safe to be consumed by the respondent against the risk of carcinogens and non- carcinogens based on weight group can be seen in Table 4 below.

Table 4. Duration of Exposure Lead in mussels were safe for consumption by the group of respondents with various body weigh to the risk of carcinogens and non-carcinogen in Five Coastal District of the city of Makassar in 2013

Body weight (kg)	Lead exposure duration in shellfish for carcinogenic risks (Years)	Lead exposure duration in shellfish for non carcinogenic risks (Years)
20	5.4	6.9
25	6.7	8.6
30	8.1	10.4
35	9.4	12.1
40	10.8	13.8
45	12.1	15.6
50	13.5	17.3
55	14.8	19.0

Source: Primary Data 2013

Table 3 shows the results of calculation of the duration of exposure to Lead (Pb) in mussels are safe to take on the risk of carcinogens and non- carcinogens to the frequency of exposure to 144 days / year , the rate of intake of 21 g / day , and the concentration of Lead (Pb) 0.157 mg / kg based on body weight groups. From the table above shows that the higher the weight the longer the duration of the respondents' safe exposure to the risk of carcinogens and non- carcinogens disease . In addition to the table 4.19. The above also shows that the duration of exposure to Lead (Pb) in clams were safe for older respondents in the non- carcinogenic risk than the risk of carcinogens .

IV. CONCLUSION

1.The number of School children who consume shellfish *Anadara* sp were higher at risk (RQ > 1) than those who were not at risk (RQ < 1).

2. Body weight is a factor that may lead to a risks, the more body weight people have the higher potential to a lead exposure risks to have.

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AFRICA- INDIA'S NEW TRADE AND INVESTMENT PARTNER

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Abstract- Trade and Investment flows between India and Africa have grown massively over the recent period. The bilateral trade between the region and India was recorded at US $ 70 billion during 2012-2013 and the Indian Investments in the region stood at US$ 14 billion. The paper discusses this emerging trend in trade and investment relation between India and Africa.

Index Terms- Africa, FDI, India, Trade

I. INTRODUCTION

INDIA'S OFDI POLICY REGIME AND TRENDS IN OFDI

India's OFDI policy regime has evolved overtime as the country embarked on New Economic Policy. Although Indian firms were investing abroad in the mid-1960s (Lall, 1983), restrictive OFDI regime limited them to small, minority joint ventures in developing economies. OFDI activity has become significant only since the onset of economic reforms in 1991and particularly 2000 onwards. The upward trend in OFDI from India is explained by the liberal policy regime adopted since 1991. The RBI Guidelines for Indian Joint Ventures and Wholly Owned Subsidiaries Abroad, as amended in October 1992, May 1999 and July 2002, provided for automatic approval of OFDI proposals up to a certain limit that was expanded progressively from $2 million in 1992 to $100 million in July 2002. In January 2004, the limit was removed altogether and Indian enterprises are now permitted to invest abroad up to 100% of their net worth on an automatic basis.[26]

Data suggests that annual average OFDI from India rose from about US$ 5 Million from 1980 to 1990 to US $ 121 million in a decade from 1991 - 2000. The level of OFDI flows recorded a sharp uptrend reaching US $ 105 billion during the period 2006-2012 as compared to US $ 10 billion between 2000 -2005. (UNCTAD FDI Statistics). Indian outbound FDI has undergone long term transformations in its character covering industrial structure, geographical composition, ownership controls, entry modes, motivations and source of financing since the country embarked on its liberalization journey (Hansen 2007). Prior to liberalization in the 1990s, India's outward FDI flows were largely limited to its neighboring developing countries and were viewed as its contribution to south-south cooperation. The share of FDI to the developed world increased from 24% in 1980s to 44% in 1990s (Kumar 2008) and has further risen to about 52% during 2000-2010 (RBI 2012)[27]. However during last couple of years developing economies have again become important destination of India's outbound FDI, accounting for about 60% of total outflows (UNCTAD 2013). The international financial crisis and resultant slowdown in the developed countries has prompted Indian firms to search for new markets and unexplored destinations for both trade and investment. Increasing trade and investment between India and Africa is an indication in the same direction. The objective of this paper is to explore the increasing trade and investment relation between India and Africa. The paper is organized as follows: Following the introduction, Section II lays down the theoretical framework of FDI. Section III discusses trade relationship between the India and Africa. Section IV explores the investment trends. Section V and VI briefly discusses the impediments to the economic relation between the region and India and support measures extended by India respectively. The last section concludes.

[26] RBI/2013-14/11 Master Circular No. 11/2013-14(Updated as on February 7, 2014)

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II. MOTIVES OF FDI- THE THEORETICAL FRAMEWORK

Firms engage in FDI because they are motivated and have the capability to do so. Makino et al (2002) puts forth two distinct but complementary perspectives which explain the motives of FDI: asset exploitation and asset seeking. In the asset exploitation perspective, FDI is viewed as the transfer of a firm's proprietary assets across borders. In the asset seeking perspective, FDI is viewed as a means to acquire strategic assets (i.e. technology, marketing and management expertise) available in a host country. Kindelberger (1969), Hymer (1976) and Caves (1971) based their work on asset exploiting perspective of FDI and explained FDI as a tool of exploiting monopolistic advantage in the host country. In similar vein, Internalization theory explains FDI as an organizational response to external market failure for rent yielding resources and an attempt by the firms to reduce transaction costs of cross border activity (Buckley and Casson 1976; Rugman 1981). Dunning's OLI framework bridged the idea of market power and transaction cost approach and explained FDI as an attempt to exploit ownership specific advantages in overseas market through the process of internalization.

The traditional literature on FDI failed to explain the new wave of OFDI from emerging economies and FDI activity of "latecomer" firms. The internationalization behaviour of latecomers is explained from the Asset Seeking perspective. The asset augmenting or asset aeeking perspective of FDI suggests that firms engage in FDI not only when they have firm specific advantages that they want to exploit in foreign market but also when they want to and have the capacity to acquire complementary assets which are owned by firms in the host country, to enhance their competitive advantages (Dunning 1995, 1998 and 2000). Luo and Tung (2007) argue that emerging economy MNCs internationalize through a distinct process dubbed 'springboarding', designed to achieve the dual purpose of acquiring strategic resources abroad and reducing their institutional and market constraints at home. Mathews (2002) also argues that EMNCs typically represent instances of accelerated internationalization and that they use their latecomer position to their advantage through repeated applications of a process of 'linkage, leverage and learning'. They are not operating in a world where they seek to push monopolistic advantages as much as one where they seek to tap resources elsewhere and device appropriate strategies and organizational forms for doing so.

III. INDIA AND AFRICA- TRADE RELATIONSHIP

Africa's bilateral trade with India has seen a positive dimension since the globalization. It has witnessed a massive growth from a mere US$1 billion in 1990 to US$3 billion in2000, reaching up to the level of US$ 36billion in 2007-08 and climbing up high to the current level of US$ 70 billion in 2012-13. This upward trend in bilateral trade is partly the consequence of India's duty-free tariff preferential scheme for 49 least developed countries (LDCs), which was announced in April 2008, and which has benefited 33 African countries. While the Indian exports include manufactured goods, machinery, transportation equipment, food, and pharmaceutical products, India's imports from Africa are still dominated by crude petroleum, gold, and inorganic chemical products, reflecting India's high demand for energy resources.

INDIA'S EXPORTS TO AFRICA

India's trade relation with Africa took a new direction when Indian Foreign Trade Policy 2002-07 came along with a programme of "Focus Africa". The government of India launched this Programme in 2002-03 to increase the interaction between the two regions by identifying potential areas of bilateral trade and investment. The Focus Africa programme's commercial focus is expansive and beyond regular fiscal incentives, whereby export promotion activities are conducted by various export promotion councils and business associations with grant under Market Development Assistance (MDA) and Market Access Initiative (MAI) Schemes. The programme forms part of a larger strategy of India to diversify its trade relationships beyond traditional markets.

INDIA'S EXPORT TO AFRICA (US $ MILLION)								
REGION	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
North Africa	1593.21	1861.99	2652.26	3422.61	3125.18	3985.85	4693.63	5681.84
West Africa	1857.6	2446.76	3461.93	3357.08	3136.98	4296.61	6460.45	6523.39
Central Africa	165.27	203.54	257.7	384.87	349.63	465.03	707.8	931
East Africa	1437.42	2942.22	4214.15	4509.79	3512.18	5346.87	6594.24	8839.29
Southern Africa	1940.02	2814.93	3605.74	3139.07	3308.94	5619.11	6217.96	7166.98

TABLE-1 (source: http://commerce.nic.in/eidb/ergn.asp)

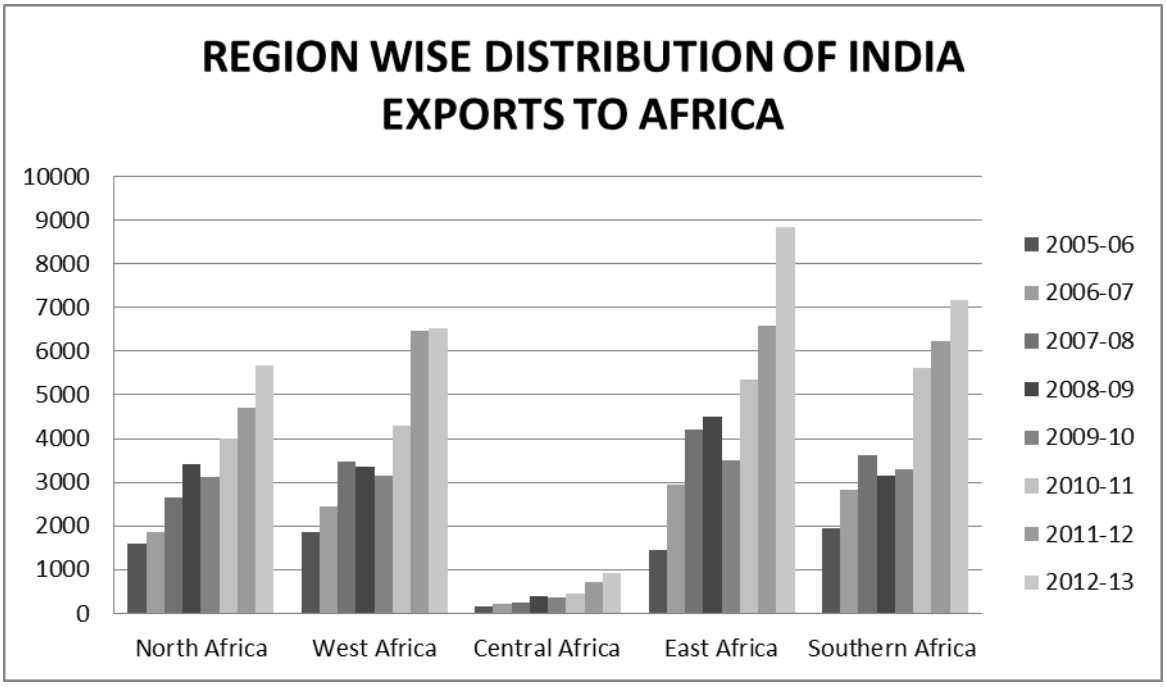

Figure 1

As can be seen from the data, Indian exports to Africa have been showing an upward trend since the inception of programme. With around 30% share of total exports to Africa, East Africa has been a major importer followed by Southern Africa (24.6%)and North Africa(19.5%)in the year 2012-13.

East African countries share good trade relationship with India and this is why, the largest market for Indian goods. The major export items to East Africa region includes refined petroleum products, pharmaceuticals, industrial machinery, iron and steel and sugar products. Ethiopia, a less developed country of the region has turned out to be a major trading partner for Indian exporters investing primarily in sectors of agriculture and mining.

Southern Africa accounting for around 24.6 % share of total India's exports to Africa in 2012-13, has seen a considerable rise in the exports from India. Southern African countries have been importing refined petroleum products, automobiles, pharmaceuticals, electrical and industrial machinery from Indian firms.

Following Eastern and Southern counterparts, North Africa has also been picking up pace when it comes to importing from India. In the northern region, Egypt has come out to be the largest market for Indian goods. The major import items are automobiles, electrical machinery and bovine meat. Turnkey Projects, refinery installations , gas pipeline , transmission line and water supply projects are the major projects undertaken by Indian firms in the Maghreb region.

With about 22 % share in total Indian exports to Africa, West Africa region's imports from India mainly include pharmaceuticals, electrical machinery and vehicles. Nigeria is the largest economy of the region and the largest market for India.

Central African countries account for less than 5% of India's exports. However, the region's imports from India are on rise. The major export destination in this region are Angola, Cameroon and the Republic of Congo and demand is mainly for the items like pharmaceuticals, refined petroleum products, vehicles and industrial machinery.

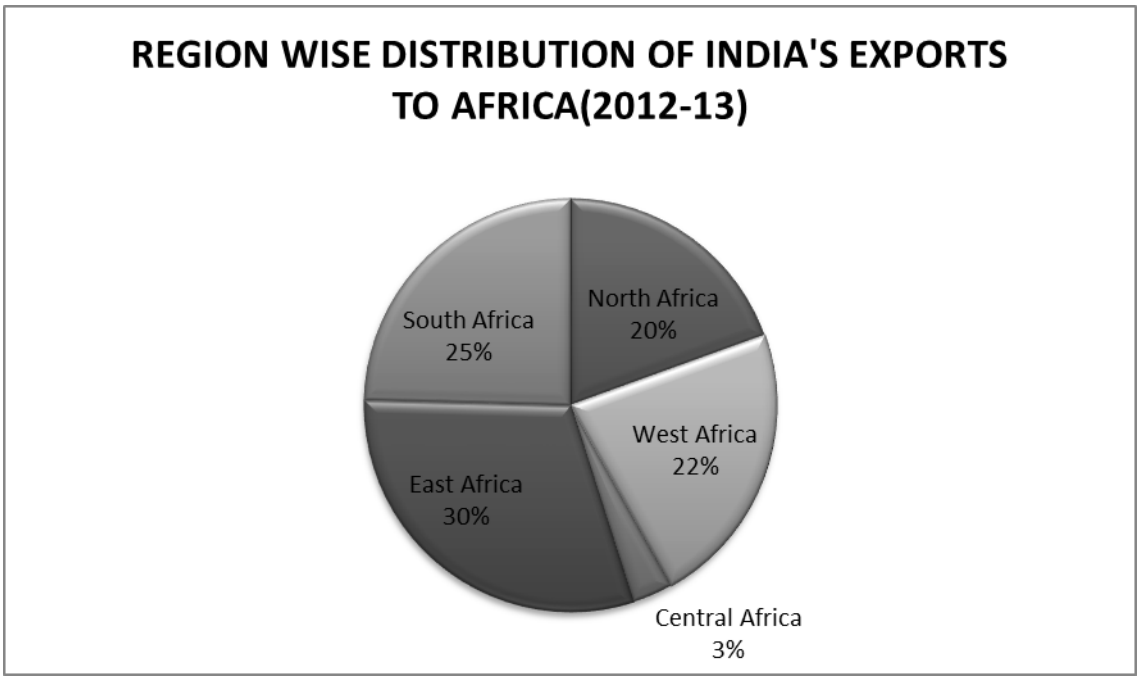

Figure 2

INDIA'S IMPORTS FROM AFRICA

For a good trade relationship to hold, both countries shall provide good and services to each other. This is why; India can't just export its merchandise and services to Africa. It shall also import and it does indeed. As can be seen from the table2, Indian imports from Africa have risen over the past few years. The major exporter to India has being Southern Africa accounting for 41% of total imports from Africa in 2012-13 followed by West Africa (39.5%) and North Africa (16%).

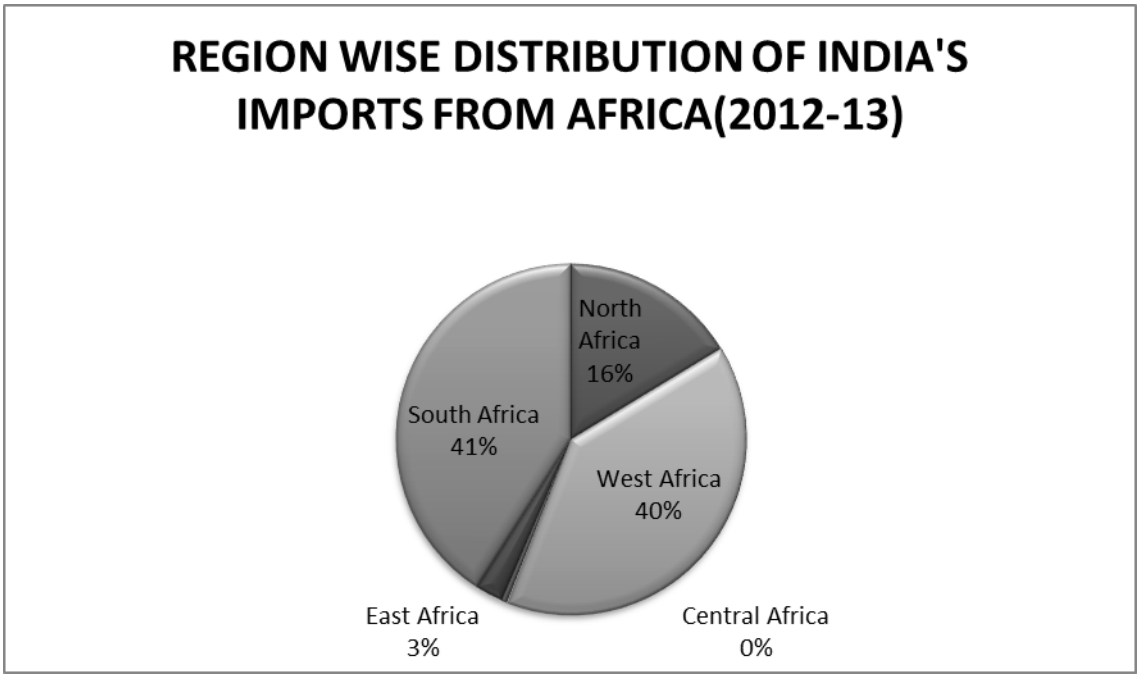

Figure 3

Imports from Africa are dominated by South Africa, the largest economy of Africa. The country is a major exporter to India and mainly exports gold and coal. Besides fulfilling the demand of its wide consumer base of gold, India has also been importing iron and steel, inorganic chemicals and mineral ores from the country. With a share of about 40%, West Africa's exports to India have seen an upward trend. India is a major importer of crude oil from this region. Besides oil, edible fruits and nuts, especially shelled cashews are significant import item. Following up the footsteps of Southern and Western Africa, North Africa has also started developing trade relations with India. Egypt, Algeria and Morocco could be seen as major trading partners. The import items from North Africa mainly include fertilizers, inorganic chemicals and mineral fuel. Apart from above, India has also been importing edible nuts, vegetables, iron and steel, coffee and inorganic chemicals from East Africa and crude oil from Central Africa.

INDIA'S IMPORT FROM AFRICA (US $ MILLION)								
REGION	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
North Africa	837.17	3353.47	5,542.93	5,823.96	4,899.66	5,894.40	7,405.84	6,723.32
West Africa	1,161.99	8,178.06	9,726.27	11,179.37	9,864.24	12,862.57	17,850.58	16,264.44
Central Africa	19.36	29.05	49.24	153.06	270.43	45.74	85.63	230.12
East Africa	223.73	234.42	321.14	353.43	388.49	579.73	542.87	1054.6
Southern Africa	2,636.31	2,921.23	4,831.33	7,218.48	10,191.94	12,573.98	17,980.70	16,838.20

TABLE-2 (source: http://commerce.nic.in/eidb/ergn.asp)

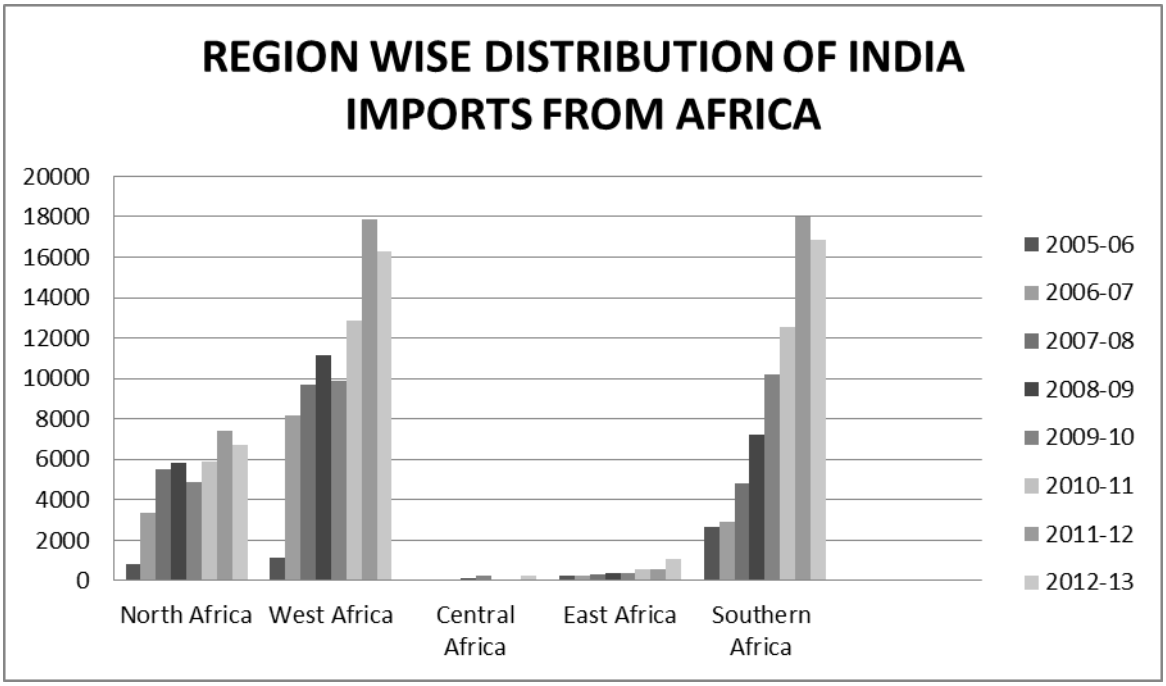

Figure 4

IV. INVESTMENT RELATION BETWEEN INDIA AND AFRICA

Africa is now considered as a continent poised for economic growth, the reasons of which lies deep rooted in economic, resource and operational factors. Africa is the third fastest growing economic region in the world.[28] Soaring prices for oil, minerals, and other commodities have helped lift GDP since 2000. On an average, Real GDP during 2000-2012 rose by 4.48%, almost twice its pace in the 1980s and 1990s. In addition to the surge in commodity prices during the last decade, the rise in GDP is accounted by various factors including government action to end armed conflicts, improve macroeconomic conditions, and undertake microeconomic reforms to create a better business climate. Africa has strong long-term growth prospects, propelled both by external trends in the global economy and internal changes in the continent's societies and economies.[29]

Over the years, African countries have emerged as the major reformers, trying to improve their business environment as a strategy to attract more FDI. The World Bank 'Doing Business In' Survey for 2012 – seen as a benchmark for rating the world's business environments – tracked Morocco as the top reformer globally during the survey period, with Sao Tome and Principe, Cape Verde, Sierra Leone and Burundi also among the top 10 reformers. Changes in domestic policy in these countries improved the process of dealing with construction permits, protecting investors and paying taxes, among other areas.[30] Improved business climate, prudent macroeconomic and fiscal policies, rising GDP and GDP per capita, increasing urbanization, improved infrastructure, growing middle class and most importantly abundance of natural resources has made Africa an attractive investment destination. The average annual FDI inflows in Africa increased from US $7 billion during 1990s to US $ 35 billion during 2000-2012. FDI inflows reached its peak during 2008, recorded at US$59 billion but subsequently declined for three years due to global financial crisis.(UNCTAD FDI STATISTICS). According to UNCTAD World Investment Report, 2012 the decline in investment, from $43.1 billion in 2010 to $42.7 billion in 2011, was largely due to reduced inflows to North Africa as social and political unrest in Egypt and Libya deterred investors. However, inflows to Africa are expected to recover as a result of stronger economic growth, ongoing economic reforms and high commodity prices, as well as improving investor perceptions of the continent, mainly from other emerging markets (UNCTAD 2012).

[28] IIFT Working Paper No. EC-13-18: India's Export Opportunity in Africa: Issues and Challenges in Select Sectors (April 2012).
[29] McKinsey Quarterly Report: What's driving Africa's growth.
[30] World Bank Doing Business Report (2012): Doing Business in a More Transparent World

INDIA FDI INTO AFRICA

Trade and investment relations between India and Africa were established in the 16th Century. The first OFDI in Africa was undertaken by the Birla Group in 1960s when they established textile mill in Ethiopia. India's investment in Africa is primarily driven by its need to ensure the reliable supply of natural and energy resources, which the region has in abundance. It is also driven in the search of newer markets. India OFDI outflows increased from US $243 million in 2000 to US $ 11 billion in 2007 (UNCTAD FDI STATISTICS). Indian Investments in Africa stood at US$ 9.2 billion in 2008-09. According to IMF estimates, total Indian investments in Africa at the end of 2011 were US$ 14.1 billion – a share of 22.5% in total Indian outward FDI stock, making country the seventh largest investor in the continent. Another estimate puts cumulative Indian investments into Africa at over US$ 35 billion. Although outward investment data from India to Africa remains sketchy, but upward trend in the same cannot be ruled out. (CII & WTO REPORT)

Indian FDI in Africa has traditionally been concentrated in Mauritius, taking advantage of the latter country's offshore financial facilities and favourable tax conditions; as a result, the final destinations of these investments have often been elsewhere. Indian investors have, however, been investing in other countries in the region, too, such as Côte d'Ivoire, Senegal and Sudan. (UNCTAD 2012)

V.IMPEDIMENTS

It has been observed that though the trade relationship between two countries is improving, however, there are some of the hindrances that are faced by the business firms in both the countries. High transaction costs due to exporting goods from India to Africa have been a major impediment for Indian exporters. The shipping and insurance costs keep on increasing, which is why, Indian exporters prefer to sell on "on delivery basis". Secondly, Small and medium enterprises in India, accounting roughly 40% of total Indian exports are unaware about the developments of Africa. So a need has been felt to update the knowledge about the African market among the Indian business market-both large and small. Moreover, getting work permit/visa is particularly difficult in some of the African countries .This create hurdle for the employees who want to work in Africa. Some of the other hurdles impeding Indian investments in Africa that has been observed as access to capital; absence of bilateral investment treaties; and, smaller market size

VI. INDIA'S SUPPORT TO AFRICA – A MARK IN SOUTH – SOUTH COOPERATION

The improved trade relationship between two countries has been a result of great co-operation and support. India has been providing skill training to African civilians through its various programs and schemes conducted with Afro-Asian Rural Development Organization (AARDO), African Union (AU), Pan African Parliament and EAC. The Indian Technical and Economic Co-operation (ITEC), the flagship program of Indian government provides assistance for agricultural processing, carpentry, plastic moulding and small engineering units.

To add to the above, triangular India-U.S.-Africa partnership in agricultural training was inaugurated in 2009 to improve agricultural productivity, strengthen agricultural value chains, and support market institutions in Kenya, Liberia, and Malawi .Moreover, Indian government has been supporting Africa in establishing new institutions since 2011. These institutions are generally based on Public Private Partnership model wherein the entities of both countries participate Further to overcome the hurdle of finance, India has increased its financial assistance towards African countries. The official aid and loan programmed toward Africa has seen an upward trend in the recent years.

CONCLUSION

The paper highlights the emerging trade and investment relation between India and Africa. Given the projected growth of India, her demand for natural and energy resources coupled with massive untapped resources in Africa, Indian entrepreneurs quest to ensure raw material security, owing to rising process of essential commodities in international market, improved business climate and macroeconomic policies adopted by Africa, the trade and investment between India and Africa is expected to grow tremendously. Though the outward investment from India to Africa has increased in recent years, there are potential hindrances that can dampen this upward trend. Realizing the opportunities in Africa, Indian Government has been extending support measures to facilitate the

development in Africa, such as providing through EXIM Bank the Line of Credits to African entities to facilitate project finance. In the light of all the factors discussed, it can be firmly concluded that Africa can be the next big trade and Investment partner of India. Further research may be directed at exploring the nature motives of India OFDI in Africa.

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Who becomes a history Teacher in Ghana: Characteristics and Experiences of UCC history Student Teachers upon Entry into the University?

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Abstract- The study explored the experiences and characteristics of history student teachers as they are admitted into the history teacher education programme in the University of Cape Coast. The study surveyed 16 history student teachers, 3 lecturers and Twenty four (24) practising teachers. A combination of purposive sampling and census methods, stratified sampling and snowball sampling techniques were respectively used for the study. The results showed that candidate who chose to pursue teacher education in history at the university of Cape Coast had some teaching experience mostly at the basic level and have taught history related subjects. Also student teacher candidates had good grades in history as well as had good aggregates before enrolling into the programme. Again individuals who intend pursuing the programme also had interest in the study of history.
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Index Terms- Education, History, Teacher, Entry characteristics, Ghana

I. Introduction

In Ghana, the training and development of teachers for the Junior High Schools is mostly undertaken by the 38 public training colleges in the country with the University of Cape Coast being the examining body. The University of Cape Coast and University of Education, Winneba, on the other hand, also run various teacher education programmes to prepare teachers for the basic and senior high schools in the country. Established in 1962, the University of Cape Coast was born out of a dire need of the then government for highly qualified and skilled manpower in education to man the affairs of the education sector. The university was established to train graduate teachers for second cycle institutions, teacher training colleges, and technical institutions. Education became a compulsory component of every programme in the university leading to the award of B.A and B.Sc. (general) education degrees to its graduands (Dwarko & Kwarteng, 2003). Due to the dominant education component, the Faculty of Education was established and the Department of Curriculum and Teaching was born. The department was responsible for the development of teaching methods and supervision of school practice. By 1975, the department became known as the Department of Arts and Social Sciences Education with additional responsibility of carrying out research to evaluate the effectiveness of teaching methods and at the same time devise new teaching methods and strategies. Currently, the department offers teacher education programmes in Arts, Social Science, Management

and Social Studies. The B.Ed (Arts) programme is designed to train teachers in arts related subjects especially English, History, Religious Studies, Ghanaian Language, French and Music.

There is a saying that if you forget your past you may miss the future. Others also believe that the past guides our way to the future. People become proud when they are able to trace their heritage from the earliest times to the present. Knowing one's heritage is one of the most cherished ideals in a society. One's knowledge of his/her heritage creates awareness of how people in the past lived, the way they entertained themselves, the way they dressed, the food they ate, how they related to each other, among others. In many African countries, cultural heritage such as festivals, religion, funeral rites, language and even the type of education they go through have their meanings evolving from the past (Oppong, 2009). This therefore means that a clear understanding of the present must first start from the past, thus a history of the past. Hence the inclusion of history into the Ghanaian school curriculum. In the Ghanaian school curriculum, the teaching and learning of history have enjoyed considerable attention since the colonial period. During those days it was taught as a subject in both the missionary schools and the schools established by the British colonial administration. It continued to enjoy its place in the school curriculum even after colonialism and was one of the four subjects, which were written during the Middle School Leaving Certificate Examination (M.S.L.C.E).

History was also offered in the secondary schools from form one up to form five as an elective subject for Arts students who wrote the School Certificate and General Certificate of Education Ordinary Level (SC/GCE 'O' Level). At the sixth form, history was one of the subjects offered for the General Certificate of Education Advanced Level (GCE 'A' level) examination. After the introduction of the 1987 educational reform, history was incorporated into social studies at the basic school level and offered as an elective for General Arts students at the senior secondary school (now senior high school) level (Oppong, 2009). Each year, the University of Cape Coast (UCC) compiles data on the background of students it admits into its programmes. The data is drawn from academic certificates submitted by applicants as well as information provided by the applicants during interviews conducted prior to admission (matured applicants). This data serve various purposes for which it is intended. For example, from the collected data, the university is in a position to monitor students' performance base on, among other things, whether or not a particular student entered with high or low grades. The idea of collecting information on student characteristics seems to be a step in the right direction. However, the data collected is not comprehensive enough to use for purposes other than administrative duties. More often than not, for example in the University of Cape Coast, it is common to have in a group of applicants two categories: (a) those who have a teaching experience and (b) some without such an experience. Additionally, a known fact is that prospective teachers enter the university with some idea about life in a school classroom. Data focusing on experiences among other things does not seem to form part of the data currently collected at the university. Such information, if properly documented and made available to teacher educators and

prospective teachers themselves in a refined manner could be used in the university for many purposes. Most importantly, through investigating entry characteristics regularly, the university will gain knowledge about the trainees it deals with and that knowledge can be used in informing the planning of programmes and at classroom level too (Oppong, 2009). The study sought to explore the type of teacher the history teacher education programme in the university of Cape Coast aim at producing, the entry characteristics of the student teachers upon entry into the history teacher education programme as well as their reasons for choosing history as their major subject

II. Theoretical Underpinnings

Becoming a teacher is a multifaceted process that can be interpreted, for example, as learning to teach, as personal development, or as teacher socialization. During their development, teachers create their expertise, competence and practical knowledge, which to a great extent are simple and experiential. According to Virta (2002), becoming a teacher is not only a personal process, but is interactive and situated in certain contexts, and for a subject-specific teacher this process seems to include a great number of ingredients which are:

- Early influences of childhood and school years (formation of beliefs about teaching, learning, students, and school subjects),
- Attachment to the subject,
- Socialization into the academic subculture of the university department,
- Development as a subject specialist,
- Socialization as a teacher in teacher education and in work settings.

In the view of Grossman and Stodolsky (1995), secondary school subjects represent an essential framework in the formation of teacher identities and school culture, and remain central in all phases of teachers' careers. Most secondary school students' choice of becoming teachers is affected by the way they are taught (Little, 1990; John, 1996). There is a rich literature showing the importance of the early school experiences and the beliefs of student teachers at the beginning of their studies as the basis of their development as teachers (Calderhead, 1991; John, 1996; Lortie, 1975; Sugrue, 1997; Wideen, Mayer Smith, & Moon, 1998). As these researchers observed, early school experiences play a major role in students' choice of teaching as a career. To them, during lessons, students do not only learn for instance history, but also receive a rich store of experiences of differing types of teachers, differing styles of teaching, and various ways of studying. This is what Lortie (1975) called "apprenticeship of observation".

To the author, during this period teachers-to-be collect impressions and tacit knowledge about their future profession from their teachers. It is also believed that socialization into a subject teacher's role and into the subject subculture begins during this process. Also during this process, student teachers-to-be adopt the act of teaching various subjects, the status of the subjects in the school curriculum, and their appropriate teaching methods. The cycle continues at the university, where they learn to be subject specialists and adopt the models of reasoning and thinking typical of the field, although, in a single domain, the subject tradition may not be

totally coherent (Quinlan, 1999). Research by Virta (2002) suggests that students choose to be educated as history teachers themselves, because of their attachment or interest in a subject. To him although the school may have total influence in student's enthusiasm for the subject, it does not have much to offer; rather, it is the interest students have for the subject that motivates them to choose history teaching as a career.

John (1996) also analysed the interviews of 42 prospective history teachers and explored their implicit theories of learning and teaching history. He asked them how they had originally became interested in history, and it was found that it had more often been the school than because of its families, travels, museums and visiting of historical sites which had been more important. This means that, issues such as families, travels, museums and visits to historic sites is a contributing factor to student teachers implicit theories of learning to teach history. Similar results were reported by Von Borries (1988), who studied how professional historians became interested in history.

Friedrichsen, Abell, Paraja, Brown, Lankford and Volkmann (2009) investigated the influence of prior teaching experience upon prospective and novice biology teachers' knowledge for teaching upon entry into an alternative certification program. Both prospective and novice teachers demonstrated an information-transition approach to science teaching as evidenced by the sequence of instruction which followed an inform-verify-practice sequence and perceived learning as memorizing information (Friedrichsen *et. al.*, 2009). Study findings suggest effective teacher preparation programmes must include effective mentoring with a strong emphasis upon reflection as well as collaboration among interns "to assess student work, reflect on practice, challenge common myths of teaching, and share best practices to support the development of discipline and topic-specific Pedagogical Content Knowledge (PCK)" (p. 376). In other studies by Hollingsworth (1989), Adams and Krockover, (1997) the researchers found, however, that the entering beliefs and knowledge of prospective teachers act as powerful predictors of what they learn in education courses. Cobbold (1999) evaluated the implementation of the programme of instruction developed for social studies in the teacher training colleges of Ghana. Results of the study reveal strong evidence that the characteristics of the social studies programme was fairly clear to both tutors and students. However the professional and academic background of the tutors was found to be unsupportive of the implementation of the programme. It is against this background that the study sought to examine the characteristics and experiences of UCC history Student Teachers upon entry into the university.

III. Methods

The research employed descriptive survey design that purposely observe, describe, and document aspects of a situation as it occurs naturally. Fraenkel and Wallen (2000) describe descriptive research as the collection of data in order to test hypothesis or answer research questions concerning the current status of the subjects of the study. Both in-depth interview and focus group discussions

(qualitative methods) and questionnaires (quantitative) were used to collect data from the respondents. The study targeted all B.Ed (Arts) students offering history as a major subject, all history teachers in the central region of Ghana who pursued B.Ed (Arts) in UCC and all Lecturers involved in the history teacher education programme in the university. Data collected from the questionnaire were edited, coded and analysed using SPSS version 16. Discussion recorded from interview with lecturers and focus group discussion with the students in relation to the research questions were transcribed and grouped into themes and sub themes. These issues were quoted to support some of the discussions. Questions related to the entry characteristics of student teachers were analysed using percentages and frequencies.

IV. Results and Discussion

Socio demographic characteristics of respondents

Sex distribution of respondents

The respondents were asked to indicate their gender. Their responses are presented in Table 1.

Table 1: Sex Distribution of Respondents

Gender	Student Teachers N %	Practising Teachers N %	lecturers N %
Male	11 (68.8)	14 (58.3)	5 (100)
Female	5 (31.3)	10 (41.7)	-
Total	**16 (100)**	**24 (100)**	**5 (100)**

Table 1 indicates that there were 16 student teacher respondents and 24 practising teacher respondents. Among the student teachers 11(68.8%) were males and 5(31.3%) were females. The students' population represents the devaluing nature of history as a subject. In terms of gender, the number of female respondents compared to that of males was slightly lower which may be attributed to the fact that most females do not have interest in the study of history. For the practising teachers, 14(58.3%) were males and 10(41.7%) being females. This implies that the number of male history teachers at the senior high school level outnumber their female counterpart. On the part of the lecturers, all the 5 respondents were males. This can be attributed to the fact that there are not enough female lecturers in the programme.

Age distribution of respondents

The age distribution of both respondents was of importance to the researcher. The outcome is presented in Tables 2.

Table 2: Age Distribution of Respondents

Age	Student Teachers N%	Practising Teachers N%	Lecturers N%
21-25	9 (56.3)	3 (12.5)	0

26-30	4 (25.0)	9 (37.5)	0
31-35	3 (18.8)	9 (37.5)	2 (40)
Above 36	0	3 (12.5)	3 (60)
Total	**16 (100)**	**24 (100)**	**5 (100)**

Table 2 indicates that the age distribution of the student teachers ranges from 21 – 35 years with the majority (56.3%). The outcome indicates that the student teachers were matured enough to read, understand and respond to issues and also since they had spent a greater number of years on the programme, it will enable them evaluate the programme well. Majority of the practising teachers on the other hand were found to be within the range of 26-35 years and the lecturers were also found to be above 36years.

Type of teacher the history teacher education programme in the University of Cape Coast aim at producing

Documentary evidence laid bare on what the history education programme aims at producing. The history teacher education programme aims at providing insights, perspectives, directives and projections to prepare prospective teachers to provide guidance and leadership in the teaching/learning process in their schools and classrooms. The programme also aims to enable teachers draw up curricula for various levels of educational institutions in the country. It is also to lay the foundation for the preparation of qualified teachers dedicated to helping students attain high academic standards or laurels.

In this vein, I inquired from the student teacher and lecturer respondents about their knowledge and understanding of the type of teacher the history teacher education programme aims at producing. From the focus group discussions, student teachers were unanimous in their view that the objectives of the history teacher education is to train teachers to effectively teach history at the respective senior high schools. However, some had divergent views on what the programme aims at producing. This includes the idea of imbibing in student teachers an understanding of his country and the world at large. A lecturer also shared a similar view stating that the programme aims at developing people to work in other institutions such as the Archival offices, Institute of National Culture, among others.

When probed, through interview and focus group with lecturers and student teachers respectively on what the history teacher education programme should aim at producing, one thing stood out. Thus the programme should seek to produce teachers who knew their subject and could teach effectively. One student had this to say;

It should aim at helping student teachers to understand teaching history in the context of teaching resources and its problems as well as being practical.

Another student also stated

It should aim at helping students think critically and to analyse educational issues from their own perspective.

*T*he views expressed by some of the lectures in regards of the objective and nature of histopry in the university were captured in the following instances.

A lecturer also indicated that, it should aim at training students to work in other areas of the economy be it the security and also should be redesigned to incorporate other courses because it is too 'education oriented'.

Another lecturer respondent suggested the incorporation of government related courses so that the history student teacher would be seen as having knowledge base both in government and history.

It can therefore be stated that the type of teacher the history teacher education programme aims at producing though explicitly stated in the faculty brochure, is not very clear to both respondents since all their responses bothered on the overall aim of the programme. However, it can be said that it aims to prepare teachers to teach effectively in their various classroom. This is typical of a teacher as a 'technician' whose role is to have knowledge of the curriculum- which is prescribed at a higher level and deliver them as efficient as possible. This is characteristic of an applied sciences model of teacher education (Cobbold, 2011) which is typical in most teacher education programmes in sub-Saharan Africa. Again, the programme depicts Lewin & Stuart (2003) 'technician' type of teacher education in Ghana as indicated in the MUSTER studies.

On the whole the objectives of the programme reflect the philosophy of teacher education in Ghana as it is in the philosophy of teacher education in the national teacher education policy (2011). Assertions of Aggarwal (2004) on the objectives of teacher education such as enabling teachers to play effective roles in their various classrooms and schools is also seen in this angle. In all these however, it can be said that the specific objectives of the history teacher education programme is not very clear to both respondents since all their responses bothered on the overall aim of the programme but not the exact objectives of the programme.

Entry characteristics of history student teachers in the University of Cape Coast

This aspect of the research sought to survey data relating to the background characteristics of respondents before enrolling in the programme. These included, among other things, the qualification, aggregates, grades obtained in history, teaching experience and especially the motives of student teachers for pursuing the B.Ed (Arts) programme. From the data collected from the two groups of respondents i.e. student teachers and practising teachers, it is possible to construct a profile of the background characteristics of those who are trained by the University of Cape Coast to become history teachers in Ghana. This is presented in Tables 3,4,5,6, and 7.

By the regulations of the programme, applicants to the programme are to at least have a senior secondary school certificate. The researcher by this inquired from student teachers and practising teachers' about their highest qualification before enrolling into the programme. This data is presented in Table 3.

Table 3: Highest Qualification before Enrolling into the Programme

Qualification	Student Teachers		Practising Teachers	
	N	%	N	%
HND	1	6.2	0	0
Diploma	0	0	0	0
Certificate 'A'	4	25.0	12	50.0
SSCE/WASSCE	11	68.8	11	45.8
'A' Level	0	0	1	4.2
Total	**16**	**100**	**24**	**100**

It is evident from the findings that 11 (68.8%) of the student teachers entered the university directly from the Senior High School. In the case of the practising teachers, not many of them entered straight from the Senior High School. Twelve (50.0%) of the respondents had certificate 'A' from the teacher training colleges before entering the university. However 11 (45.8%) of the practising teachers from the results can be said to have entered directly from the Senior High School. This clearly shows that majority of the entrants have qualifications from the senior high and training colleges in Ghana.

From the available data in Table 4 it was realised that some of the student and practising teacher respondents had experience of teaching before their admission into the programme. With respect to the number of years spent in teaching, 6 of the student teachers indicated that they had teaching experience ranging between 1-5 years. On the part of the practising teachers, 13 (86.7%) taught between 1-5 years and 2 (13.3%) of them taught between 6-10 years.

I also inquired from the student teacher and practising teacher respondents the level at which they taught. Data related to this question is presented in Table 4.

Table 4: Respondents' level of Teaching

Level of teaching	Student teachers		Practising teachers	
	N	%	N	%
Kindergarten	0	0	0	0
Nursery	1	16.7	0	0
Primary	1	16.7	1	6.7
JHS	3	49.9	13	86.7
SHS	1	16.7	1	6.7
Total	**6**	**100**	**15**	**100**

It can be said from Table 4 that majority of the student teachers 5 (83.3%) and practising teachers 14 (93.3%) who indicated they had teaching experience taught at the basic school level with only 1(16.7%) student teacher and 1 (6.7%) practising teacher teaching at the Senior High School level.

To qualify as a student teacher in the history teacher education programme, applicants are to have aggregates ranging from 6 to 20 from the WASSCE. By this, the researcher sought to find out aggregates obtained by prospective student teachers before enrolling into the programme. This is presented in Table 5.

Table 5: Aggregate obtained before Enrolling into the Programme

Aggregate	Student Teachers		Practising Teachers	
	N	%	N	%
6-10	2	12.5	4	16.7
11-15	12	75.0	11	45.8
16-20	2	12.5	9	37.5
Total	**16**	**100**	**24**	**100**

Table 5 indicates that 12 (75.0%) representing the student teacher sample had aggregates ranging from 11 to 15 whilst 11 (45.8%) of the practising teachers fell within the same range. Just a few student teachers 2 (12.5%) and practising teachers 4 (16.7%) had higher aggregates within the range of 6 to 10 before enrolling into the programme. Few student teachers 2 (12.5%) and practising teachers 9 (37.5%) had aggregates within the range of 16 to 20. This shows that student teachers enter into the history teacher education programme with fairly good aggregates.

In order to qualify as a history student teacher, there is the need for students to have basic knowledge in history. Table 6 indicates whether prospective student teachers studied history in the Senior High School.

Table 6: Respondents' Study of History in the SHS

	Student Teachers		Practising Teachers	
	N	%	N	%
Yes	15	93.7	24	100
N	1	6.3	0	0
Total	**16**	**100**	**24**	**100**

With respect to whether respondents had basic knowledge of history before enrolling into the programme Table 6 shows that majority of the student teachers 15 (93.8%) as well as practising teachers 24 (100%) studied history in the Senior High School. Only one student (6.3%) did not study history in the Senior High School, but rather studied government.

I further inquired from respondents the grade they obtained in history and this is presented in Table 7.

Table 7: Grade Obtained in History

Grade	Student Teachers		Practising Teachers	
	N	%	N	%
A	4	26.6	8	33.4

B	9	60.0	14	58.3
C	2	13.4	2	8.3
Total	**15**	**100**	**24**	**100**

From Table 7, it can be deduced that all the respondents who qualified for admission, possessed history grades in the top pass category of A, B and C. About 9 (60.0%) of the students and 14 (58.3%) practising teachers had grade B. A few of the students 2 (13.4%) and practising teachers 2 (8.3%) obtained grade C with about 4 (26.6%) student teachers and 8 (33.3%) practising teachers having a higher grade of A.

In relation to the subjects taught before entering the university, data shows that majority of those who had teaching experience taught social studies which is history related. With respect to the practising teachers majority of them taught Social Studies, English, Mathematics and Ghanaian language. The student teachers on the other hand taught subjects such as Social Studies, English, Religious and Moral education, Mathematic (i.e.) all the subjects taught in the primary school. This portrays that prospective student teachers had some ideas and interest in history before enrolling into the programme. Though it seems difficult to know how the profile status of student teachers impact on their early years of teaching. Nevertheless it is reasonable to believe that certain aspects of their background profile contribute to the development of their professional self-identity and image.

Reasons for choosing history as a major subject

Respondents were again asked on reasons why they chose to pursue the B.Ed (Arts) programme with history as their major subject. From the data provided it indicated that most of the student teachers chose to pursue the history teacher education programme out of their interest in teaching history. Six student teachers representing 37.5% of the student teacher population had interest in the teaching of history. Seven other student teachers representing 43.75% of the student teacher population wanted to develop themselves professionally by pursuing the programme and three student teachers pursued the programme either because of seeking employment, a 'vision' or chosen for by a relative. On the part of the practising teachers it was observed that majority of them pursued the programme because they wanted to develop themselves professionally. The idea of interest as compared to the student teacher respondents also reflected in the area of the practising teachers as 4 representing 16.6% indicated they had interest in pursuing the programme. Some practising teachers also chose the programme because they wanted to understand issues and acquire more knowledge about education. In all a greater number of the practising teachers pursued the programme because they wanted to develop themselves professionally. The researcher inquired from respondents of their interest in the study of history. This is presented in Table 8

Table 8: Respondents' Interest in History

	Student Teachers		Practising Teachers	
	N	%	N	%
Yes	14	87.5	24	100

No	2	12.5	0	0
Total	**16**	**100**	**24**	**100**

From the data presented in Table 8, it can be said that all the practising teacher respondents expressed their interest in the study of history. Only two student teacher respondents (12.5%) had no interest in the study of history. When probed during the focus group discussion it was discovered that the grades they get in the programme deter them from developing interest in the programme as a student teacher remarked:

Madam, sometimes you will try your best to learn hard for quizzes and examination and it seems there is a predetermined grade for you. I never progress in the type of grades I have from the history department. My highest grade is a C+.

This result supports the findings Virta (2002) research that student teachers choose to be educated as history teachers themselves because of their attachment or interest in the subject. Findings to this effect indicate student teachers need to be motivated in order to maintain their interest in the learning and teaching of history. In this sense, motivating factors such as travels, museums and visits to historic sites should be made available to student teachers in order to boost their implicit theories of learning to teach (John, 1996). Again the findings in relation to the deeper motivation of student teachers choice of the programme is in consonance with Akyeampong (2001) study on the motives behind beginning student teachers choice of teaching as a career. With most of the practising teachers and student teachers holding certificates from the teacher training college, it can be said that the policy of study leave with pay which Akyeampong (2001) stated as one of the reasons for the choice of the teaching profession at the basic level is reflected here. Also its (teaching) offer of readily available job for all graduates in the country who are interested in teaching as profession as a basis for their choice of the teaching profession emerged in this research. It can be concluded from the findings on entry characteristics that people who chose to pursue teacher education in history had some teaching experience mostly at the basic level and have taught history related subjects. Statements can also be made to the effect that teacher candidates had good grades in history as well as had good aggregates before enrolling into the programme. Again individuals who intend pursuing the programme also had interest in the study of history.

V. CONCLUSION

1. The history teacher education programme in the University of Cape Coast is a technician type of teacher education which aims to train teachers to help students attain high academic standards or laurels in their academic pursuits. It is recommended therefore that the content area courses, especially the African related courses be revised to meet current trends and topics in the Senior High School (SHS) syllabus. This will equip the student teacher with the required knowledge and Insight needed

to impart on the students and also improve their understanding of the issues bordering the African continent and the world as a whole. It is suggested that the Department of history revises their course content to cater for these anomalies.

2. It can also be concluded that the respondents entry characteristics to the programme are appropriate and well deserving, coupled with their background in history and other art related courses. They particularly have interest in the subject and had also taught other related subjects in the basic schools thereby developing their edge for the programme. Though respondents' background characteristics are appropriate, it is recommended that prospective applicants are made to choose the subject area of interest to study instead of it being chosen for them by the university. This affords prospective students the opportunity to pursue the programme with ease and confidence.
3. Again, most of the student teachers had interest and are motivated to study the course and to deliver after schools. This makes the assertion that the study of history is boring and as such people are not interested in it again somehow questionable. It is therefore recommended that the interest on would be history students be sustained and strengthen to increased the students number.

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The Improvements in Supply Chain Management through Beer Game

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Abstract- In 1960's an excellent game named "The Beer Game" was developed to provide a useful learning experience about the supply chains. This research work was made to explain certain behavior of supply chain systems with the help of beer game that was basic necessity of most of supply chains systems. This research is a real life example of how organizations are working on basis of simulation playing method of beer game. The major aim of this research was to reduce the total cost, for every member in the supply chain, by maintaining low stocks with proper delivery of orders. Research explained how the value of sharing information across the various components of supply chain helps to increase the efficiency of system. Beer game actually helped to reduce the cost as much as possible and manages the flow of material at right locations at the right time with the right quantity. In result, it helped to reveal all the hidden problems to the entire supply chain system.

I. INTRODUCTION

How the Beer Game is played:

In beer game there are four players named as

a. Retailer

b. Wholesaler

c. Distributor

d. Factory

The major goal of all supply chain members is to reduce total cost for the system and for the individual as well.

Basically, it is just a simple procedure to supply beers from factory to retailer with the coordination of wholesaler and distributor. It helps in transferring of orders from retailers to factory by taking the help of decision makers like wholesaler and distributors. There is a fixed lead time and order delay time between each player with the maximum try to minimize the backorders (If any orders cannot be met then it is recorded as backorders) and inventories. Supply chain tries its best to meet the demand of orders and is completed as soon as the inventories are available. In supply chain, each player of each item costs $ 0.50 per case for inventory and $ 1.00 per case for Backlog. It is compulsory to welcome every order in the system.

In addition to this, the wholesaler keeps some inventory to complete the orders of retailer, in the same way the distributor keeps some inventory to complete the orders of wholesaler and the factory owns both the inventory in transit to the distributor as well as the items being manufactured.

The beer game starts as first you have to take the order in, try to complete that order by moving shipment in and then move order out to the supplier. In the mean time the inventory and backlog should be recorded.

In one week, the order of each supply chain member arrives at the supplier. The most recent try of supplier is to fill it with available inventory, and then there is a delay of two weeks because of transportation before the material being shipped by the supplier and arrives at the customer.

II. Research Elaborations & Explanation:

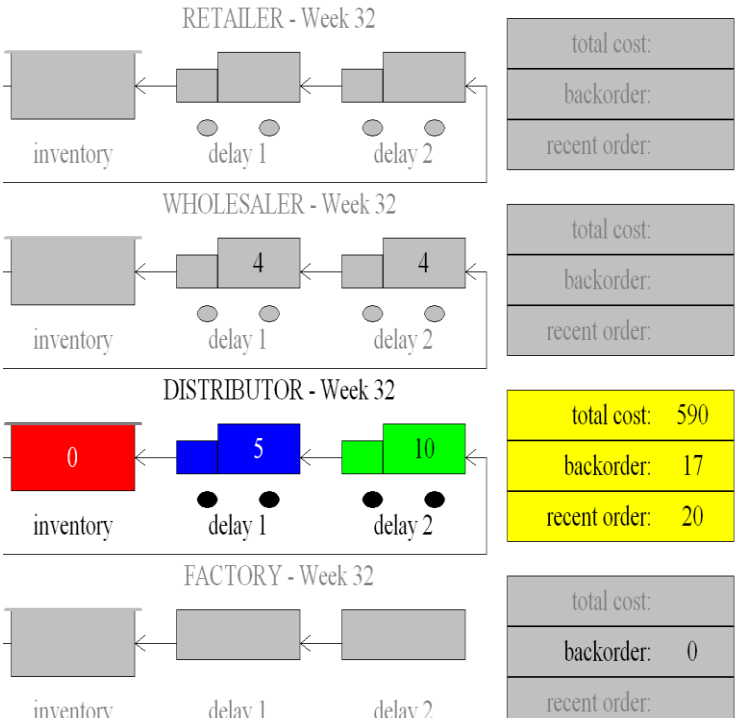
Playing of game for 32 weeks as the Distributor

Without changing any default settings, game was played for 32 weeks as a distributor. The details of the Inventory, backlog, recent orders and total cost for each week are mentioned in table given below.

Weeks	Inventory	Backlogs	Recent orders	Total cost
1	8	0	2	6
2	12	0	3	12
3	0	8	4	26
4	0	13	5	46
5	0	36	15	84
6	0	32	8	120
7	0	32	8	155
8	0	33	20	190
9	0	32	20	126
10	0	32	30	267

11	0	7	0	293
12	5	0	0	316
13	3	13	6	328
14	30	5	1	348
15	30	0	1	366
16	25	0	1	382
17	23	0	0	395
18	16	0	1	411
19	12	0	1	423
20	6	0	1	432
21	0	0	2	438
22	1	0	1	442
23	0	0	1	443
24	0	0	1	444
25	0	9	9	455
26	0	13	3	469
27	0	22	3	492
28	0	14	4	511
29	0	14	4	531
30	0	12	4	547
31	0	17	10	569
32 **Total**	0 **171**	17 **361**	20 **189**	590 **10657**

The results of beer game after playing for 32 weeks as a Distributor is as shown below:



3. Total cost of playing the game without strategies

At the end of the game total cost of playing the game as distributor is **$ 590** with 17 back orders and zero inventories.

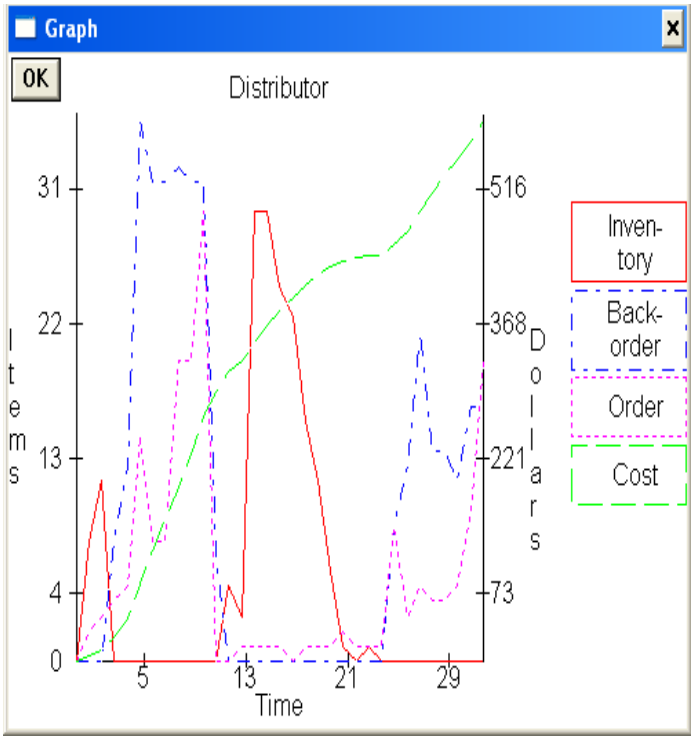
As the total cost of the whole system is

Total cost =Sum of Inventory cost of each week/2 + sum of backlog cost of each week

= 171/2 +361

= 446.5

4. Results of the beer game on Graph



As it is obvious from the graph that in the start of 3rd week the backlog starts to increase and reaches up to 32 items on the 10th week. There are the following reasons behind that:

a) Very high increase in demands from the wholesaler side.

b) The delay from the factory regarding supply of items.

That high increase of backlog resulted in increase of cost. At the end of 12th week, the inventory started shooting up because of proper supply of items from the factory and as a result, all the back orders got completed properly. But on the other side the cost started shooting up because of very high inventory from week 12 to 22. From weak 22 to 25 both the inventory and backorder got managed. But From the week 25, orders from wholesaler suddenly got increased. As a result, the back order started shooting up and it reached up to 17 items at the end of 32 weeks.

5. Use of available strategies in the game:

From the available strategies in the options of the beer game, following two strategies got selected:

a) Short Lead Time
b) Global Information

Reasons for how the strategies improve the performance of beer game

a) Short Lead Time

By using the short lead time we can reduce the delay factor for one week however in any other strategy this option is not available. By reducing the delay factor it is easier to reduce back order and to manage inventory and cost of the inventory.

b) Global Information

In this strategy, the most attractive point is that we have open information of all the supply chain players, about their back orders, inventories and even orders that they are placing to their suppliers. So it becomes easier to predict the order of wholesaler and to place the order properly to the factory.

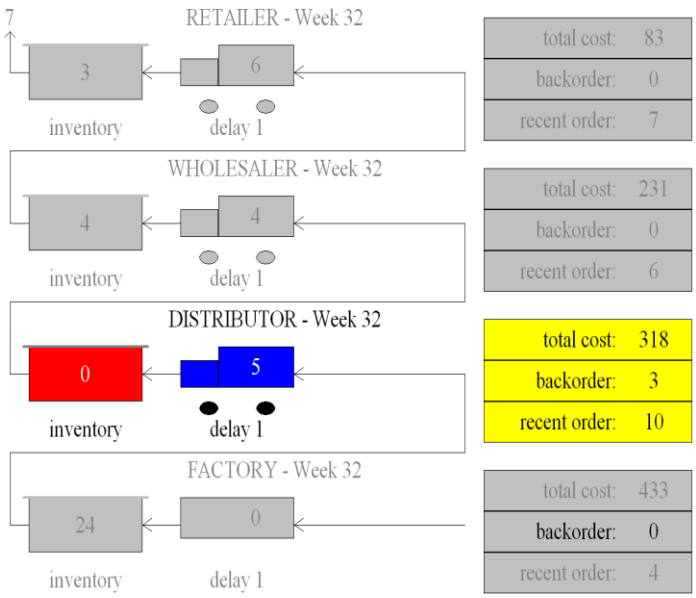
In short both of these strategies helped us to increase the efficiency of game and to reduce the cost of game.

6. Playing the Beer Game for another 32 weeks using the above strategies

After changing default settings, game was played for 32 weeks as a distributor. The details of the Inventory, backlog, recent orders and total cost for each week are mentioned in table given below.

Weeks	Inventory	Backlogs	Recent orders	Total cost
1	8	0	4	4
2	8	0	4	8
3	8	0	15	14
4	0	3	2	23
5	0	6	3	29
6	0	9	2	38
7	2	0	1	48
8	0	1	1	51
9	0	3	2	54
10	0	10	10	65
11	0	18	10	84
12	0	12	4	101
13	0	6	3	112
14	0	5	10	119
15	0	17	0	137
16	0	13	5	155
17	0	20	15	175
18	0	25	10	203
19	0	15	5	225
20	0	14	5	242
21	0	7	10	254
22	0	5	5	261
23	2	0	1	266
24	2	0	2	270
25	0	0	10	271
26	0	5	10	281
27	0	0	1	286
28	8	0	20	291
29	0	1	0	297
30	13	0	0	306
31	4	0	5	313
32	0	3	10	318
Total	**55**	**198**	**185**	**5301**

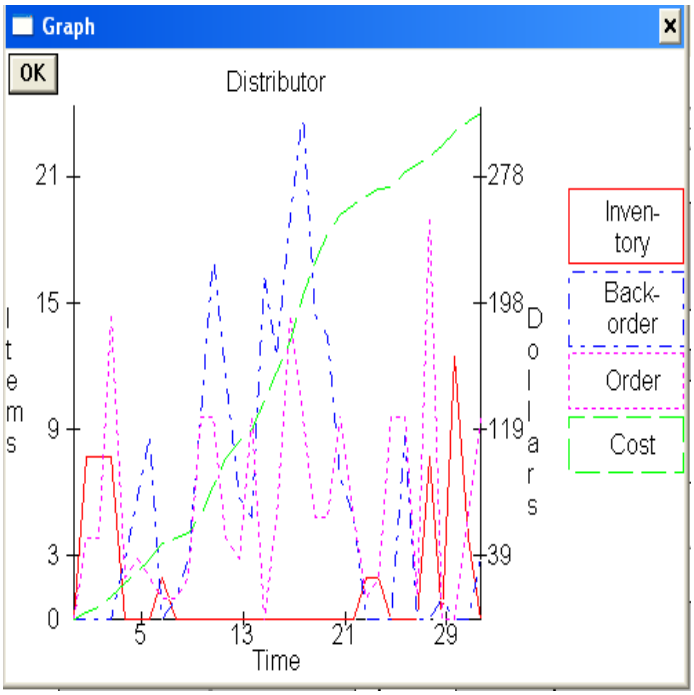
Output of the Beer Game using strategies after 32 weeks is as shown below.



7. Total cost of playing the game with the above strategies:

After setting the strategies such as Short Lead Time and Global Information, game was played again for 32 weeks as a distributor. At the end of the game total cost of playing the game was **$ 318** with backorders of 3 and 0 inventory. By using the same formula as mentioned above the total cost of the whole system is $ 225.5

8. Explanation of the graph from the new beer game:



In the start, the trend of the graph with strategies is same as the graph without strategies because the back order started increasing up in the same way as it was in case of previous graph without strategies and the reason behind is that there is no supply from the factory side. The most important factor that should be noted is from 2nd week to 26th week. Even there was a facility of strategies like short lead time and global information, but due to very high level of demands of wholesaler these strategies did not helped to reduce back log. However very high level of demand from wholesaler keep on increasing till the end of the game, from 25th week to 32nd week, it get managed at the end by increasing inventory by giving more orders through method of order demand fluctuation and order forecasting.

Results & Conclusion

Comparisons of the results from two Beer Games:

Following are the major points that need to be discussed during comparison:

1. Distributor Cost

The most prominent difference between the two graphs is the decrease in cost of distributors. The cost was $590 and after using strategies it gets decreased to $316.

2. Total Cost

The difference between the total costs of the system is one of the obvious differences. The cost of the system before the use of strategies was 446.5 and it got decreased to 225.5 after the implementation of strategies.

3. Backlog Control

The backlog started from 2nd week to 12th week in the graph without strategies and reached to the value of 37 however after use of strategies the graph shows us that there is no extra-ordinary shooting of back order even at the start of the game and back order only reaches to the value of 23.

4. Inventory Control

The graphs show us that there is a good control on the inventories when we implement strategies and it is clear from the pattern of graph if we compare it from week 5th to 25th week. Secondly the maximum value of inventory in graph without strategies is 30; however the other graph has a maximum value of 13. So the difference is obvious.

5. Total Control on System

One of the common problems in supply chain is that in the start the orders of wholesaler are always very high so it's not possible to control that backlog without proper ordering information of all the players in the game. While using strategies we can utilize this information and creates more control on all the orders of the distributor even if the amount of orders of the system is very high.

9. Implementation of adopted strategies in an actual supply chain

a) Implementation of global Information strategy

The global information strategy can easily be implemented in supply chain by using the IT Software system. The advancement in the technology of information system has created a huge impact on the evolution of supply chain management. Because of

these extra-ordinary technological advances, supply chain players and partners can now work more efficiently with a very high level of information flow to optimize the chain-wide performance. The name of this highly efficient enabler is IT (information technology). The implementation of global information strategy through IT provides us following advantages in actual supply chain:

1. Proper designing and managing of supply chain.
2. Excellent Modeling of supply chain dynamics.
3. Timely investigation of problem.
4. Good idea of demand forecasting.
5. More responsive atmosphere.
6. Proper calculation of demand fluctuation.

b) Implementation of Shorter lead time

In order to improve any supply chain performance, it is an important factor for groups in a supply chain to focus on the reduction of lead time like they are focusing on the implementation of global information. Even the theory of supply chain management suggests that lead time reduction is important in adjusting production to fit actual customer demands and helpful to reduce uncertainty which is one of the primary goal of supply chain management. There is a common observation that to begin with proper information transfer improvement; we can easily ignoring the problem of long lead times. So again IT is helpful to reduce lead time. One of the leading advantages of implementation of shorter lead time is the reduction inventory cost of the system and secondly the system becomes more efficient and simple as well.

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Biodegradation of palm oil mill effluent (POME) by bacterial

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Abstract- Palm oil mill effluent (POME) is produced in large volumes by many of the palm oil mills in Malaysia and contributes a major source of pollution. The main aim of the present study was to evaluate the biodegradation potential of bacterial isolated from POME and to find the most suitable strain(s) for a biological treatment technology of POME. The isolates were identified by sequences analysis of 16S rRNA genes. Sequencing of the 16S rRNA of the isolates suggests that they were identified as *Micrococcus luteus*101PB, *Stenotrophomonas maltophilia*102PB, *Bacillus cereus*103PB, *Providencia vermicola*104PB, *Klebsiella pneumoniae*105PB and *Bacillus subtilis*106PB.Results revealed that total suspended solids (TSS), oil and grease were reduced dynamically with treatments after 5 days. *Bacillus cereus*103PB produced the highest activity in reducing TSS (71.63%), oil and grease (85.14%).Simulation study results showed comparable reduction of parameters measured. The results presented in this study of simultaneous removal of TSS, oil and grease, appears useful for practical wastewater treatment as a compact treatment system for POME. Thus the strain *Bacillus cereus*103PB is the most effective bacteria and the best candidate to use in biological treatment technology of POME having the highest TSS, oil and grease reduction rate. Hence *Bacillus cereus*103PB do possess the biodegradation ability and is able to reduce the pollutants of the effluent sample. These results suggested that *Bacillus cereus*103PB might be applicable to a wastewater treatment system for the removal of TSS and oil. The strain also produces extracellular lipase and cellulase which stimulates better waste treatment. This study demonstrated that POME degrading microorganisms can be isolated from POME polluted area and the degrading ability of these microorganisms is *a* clear indicator that these bacteria can be applied in the bioremediation techniques for biodegradation of POME to enhance treatment.

Index Terms- Biodegradation, oil & grease, physicochemical, POME, TSS, wastewater

I. Introduction

The palm oil industry is one of the major agro-industries in Malaysia. The production of palm oil, however, results in the generation of large quantities of polluted wastewater commonly referred to as palm oil mill effluent (POME). The most significant pollutant from palm oil mils is POME (Poh and Chong, 2009). Typically, 1 t of crude palm oil production requires 5–7.5 t of water; over 50% of which ends up as POME. This wastewater is a viscous, brownish liquid containing about 95–96% water, 0.6–0.7% oil and 4–5% total solids (including 2–4% SS, mainly debris from the fruit). It is acidic (pH 4–5), hot (80–90 ^{0}C), nontoxic (no chemicals are added during oil extraction), has high organic content (COD 50,000 mg/l, BOD 25,000 mg/l) and contains appreciable amounts of plant nutrients (Singh et al., 1999; Borja and Banks, 1996). POME contains about 4000–6000 mg/l of oil and grease (Ahmad et al., 2005).

The composition of POME are mainly water, oil, suspended solid, dissolved solid and sand (Ibrahim et al., 2012), total suspended solids (TSS), as well as cellulose wastes (Rashid et al., 2009), vegetative matter, colloidal slurry of water and solids including about 2% suspended solids originating mainly from cellulose fruit debris, that is, palm mesocarp (Bek-Nielsen *et al*., 1991).The suspended solids in POME which are the cellulolytic material derived from palm mesocarp are organic in nature and considered as organic matter(Chin et al., 1996) and constitute about 50% of the POME (Ho et al., 1983; Ho et al., 1984).

Treatment and disposal of oily wastewater, such as palm oil mill effluent is presently one of the serious environmental problems contributors. Palm oil mill wastes have existed for years but their effects on environment are at present more noticeable. The oily waste has to be removed to prevent interfaces in water treatment units, avoid problems in the biological treatment stages, and comply with water-discharge requirements (Ahmad et al., 2005). Palm oil mill effluent (POME) is an important source of inland water pollution when released into local rivers or lakes without treatment. POME contains lignocellulolic wastes with a mixture of carbohydrates and oil (Oswal et al., 2002).

Recently, various physical and chemical treatment processes have been designed to treat POME, however, the problem of chemical residues and total suspended solids (TSS) which is still present after the treatment process remain to be resolved further(Abdul Karim et al., 2011). The use of microorganisms in biological treatment of POME in this present study offers an alternative solution to reduce the TSS and organic load content of the effluent (Alam et al., 2009).

Palm oil industries are facing tremendous challenges to meet the increasingly stringent environmental regulations (Najafpour et al., 2006). Thus, it is obvious that the presence of high levels of fat, oil and grease in wastewater induces serious problems not only to the receiving water but also to treatment plants and waste collecting systems. Although oil is not generally thought of as a material which is discharged into Land Rivers, it can and does reach these waters; not only as tin colored films but also in sufficient volumes to necessitate the closing of abstraction points (El-Bestaway et al., 2005). It is therefore essential that the potential danger from oil pollution is fully appreciated.

The various effluent treatment schemes which are currently used by the Malaysian palm oil industry are listed in descending order: (a) anaerobic/facultative ponds (Rahim and Raj, 1982; Wong, 1980; Chan and Chooi, 1982), (b) tank digestion and mechanical aeration, (c) tank digestion and facultative ponds, (d) decanter and facultative ponds, and (e) physico-chemical and biological treatment (Andreasen, 1982).

The current methods adapted for the treatment of palm oil mill effluent (POME) in most of the mills in Malaysia is the ponding system in which about 85% of the mills practice (Poh and Chong, 2009). This is not very effective in treating the pollutants in the POME to the stringent standards required (Jameel and Olanrewaju, 2011); The status and concentration of the oily matter/oil residue (oil and grease) after the treatment process is given less attention and this suggest that these approach employed is not sustainable to minimize the environmental impact of oil and grease in POME. Moreover, the range of concentration of oil and grease in POME is relatively higher than those obtained in toxic wastewater (Jameel and Olanrewaju, 2011). Thus, the need for effective treatment process for POME.

The anaerobic digestion treatment of POME using various types of bioreactors by researchers and the ponding systems in the mills uses undefined microbial populations (McHugh et al., 2003) to reduce the polluting power of wastes and wastewaters. This involves a consortium of undefined microorganisms catalyzing a complex series of biochemical reactions that mineralize organic matter producing methane and carbon dioxide. These microorganisms are not established and hence the substrate they degrade and utilize is not ascertained. This lead to poor effluent discharge into the environment as the performance of the microorganisms with regards to the rate of reduction and removal of oily waste cannot be monitor since they are not known.

The present study will use defined/known microorganisms isolated from POME to inoculate the POME and monitor the percentage removal/reduction of the physicochemical parameters with a view to enhance treatment. This emphasizes the originality of the study and hence, this has therefore attracted the interest of this study.

Furthermore, since several researchers based their findings on the overall COD removal, methane production and not the individual microorganisms (using undefined microbial population) utilizing and degrading the components in POME making up the COD and BOD, tailored to the fact that, no work has been done on the isolation of different individual microorganisms breaking down and utilizing the different components in POME making up the COD and BOD in order to remove or reduce the organic load level. Therefore, this research to the best of our knowledge can be listed as a novel study.

Very few investigations have been conducted on aerobic digestion process for the treatment of oil and grease present in POME (Wu et al., 2010). The major problems lie in the establishment of the most suitable microbial population for POME waste to be treated (Yacob et al., 2006; Poh and Chong, 2009). Some aerobic treatment approaches include: degradation of POME using a tropical marine yeast (*Yarrowia lipolytica*) NCIM 3589 in a lagoon (Oswa et al., 2002), trickling filter (TF) (Norulaini et al., 2001) and rotating biological contactors (RBC) (Najafpour et al., 2005). Organisms used for these aerobic treatments by the investigators are isolated from different source while this present study will isolate indigenous organisms from POME for the treatment.

Microbial degradation of oil wastewater is a concern in recent years. A variety of microorganisms such as bacteria, molds, and yeasts, have been shown to be capable of completely degrading oil wastewater (Ammar *et al*., 2005; Dhouib *et al*., 2006; Erguder *et al*., 2000; Ettayebi *et al*., 2003; Kissi *et al*., 2001). Therefore, using of microorganisms for treatment and bioremediation purposes affords a very efficient tool for purifying contaminated effluents and natural water (Glazer & Nikaido 1995). Using bacterial strain that possesses high efficiency in accumulating toxic contaminants or biodegradation of persistent biodegradable matter has potential in the use of the treatment system to remove pollution such as oil and grease or heavy metals from any polluted aquatic effluent (Campere et al. 1993).

The application of microorganisms such as *Trichoderma viride* spores, *T. viride* mycelium, *Yarrowia lipolytica* and *Saccharomyces cerevisiae* for the treatment of POME have not been extended to the removal of oil and grease (Jameel and Olanrewaju, 2011) despite their high potential in removing COD from POME. This may be due to the fact that these microorganisms are not indigenous to POME. This therefore offer researchers a greater opportunity to investigate the removal of oily matter/oil residue(oil and grease) from POME using microorganisms isolated from POME (Jameel and Olanrewaju,2011).This is the focus and emphasis of the present study and it is design for this purpose. Hence, this has therefore attracted the interest of this study. The main aim of the present study was to evaluate the biodegradation potential of bacteria isolated from POME and to find the most suitable strain(s) for a biological treatment technology of POME.

II. MATERIALS AND METHODS

Sample collection/Sampling Source

Raw palm oil mill effluent (POME) was collected from the site of a palm oil mill industry in a sterile container and brought back to the laboratory. The sample was transported to the laboratory in an ice box and analyzed for microbiological and physicochemical properties within four (4) hours of collection. The physicochemical characteristics of the sample were determined in accordance with the standard methods published by American Public Health Association (APHA, 1995; APHA, 2005)

Sample Preservation.

The POME was preserved at a temperature less than 4 ^{0}C, but above the freezing point in order to prevent the wastewater from undergoing biodegradation due to microbial action (APHA, 1985).

Identification of Bacteria Isolates by sequencing of 16S rRNA gene

Preliminary identification of individual bacterial isolates was obtained by classical tests (Gerhardt *et al*., 1981; Bergey *et al*., 1994). Such identification included the shape of cells, Gram stain

and colony morphology on solid nutrient media. Genetic identification of isolates was performed by determining nucleotide sequences of 16S rRNA genes using commonly used primers for amplifying the DNA between positions 27 and 1492 of bacterial 16S rRNA genes.

Sequence of Primers**:**
27F: 5'-AGAGTTTGATCMTGGCTCAG-3'
1492R: 5'-GGGTTACCTTGTTACGACTT-3'

Plate 1and 2 shown Genomic DNA and Purified PCR product of bacteria isolated from POME respectively. The bacteria were isolated from our previous study. Isolated bacteria from POME were investigated for their ability to produce lipase and cellulase on solid media in our previous work. Biodegradation potential and growth profile in mineral salt medium (MSM) was also investigated in our previous study.

Genomic DNA and Purified PCR product of bacterial isolated from POME

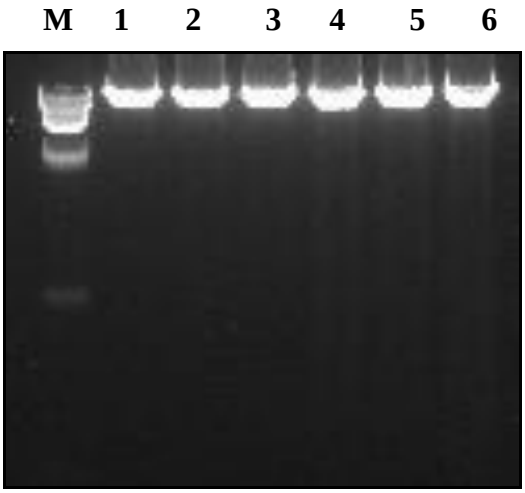

Plate 1: **Gel Picture of Genomic DNA:** Lane **1**: 101PB; **2**: 102PB; **3**: 103PB; **4**: 104PB; **5**: 105PB; **6**: 106PB; **M**: Lambda/HindIII marker.

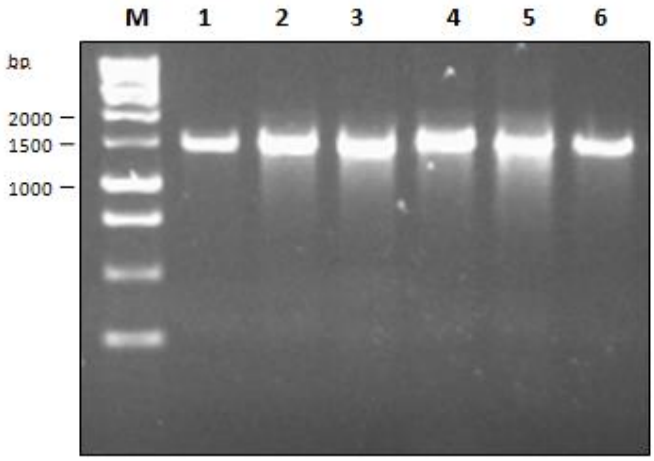

Plate 2: **Gel Picture of Purified PCR product:** Lane **1**: 101PB; **2**: 102PB; **3**: 103PB; **4**: 104PB; **5**: 105PB; **6**: 106PB; **M**: 1 kb marker (Fermentas)

Experimental procedure

Analytical methods and characterization of POME

Physicochemical parameters were also determined in order to characterize POME. These parameters included pH, total suspended solids (TSS), biochemical oxygen demand (BOD_5), chemical oxygen demand (COD) and oil & grease (O&G. Characterization of the POME was carried out before and after the treatment to determine the efficiency of the treatment. Total suspended solids (TSS) were determined as dry weight (mg/L), pH was measured using pH meter, the organic strength (COD) of the wastewater was determined by spectrophotometer method, the biodegradability of the wastewater was measured in terms of BOD_5, and oil and grease was determined according to the partition-gravimetric method. All the methods were carried out according to the procedures described in the Standard Methods for the Examination of Water and Wastewater (Clesceri et al., 1999; APHA, 1995; APHA, 2005).

Oil-degradation rate (%) was defined as the amount of oil degraded versus the amount of initial oil. The COD degradation efficiency was defined as the amount of COD decreased versus the amount of initial COD. Biodegradability of the wastewater in terms of BOD_5 was defined as the amount of BOD decreased versus the amount of initial BOD and TSS degradation efficiency was defined as the amount of TSS decreased versus the amount of initial TSS. All the experiments were performed in triplicates.

Inoculation of POME with Bacterial Isolates

Sterile POME sample

Using single/individual bacterial strains.

*Micrococcus luteus*101PB, *Stenotrophomonas maltophilia*102PB,*Bacillus cereus*103PB, *Providencia vermicola*104PB, *Klebsiella pneumoniae*105PB and *Bacillus subtilis*106PB isolated from POME were used in the present study. Strains showed varying degrees of lipase and celllulase activity on solid media in our previous study. 101 PB, 102 PB, 103 PB and 106 PB were selected for POME inoculation based on the criteria that they were able to display good rate of growth and degradation/utilization of palm oil and cellulose as sole source of carbon and energy in MSM liquid medium in our previous study.

250 mL of raw POME sample was introduced into each conical flasks and sterilized at 121°C for 20 minutes. The sterilized raw POME was allowed to cool before inoculation. Eight percent of each inoculum (standard bacterial suspension) containing 10^4 cells/mL with an optical density (OD) of 1.2 at 600 nm was used to inoculate 250 mL of POME sample without addition of nutrients. They were incubated at 37°C and at 150 rpm shaking speed. Bacterial cultures were incubated under aerobic conditions at 37°C and agitated at 150 rpm. Samples were then aseptically drawn every 24 hours for 5 days and analyzed for BOD_5, COD, oil & grease, TSS and pH. Samples were also carried out for cell counting. Cell count was determined by plating serial dilutions of samples on nutrient agar plates and incubating at 37 °C for 24 h. Control flasks were not inoculated. All the experiments were performed in triplicates. The efficiency for organic load reduction and the percentage

reduction was measured by using the following equation (Piro et al., 2011):

$$\text{Reduction } (\%) = \frac{C_{\text{raw POME}} - C_f}{C_{\text{raw POME}}} \times 100$$

Where $C_{raw\ POME}$ is the concentration of COD, BOD_5, TSS and oil & grease of raw POME and C_f the concentration of these parameters after treatment. Each set of these experiments was carried out three times.

Non- Sterile POME sample (Simulation Study)

Using single/individual bacterial strains.

The procedure for the simulation study was the same as forementioned only that the POME sample was not sterilized. The main aim was to investigate the maximum enhancement in the degradation abilities of the investigated bacteria using the natural conditions of the raw POME where they were originally isolated in order to get the most effective and economical treatment under the effluent's natural conditions in the field.

III. RESULTS AND DISCUSSION

Palm oil mill effluent (POME) characteristics

Raw POME collected from the palm oil mill was thick brownish in color, colloidal suspension, dark, oily and viscous with an obnoxious odour. The sampled effluent had a high COD content of 75,900 mg/L, BOD 34,393 mg/L, TSS 14,467 mg/L, oil & grease 190.6 mg/L and pH 4.74. The characteristics are presented in Table 1. This suggests increase potential for pollution of the effluent. In comparison, Chin et al. (1996) have reported that POME contains a high concentration of organic matter, COD concentration of 65,000 mg/L, BOD of 48,000 mg/l and oil and grease greater than 2000 mg/L. Other investigators have also reported values similar to the present study. BOD 25,545 mg/L, COD 55,775, TSS 18,479mg/L, oil & grease 8020 mg/L and pH 3.5 (Vijayaraghavan et al., 2007), BOD 43,750 mg/L, COD 51,000mg/L, TSS 18,000mg/L, oil & grease 130 mg/L, and pH 4.2 (Lam and lee, 2011), BOD 25,000mg/L, COD 50,000mg/L, TSS 18,000mg/L, oil and grease 4000mg/L (Ahmad et al., 2005).BOD 26,000mg/L, COD 55,700mg/L, TSS 16,500mg/L, oil and grease 4,900mg/L and pH 4.4 (Najafpour et al., 2006) and BOD 25,000mg/L, COD 50,000mg/L, TSS 18,000mg/L, oil & grease 4,000mg/L and pH 4.7 (AbdulKarim et al., 2011). The result for oil and grease in the present study was low when compared with results from other researchers who obtained higher values for oil and grease (Ahmad et al., 2003; Najafpour et al., 2006; Vijayaraghavan et al., 2007 and Wanna and Pornpan, 2007). Although, Lam and lee, (2011) also reported low values of 130 mg/L for oil and grease comparable to the present study which exceeded the discharge standard limit. The difference may be due to differences in species of oil palm, degree of oil extraction during milling and method of extraction, whether local or automated. The volume of water used during the milling process is also a factor to consider.

Table 1 Characteristics of raw palm oil mill effluent (POME) and Discharge Standard limits

Parameters	Raw POME (mg/L)	Discharge Effluent Standard
Chemical oxygen demand (COD)	75,900	-
Biochemical oxygen demand (BOD)	34,393	100
Total suspended solids (TSS)	14,467	400
Volatile suspended solids (VSS)	13,033	-
Oil and grease (O &G)	190.6	50
pH	4.74	5 - 9

All parameters are in mg/L except pH

Biodegradation study

Removal Efficiency (RE %) of oil and grease by bacteria isolates

Results showed that oil and grease decrease remarkably with treatments on the fifth (5) day. In POME sample, percentage removal efficiency of oil and grease for all the isolates are presented in figure 1.

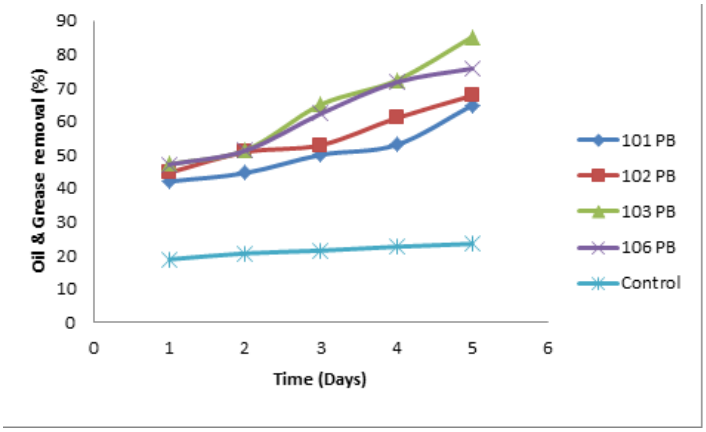

Figure 1 Percentage removal of oil and grease in sterile POME sample.

Results in figure 1 represent levels of percentage removal efficiency (RE %) of oil and grease from POME. Results revealed that removal efficiency of oil and grease for all the isolates are as follows: *Micrococcus luteus*101PB(64.76%), *Stenotrophomonas maltophilia* 102PB (67.65%),*Bacillus cereus*103PB(85.14%), *Bacillus subtilis*106PB (75.7%) and control (23.48%). It was observed that the pH of the POME increases as follows, 101 PB (7.02), 102 PB (7.22) 103 PB (8.01) and 106 PB (8.03) after 5 days of treatment Figure 1. The initial acidic pH of the raw POME (4.74) became alkaline except in the control sample (5.04) probably due to the utilization of fatty acids present in the raw POME by the bacteria isolates. The results presented here is comparable to those of Oswal et al. (2002) who reported increase from acidic pH to alkaline after

treatment of POME with *Y lipolytica* NCIM 3589 indicating utilization of fatty acids present in the raw POME by the isolates. Bhumibhamon et al. (2002) has reported removal of fat and oil by *Bacillus* sp KUL39 (81.6%) from wastewater of palm oil and bakery industries. This is in consistent with the present study with 85.14% removal of oil and grease by *Bacillus cereus*103PB. Harikrishna et al. (2012) reported 71% removal of oil by *B subtilis*. Bujang, (2013) has also reported treatment of oily wastewater with *Bacillus cereus.*

Therefore, in the present scenario of POME treatment or study, as the pH increases for each selected strain, the maximum value of degradation activity was produced as also shown by other workers (Stztajer & Maliszewska 1988; Wang et al. 1988; Jaeger et al. 1994).

In the present study, it was observed that a clearer colour change from red of the solvent layer's colour according to the degradation extent of oil as compared to the control where no bacteria was inoculated (no colour change) indicates oil biodegradation during oil and grease analysis after treatment using standard methods. Chaudhry et al. (2012) also reported change in colour after treatment indicating oil degradation by their isolates in a similar study. April et al. (2000) reported similar findings.

The biodegradation of oil in the environment is a complex process, whose quantitative and qualitative aspects depend on the nature and amount of the oil present, the ambient and the seasonal environmental condition, and the constitution of the indigenous microbial community (Leahy and Colwell, 1990; Hinchee and Olfenbuttel, 1991).This is in compliance with the present study whereby constitution of indigenous bacterial isolated from POME were used for degradation oil present in POME sample.

The difference in percentage degradation rate by different isolates in various studies by researchers could be due to the difference in waste characteristics where each type of oily wastewater has its own characteristic composition (Ainon et al., 2010).

The ability of the bacterial isolates to degrade oil was demonstrated in terms of reduction in the quantity of oil. The percentage degradation was determined from the equation earlier aforementioned.

Generally, microbial oil degradation is considered to occur as a result of hydrolysis of oil by secretion of lipase (oil degradation enzyme), which degrades the oil to organic acids and volatile fatty acids (VFAs) or reduces it to a low molecule via beta oxidation (fatty acid degradation pathway). And finally, the oil is decomposed to CO_2 and H_2O (Koshimizu et al. 1997).

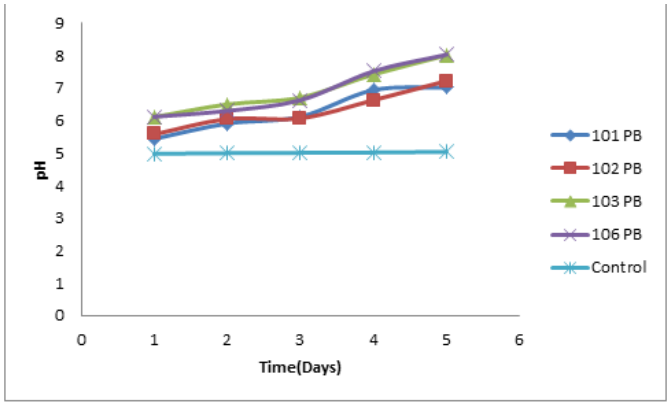

Figure 2: pH in sterile POME sample.

The strain 103PB with the oil and grease removal rate of 85.14% was the most effective followed by 106PB (75.7%), 102PB (67.65%) and 101PB (64.76%) Figure 1. The oil and grease removal were higher than the control sample where no strains were added. This suggests that our strains isolated from POME are effective in this present treatment technology for oil and grease removal. This study would help in understanding the role of bacteria in biological treatment of wastewaters such as those of oil processing.

In consistence with the present study, biological treatment of oil-containing wastes significantly removed organic load as well as oil and grease (ELGohary et al. 1987; Martine 1991; Martirani et al. 1996; Raj & Murthy 1999; El- Bestawy et al., 2005; El-Masry et al., 2004). Other investigators have also reported oil and grease removal which is comparable to the present study. Serikovna et al. (2013) reported fat, oil and grease removal by *P aeruginosa* G23 with the degradation rate of 62%-66%, *Acinetobacter* sp (60-65%) (Wakelin et al. (1997), *Rhodobacter shaeroide* S (74.2%) (Takeno et al. (2005). 96% of oil was also removed from wastewater as reported by Takeno et al. (2005), *Y lipolytica* W29 (93.3%) (Lan et al. (2009), *Acinetobacter* sp KUL8(88.8%), *Bacillus* sp KUL39(81.6%) for palm oil and bakery wastewater (Bhumibhamon et al. 2002). Hassan et al. (1997) has also reported the treatment of palm oil by *Rhodobacter sphaeroides.*

Our findings of the degradation of wastewater containing oil and grease such as POME with strains 101PB, 102PB, 103PB and 106PB were similar with those results in previous publications (Lanciotti *et al*., 2005; Oswal *et al*., 2002; Papanikolaou *et al*., 2002; Scioli and Vollaro, 1997). However, they use organisms isolated from other sources, while in our study bacteria were isolated from POME for its treatment. This emphasizes the originality of our work. This was further elucidated by Jameel and Olanrewaju, (2011) who reported that the application of microorganisms such as *Trichoderma viride* spores, *T. viride* mycelium, *Yarrowia lipolytica* and *Saccharomyces cerevisiae* for the treatment of POME have not been extended to the removal of oil and grease (Jameel and Olanrewaju, 2011) despite their high potential in removing COD from POME. This may be due to the fact that these microorganisms are not indigenous to POME. This therefore offer researchers a greater opportunity to investigate the removal of oil and grease from POME using microorganisms isolated

from POME (Jameel and Olanrewaju,2011).This is the focus and emphasis of the present study and it is design for this purpose. Hence, this has therefore attracted the interest of this study.

Results showed that higher oil and grease percentage removal was achieved in non-sterile POME sample with treatment after 5 days. This was due to the fact that bacteria already exist in consortium or mixed culture since this sample was not sterilize. This suggests that the addition or inoculation of more bacterial into the environment (POME) degrade the oil waste more efficiently. This is in agreement with Obire, (1988) who reported that biodegradation of oil polluted environment can be enhanced by inoculation with microbial species that will degrade the oil waste more efficiently.

The main aim of the non- sterile POME sample was to investigate the maximum enhancement in the degradation capabilities of the investigated bacteria using the natural conditions of the raw POME where they were originally isolated in order to get the most effective and economical treatment under the effluent's natural conditions in the field.

In non- sterile POME sample, percentage removal efficiency of oil and grease for all the isolates are presented in Figure 3.

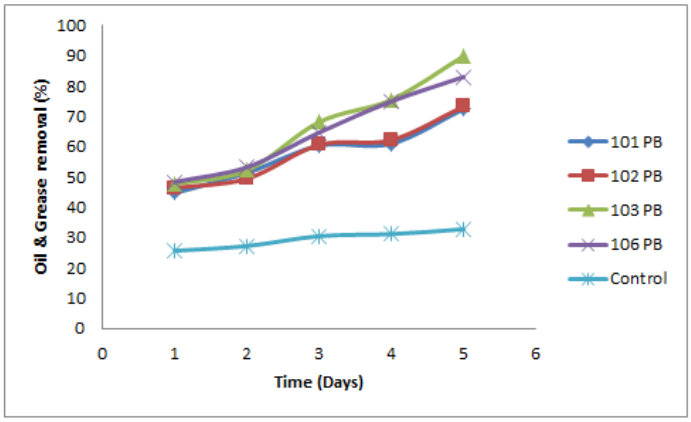

Figure 3: Percentage removal of oil and grease in non sterile POME sample

Results revealed that removal efficiency of oil and grease for all the isolates are as follows: 101 PB (72.50 %), 102 PB (73.30%), 103PB (89.87%), 106 PB (83.04%) and control (32.80%) Figure 3. It was also observed that the pH range for all the isolates were 7.04 – 8.37 after 5 days of treatment Figure 4. The initial acidic pH of the raw POME (4.74) became alkaline except in the control sample (6.27) probably due to the utilization of fatty acids present in the raw POME by the bacteria isolates (Oswal et al., 2002. In the non- sterile POME, pH increase was higher than in the sterile POME (non- sterile, 7.04-8.37 and sterile, 7.02- 8.03) probably because palm oil which is an inducer is more in the non sterile POME sample since no heat was applied and in the presence of some lipase producing organisms, hence raises extracellular lipase yield as much as 10-fold (Shabtai 1991; Shabtai & Daya-Mishre 1992; Sigurgisledottir et al. 1993; Woolley & Petersen 1994) with concomitant increase in pH to a more alkaline environment.

The strain *Bacillus cereus*103PB with the oil and grease removal rate of 89.87% was the most effective followed by *Bacillus subtilis* 106 PB (83.04%),*Stenotrophomonas maltophilia* 102 PB (73.30%) and *Micrococcus luteus*101PB(72.50%) Figure 3. The oil and grease removal were higher than the control sample where no strains were added to the already existing microbial population in order to increase their concentration and hence low removal rate was achieve as compare to POME samples where more strains were added to the microbial population already existing in the POME sample. This suggests that 103 PB and 106 PB and other strains were able to survive competition in the environment and together with other existing lipase producing

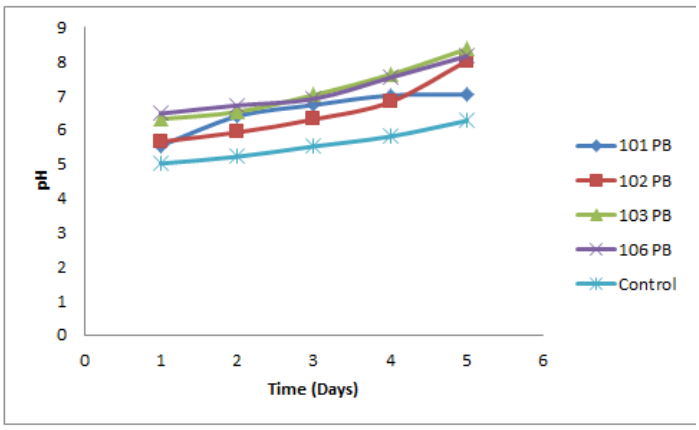

Figure 4: pH in non- sterile POME sample

organisms were able to achieve higher removal of oil and grease as compare to the sterile POME sample. This is in good agreement with Serikovna et al. (2013) who reported that, it is known that in order to reach more efficient removal of pollutant; bacterium must be pre-adapted in the medium containing the contaminant, which makes the bacteria more competitive. This suggest that if our isolates in the sterile POME sample are combine or mixed since they are already pre-adapted from POME, high removal rate will be achieve. This was evident in our previous study where mixed cultures provide high degradative activity than pure culture.

Since non- sterile POME sample in this present study represent mixed culture of organisms with the ability to remove higher organic load (oil and grease), cited literatures reported that using bacteria as mixed cultures produces higher degradation activity than pure/single cultures. El- Bestawy et al. (2005) and

Wakelin et al. (1997) reported the investigation of pure and mixed cultures for microbial removal of fats, oils and greases. *Acinetobacter* sp. was the most effective among the pure cultures studied in the work, and hydrolyzed 60-65% of fatty material.

Removal of TSS in sterile and non sterile POME sample

In sterile POME sample, percentage removal efficiency of TSS for all the isolates is presented in figure 5. Results in figure 5 represent levels of percentage removal efficiency (RE %) of TSS from POME. Results revealed that removal efficiency of TSS for all the isolates are as follows: *Micrococcus luteus*101PB (45.85%), *Stenotrophomonas maltophilia* 102 PB (50.45%), *Bacillus cereus*103PB (71.63%), *Bacillus subtilis*106 PB (57.36%) and control (22.34%). The strain 103 PB with TSS removal rate of 71.63% was the most effective followed by 106 PB (57.36%), 102 PB (50.45%) and 101PB (45.85%) Figure 5. The TSS removal was higher than the control sample where no strains were added. This suggests that our strains isolated from POME are effective in this present treatment technology for TSS removal. This study would help in understanding the role of bacteria in biological treatment of wastewaters such as those of oil processing like POME.

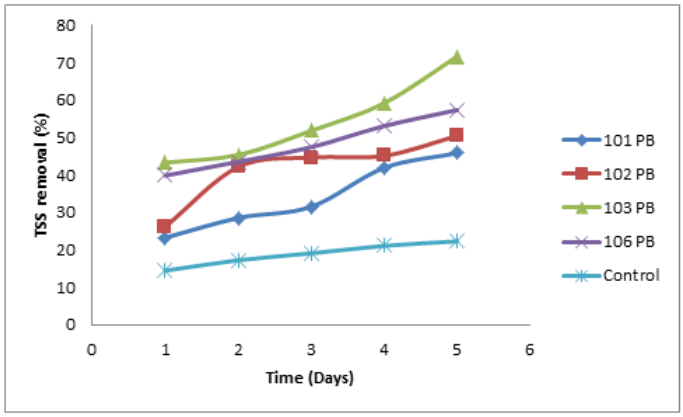

Figure 5: Percentage removal of TSS in sterile POME sample.

Comparisons of TSS removal efficiencies by bacteria isolated from POME revealed that percentage removal were similar with those results in previous publications. Abdul karim et al. (2011) reported 27.2% TSS removal by *Trichoderma harzianum* from POME. Maygaonkar et al. (2012) also reported TSS reduction by *Aspergillus nidulans* with significant change in TSS reduction from distillery effluent. Oswal et al.(2002) reported similar reduction of total dissolved solids (TDS) from POME.

In compliance with the present study, other workers have reported biodegradation of oily wastewaters with significant reduction in TSS and similar parameters (ELGohary et al. 1987; Martine 1991; Martirani et al. 1996; Raj & Murthy 1999; Odegaar et al. 1998; El- Masry et al., 2004; El-Bestwy et al., 2005).

Since palm oil mill effluent (POME) contains a very high organic matter, which is generally biodegradable, this facilitates the application of biological treatment based on aerobic process (Chin and Wong, 1983). This is evident by the present study in which biodegradation of POME using bacteria isolated from POME showed noticeable reduction in TSS and other parameters. The biological treatment depends greatly on active microorganisms, which utilizes the organic substances present in the POME as nutrients and eventually degrades these organic matters into simple by-products such as methane, carbon dioxide, hydrogen sulphide and water (Jameel and Olanrewaju, 2011; Jameel et al.,2011). Thus, the exploitation of these microorganisms isolated from POME for biodegradation and bioremediation purposes will offer a very efficient tool for purifying contaminated effluents water.The results presented in this study of simultaneous removal of TSS and oil and grease, appears useful for practical wastewater treatment as a compact treatment system for POME.

Results showed that higher TSS percentage removal was achieved in non-sterile POME sample with treatment after 5 days. The reasons are the same as earlier elucidated in non-sterile POME sample for oil and grease removal in our earlier study and the essence/aim of the step was clearly stated.

In non- sterile POME sample, percentage removal efficiency of TSS for all the isolates are presented in figure 6.

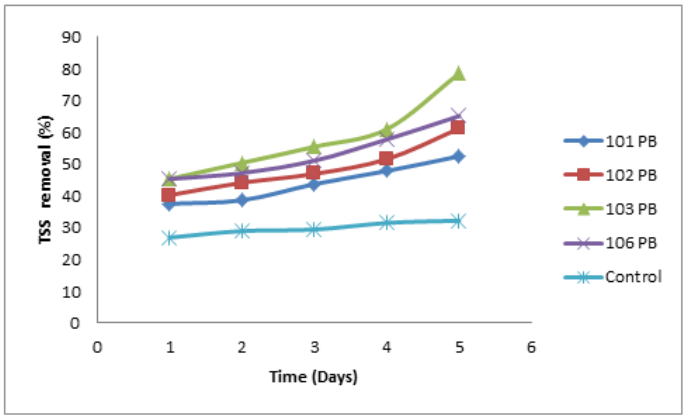

Figure 6 Percentage removal of TSS in non sterile POME sample.

Results revealed that removal efficiency of TSS for all the isolates are as follows: *Micrococcus luteus*101PB(52.53%),*Stenotrophomonas maltophilia* 102PB (61.28%),,*Bacillus cereus*103PB 78.57%), *Bacillus subtilis*106 PB (65.2%) and control (32.25%) Figure 6.The strain 103 PB with removal rate of 78.57% was the most effective followed by 106 PB (65.2%), 102 PB (61.28%) and 101 PB (52.53%) Figure 6. Strains were able to survive competition in the raw non- sterile POME sample because they were originally pre- adapted from the medium/niche (POME) which makes them more competitive (Serikovna et al., 2013). As earlier suggested, if our isolates in the sterile POME sample are combine or mixed as consortium, higher removal rate will be achieve in the cleaning technology of TSS and oil and grease polluted wastewaters. This is in good agreement with previous workers who used mixed/consortium/combination of organisms to achieve higher degradative activity in reducing the parameters. Higher biodegradative activity was achieved in our previous study when mixed cultures were used in biotreatment of POME. Oswal et

al. (2002) has reported treatment of POME with a consortium of bacteria developed from garden soil. The sequential treatments brought about a significant reduction in organic matter in POME. El- Bestawy et al. (2005) reported the combination of *Pseudomonas* sp. and *P. diminuta* as mixed cultures which produced the highest activity in reducing organic matter from contaminated industrial effluents.

In comparison with other similar methodologies, the present treatment proposal manifested more advantages. Results in the present study confirmed the usefulness of our aerobic selection where besides avoiding the anaerobic conditions required for operating and maintain anaerobic strains (Fiestas 1984; Martine 1991), no primary treatment (Valenzuela 1986; Tsonis 1993) is needed and it is a one-step process.

IV. CONCLUSION

This study demonstrated that POME degrading microorganisms can be isolated from POME polluted area and the degrading ability of these microorganisms is a clear indicator that these bacteria can be applied in the bioremediation techniques for biodegradation of POME to enhance treatment.

The present treatment proposal using a selection of aerobic bacterial strains isolated from POME exhibited high efficiency for removal of oil and grease as well as organic load (TSS). The strains also produce extracellular lipase and cellulase in our previous study which stimulates better waste treatment. Besides the high efficiency, no additional physical or chemical treatment was required. Moreover, maximum removal of the contaminants was achieved bringing the wastewater to an environmentally accepted quality for discharging into surface water safely. The results presented in this study of simultaneous removal of TSS, oil and grease, appears useful for practical wastewater treatment as a compact treatment system for POME.

To this end, the study used known bacteria isolated from POME as compare to the anaerobic digestion techniques used by other investigators and in most palm oil mills in Malaysia which uses undefined/unknown microbial consortium/populations for their treatment technology. This emphasizes the originality of our work.

In a nutshell, the main aim of the present study was to evaluate the biodegradation potential of bacteria isolated from POME and to find the most suitable strain(s) for a biological treatment technology of POME. Thus the strain *Bacillus cereus*103PB is the most effective bacteria and the best candidate to use in biological treatment technology of POME having the highest TSS and oil and grease reduction rate. Hence from this study it could be concluded that *Bacillus cereus*103PB do possess the biodegradation ability, and is able to reduce the pollutants of the effluent sample.

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Design and Cost Analysis of PV System Using Nano Solar Cell

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Abstract- Photovoltaic is a technical term for generating electricity from light. In the present day scenario of electricity generation, it is fast becoming an important industrial product. Presently the PV market is dominated by wafer based crystalline Si cells, but is hampered by high cost. Nanotechnology is worldwide regarded as a key technology for innovations and technological progress in almost all branches of economy. The paper presents the designing of PV system for a commercial organization to meet its load demand with conventional solar cell and nano solar cell. Moreover, the cost comparison of conventional PV system and nano PV system carried out in this paper shows the superiority of nano solar cells over others in terms of cost and efficiency.

Index Terms- PV System, nano solar cell, grid, nano PV system.

I. Introduction

The generation of electricity with the ever depleting conventional sources has led to the development of photovoltaic (PV) systems. On an average India receives 6-7 KW/m^2 of solar radiant energy for about 300 days in a year [1]. This energy can be harnessed to obtain electrical energy to meet the commercial and domestic load demands. These PV systems utilize solar energy for producing electricity. The efficiency and cost of the conventional PV cells, made from wafer based crystalline Si cells, are low and high respectively. Nevertheless to meet the domestic load demands a comparison between grid system and solar PV (SPV) system have shown the latter to less costly and economically viable [2]. The drawbacks of conventional PV solar cells to some extent have been curbed by nano solar cells [3].

The paper presents the design and cost analysis of nano solar PV system for a commercial building. The comparison of the proposed nano SPV system with the existing systems viz. conventional SPV plant on the basis of cost have also been carried out. The analysis indicates that nano SPV system for a commercial building is an economically viable alternative to conventional SPV system.

II. SOLAR PHOTOVOLTAIC (SPV) SYSTEMS

A SPV system generates electrical energy and provides power for different types of devices after storing the energy in a battery bank. [4]. The SPV panel is the fundamental component irrespective of any system configuration. Solar cells are the building blocks of the panel [2]. A complete system includes different components which are selected taking into consideration individual needs, site location, climate and expectations.

2.1 Major System Components

The functional and operational requirements determine the components to be included in the PV system [3]. The major components incorporated in PV system as shown in Figure 1 are DC-AC power inverter, battery bank, system and battery controller, auxiliary energy sources and sometimes the specified electrical loads (appliances) [3].

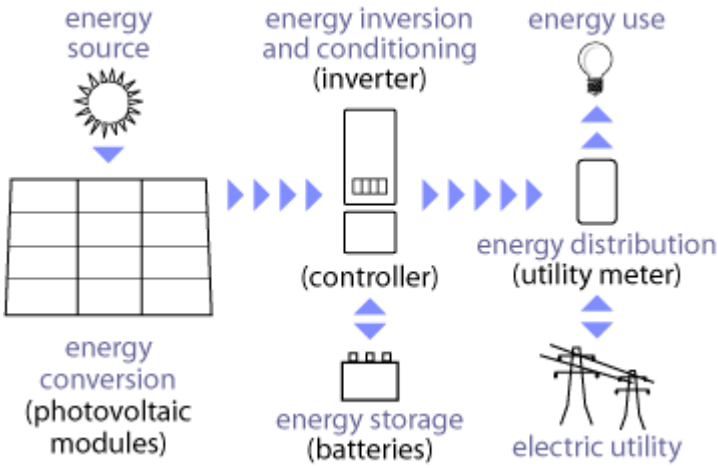

Fig.1 Different components of PV system [3]

- **PV Module –** It converts sunlight instantly into DC electric power.
- **Inverter** –It converts DC power into standard AC power for use in the home, office etc synchronizing with utility power whenever the electrical grid is distributing electricity.
- **Battery** – Battery stores energy when there is an excess coming in and distribute it back out when there is a demand. Solar PV panels continue to re-charge batteries each day to maintain battery charge.
- **Utility Meter** - utility power is automatically provided at night and during the day when the demand exceeds your solar electric power production. The utility meter actually spins backwards when solar power production exceeds house demand, allowing you to credit any excess electricity against future utility bills.

- **Charge Controller** – It prevents battery overcharging and prolongs the battery life of your PV system. In addition, an assortment of balance of system hardware; wiring, over-current surge protection and disconnect devices, and other power processing equipment.

III. DESIGN OF PV SYSTEM FOR A COMMERCIAL APPLICATION

To design a PV system for offices the following steps have been considered. The designing depends on the types of load connected, built in area available for the installation of the system, the amount of sunlight available and the availability of fund[5].

Step1 Determination of load

To determine the total load demand, individual ac and dc loads and usage hours of particular equipments or appliances are considered. The total load is calculated using equation (1).

$$Total\ load = (ac\ load \times hours\ of\ operation\ per\ day) + (dc\ load \times hours\ of\ operation\ per\ day) \quad (1)$$

Step2 Select the battery size

To calculate number of batteries required for battery bank, equations (2-4) is used. The days without sunshine (as monsoon) i.e the days of autonomy are decided. During this period the load is met through the batteries for which the depth of discharge (DoD) of the battery is required to be considered. The battery capacity in Ah in equation (2) is

$$Required\ battery\ bank\ capacity = \frac{average\ Wh\ per\ day \times days\ of\ autonomy}{Battery\ voltage \times DoD} \quad (2)$$

Now, total number of batteries comprises of number of batteries in series and in parallel. To calculate number of batteries in series, the knowledge of nominal voltage of the battery is necessary as shown in equation (3).

$$Number\ of\ batteries\ in\ series = \frac{voltage\ of\ the\ system}{nominal\ voltage\ of\ battery} \quad (3)$$

Similarly by knowing the value of Ah of battery, number of batteries in parallel is calculated from equation (4)

$$Number\ of\ batteries\ in\ parallel = \frac{Ah\ rating\ of\ battery\ bank}{Ah\ of\ Battery} \quad (4)$$

Step3 Select the size of solar array

Equations (5-8) provide the size of the PV solar array. The array sizing should be such that it meets the average Ah demand per day needed with the nominal operating voltage. The average Ah per day that has to be supplied by the array to the battery is obtained from equation 5.

$$avg\ Ah\ per\ day\ to\ be\ supplied\ by\ the\ array = \frac{daily\ avg\ taken\ From\ the\ battery}{efficiency\ of\ the\ battery} \quad (5)$$

$$Array\ peak\ amps = \frac{average\ Ah\ per\ day\ to\ be\ supplied\ by\ the\ array}{peak\ Sunshine\ hours\ per\ day} \quad (6)$$

Module in parallel can be calculated as

$$Module\ connected\ in\ parallel = \frac{array\ peak\ amps}{peak\ amps\ per\ module} \quad (7)$$

Module in series can be calculated as

$$Module\ connected\ in\ series = \frac{battery\ bank\ voltage}{nominal\ \ module\ voltage} \quad (8)$$

Step4 Select the array inclination

It is a usual practice to position a PV module facing the south in northern hemisphere and north in the southern hemisphere. Thus, solar module is fixed so that it always faces the sun at noon. A steeper angle tilting increases the output in winter while a shallower angle gives more output in summer. In practice, it is preferred that the panel is fixed at an angle corresponding to the latitude of the

place, for which it becomes necessary to either add or subtract another 10° depending on the season. Table 1 gives the optimum tilt angle at different latitude [6].

Table 1: PV module tilt angle

Latitude (degree)	Optimum Tilt angle (degree)
9	15
10-20	Latitude +5
21-45	Latitude +10
46-65	Latitude +15
66-75	80

Step5 Finally estimate the system design

After carrying out the above calculations including size of battery bank, size of array and array inclination, final estimation of the system design is taken up to connect all the components as shown in figure 1.

3.1 Designing and calculations of PV system (Case Study-1)

The commercial building [7], National Thermal Power Corporation (NTPC), Lucknow, considered as a case study, is a very well known organization of the country housed in the northern region. The building is a newly constructed Northern Region Head Quarter (NRHQ) of NTPC organization located at Gomti Nagar in Lucknow, Uttar Pradesh, India. The total load of the commercial building of 269.3318 KWh [7] has been calculated using equation (1). Table 2 gives the total load of the NTPC building including the internal and external load.

Table 2. Load of NTPC, NRHQ Building, Lucknow

Internal load (Wh)	222931.8
external load (Wh)	46400
Total	**269331.8**
Internal load (W)	24770.2
External load (W)	4640
Total	**29410.2**

Table 3 provides the different rating values of Battery, PV conventional modules and Nano PV module .These equipments are used for designing the conventional solar PV and nano solar PV systems.

Table 3. Ratings of Different Equipments Used

Battery		**Module (conventional PV)[5]**		**Module (Nano) [6]**	
Voltage	12 V	Peak power	170W	Peak power	170 W
		Peak power voltage	31.7A	Peak power voltage	27 .8V
ampere hours	200Ah	Peak power current	3.8 A	Peak power current	4.3A
		Open circuit voltage	43.6 V	Open circuit voltage	41.1 V
Depth of discharge	0.8	Short circuit current	8.1 A	Short circuit current	5.7 A
		Max. system voltage	600 V	Max. system voltage	1500 V
Efficiency	0.9	Series fuse rating	15A	Series fuse rating	25 A

3.2 Calculation for designing of PV system using conventional SPV module

Table 4 shows step wise calculation for battery bank and array size referring equations (2-8) of section2. The rating values provided in table 3 for battery and PV module (conventional) and assumed data given in appendix are used.

Table 4 Calculation of PV system (Conventional module)

1	Battery bank amp/Ah	(Avg Wh/day×day of autonomy)/battery voltage	26933.8×1 / 220	1224.23
2	Final battery bank capacity Ah	Battery bank Amph/DOD	1224.23 / 0.8	1530.28
3	Batteries in series	System voltage /battery voltage	220/12	18
4	Batteries in parallel	Ah of battery bank/Ah of battery	1530.28/200	8

	Total No. of batteries	**3*4**	**18 ×8**	**144**
5	Array peak amp	Battery bank Ah capacity/(battery efficency×peak sun shine)	1530.28 0.9×5	340.06
6	modules in parallel	Array peak amp/peak amp per module	340.06 3.8	89
7	modules in series	Battery bank voltage/nominal module voltage	220 31.7	7
	Total no of PV modules	**6*7**	**7×89**	**623**

3.3 Calculation for designing of PV system using nano solar PV module

The step wise calculation for battery bank and array size for nano solar based PV system using equations (2-8) is provided in table 5. The rating values provided in table 3 for battery and PV module (nano) and assumed data in appendix are utilized for designing.

Table 5 Calculation of PV system (Nano Solar Cell)

1	Battery bank amp/Ah	(Avg Wh/day × day of autonomy)/battery voltage	26933.8×1 220	1224.23
2	Final battery bank capacity Ah	Battery bank Amph/DOD	1224.23 0.8	1530.28
3	Batteries in series	System voltage /battery voltage	220/12	18
4	Batteries in parallel	Ah of battery bank/Ah of battery	1530.28/200	8
	Total No. of batteries	**3*4**	**18 ×8**	**144**
5	Array peak amp	Battery bank Ah capacity / (battery efficiency× peak sun shine)	1530.28 0.9×5	340.06
6	modules in parallel	Array peak amp/peak amp per module	340.06 4.3	79
7	modules in series	Battery bank voltage/nominal module voltage	220 27	9
	Total no of PV modules	**6*7**	**79×9**	**623**

IV. Cost Analysis of Conventional SPV and Nano SPV Systems

3.1 Data used for cost analysis of SPV Systems

For determining the cost viability of a SPV system, the power requirements of NRHQ, NTPC for internal and external lightings are being considered. The cost analysis is further based on the following configuration.

a) The life expectancy of different of PV system are given in table 6 [8]

Table 6 Life expectancy of components

PV module	25 years
Regulator	15 year
Inverter	10-15 years
Solar Battery	5 years
Wiring	10 years

b) Financial incentive to investor of SPV plants
- Subsidy provided by MNRE is 30% of capital cost of PV system.[8]
- Soft loan upto 80% of project cost is provided by IREDA[9]

c) The average number of sunshine days in a year in India is 300 days.

d) The average insulation during the least sunny days is 5.3 kWh/m^2 /day in India.

e) The maximum power of each PV panel is 150 Wp.[10]

f) Market price of different equipment components of PV system are:
- PV panels @ Rs 150/ Wp {Cost of panel=150×No of cells in panel(72)}[10]
- Nano PV panels @ Rs 50/Wp {Cost of panel=50*No of cells in panel(84)}[11-12]
- Solar Battery @ Rs 11000/- each
- 30 KW inverter @ Rs 246000/- each

g) Cost of conventional (grid) power including fix tariff for commercial building is Rs. 9 per unit [7].

h) Depreciation on battery is 20% and on the remaining components of the PV system is 4% considering battery life and balance equipment life as 5 years and 25years respectively.

i) Annual operation and maintenance (O&M) cost of the system is 0.5% of the capital cost and interest charge [8].

j) Depreciated value is calculated on the basis of sinking fund method and is given by equation (9) [8]

$$[(Initial\ value - salvage\ value) \times r] \div [(1+r)^n - 1] \quad (9)$$

Where;

r = rate of compound interest per annum =8%

n= number of years over which the total amount of depreciation is to be saved= 25 years

3.2 Cost analysis of SPV system using conventional module.

Consider data in section 3.1 to calculate the total cost of the SPV system using conventional solar cells. Stepwise cost calculation is shown in table 7.

Table 7 Cost analysis of PV System considering Conventional Solar cell

1		Total load of system(Wh)	269331.8
2		Total load of system (W)	**29410.2**
3		Required number of panels	623
4		Required numbers of batteries	144
5		Cost of different components of required PV system:	
	a)	Cost of each module	10800/-
	b)	Cost of total modules (3×a)	6728400/-
	c)	Cost of each battery	11000/-
	d)	Cost of total batteries (4×c)	1584000/-
	e)	Cost of inverter	246000/-
		Total (b +d + e)	8558400/-
	f)	Cost of wiring + installation (2% of Total)	171168/-
	g)	Total capital cost (Total + f)	8729568/-
	h)	Calculation of Salvage value for depreciation of PV equipments	
	h1	module at 60% of initial cost (60% of b)	4037040/-
	h2	Inverter at 20% of initial cost (20% of e)	49200/-
		Total salvage value against initial cost (h1 + h2)	4086240/-
	i)	Total cost on PV system installation to be borne by NTPC organization is calculated as follows[10]	
		Depreciation on battery cost (20% of d)(considering life of 5 year)	316800/-
	j)	Depreciated value on balance equipment of cost	7145568/-
	k)	Referring eq. 3 in section 3.1(d-g) and (h1+h2) @8% after 25 years	41836.96/-
	l)	Depreciation on total cost @ 4% (4% of k)	1673.479/-
	m)	Maintenance cost of PV system @ 0.5% (0.5% of g)	43647.84/-
6		total cost on PV system installation (g+i+l+m)	9091689/-
7		Subsidy on capital cost (30%) =	2727507/-
8		**Cost to be borne by NTPC organization (6-7)**	**6364183/-**

3.3 Cost Analysis of SPV system using nano module.

The data in section 3.1 have been utilized in calculating cost of SPV system considering nano solar cells. The cost of module and required data has been collected from a company based in California, USA [11-12]. Stepwise cost calculation is shown in table 8.

Table 8 Cost analysis of PV System considering Nano Solar cell

1		Total load of system(Wh)	269331.8
2		Total load of system (W)	29410.2
3		Required number of modules	711
4		Required numbers of batteries	144
5		Cost of different components of required PV system:	
	a)	Cost of each module	4200/-
	b)	Cost of total modules (3×a)	2986200/-
	c)	Cost of each battery	11000
	d)	Cost of total batteries (4×c)	1584000/-
	e)	Cost of inverter	246000/-
		Total (b+d+e)	4816200/-
	f)	Cost of wiring + installation (2% of Total)	96324/-
	g)	Total capital cost (Total + f)	4912524/-
	h)	Calculation of Salvage value for depreciation of PV equipments	
	h1	module at 60% of initial cost (60% of b)	1791720/-
	h2	Inverter at 20% of initial cost (20% of e)	49200/-
		Total salvage value against initial cost (h1 + h2)	1840920/-
	i)	Total cost on PV system installation to be borne by NTPC organization is calculated as follows[10]	
		Depreciation on battery cost (20% of d)(considering life of 5 year)	316800/-
	j)	Depreciated value on balance equipment of cost	3328524/-
	k)	Referring eq. 3 in section 3.1(d-g) and (h1+h2) @8% after 25 years	5605.197/-
	l)	Depreciation on total cost @ 4% (4% of k)	224.2079/-
	m)	Maintenance cost of PV system @ 0.5% (0.5% of g)	24562.62/-
6		Total cost on PV system installation (g+i+l+m)	5254111/-
7		Subsidy on capital cost (30%) =	1576233/-
8		**Cost to be borne by NTPC organization (6-7)**	**3677878/-**

V. RESULTS AND DISCUSSIONS

The results obtained from the analysis of the cost of conventional SPV and nano SPV system for a commercial building. Table 10 shows comparison of cost calculation of both systems.

Table 10 Comparison of two systems

Sr. No.	System	Cost(Rs)	Result
2.	SPV	6364183	Nano system is better than SPV system
3.	Nano	3677878	

The cost analysis for two systems has been carried out for 10 years including maintenance cost of the system. From the above calculations, it is evident that to have reliable and power conditioned electric energy supply, the proposed nano SPV system is much more cost-effective than conventional PV systems to meet the load demand of the commercial building in concern. This is because, the cost of nano SPV system installation to be borne by the commercial consumer to meet the load requirement of 269.18 units is less (i.e. Rs. 3677878) than the cost of conventional SPV system to meet the same load demand over a period of 10 years (i.e. Rs. 6364183). Thus, nano SPV system is an economically viable alternative to both conventional SPV system and grid supply. Besides the SPV system has an advantage over grid system of providing non pollutant electric energy which in the long run will be beneficial for the government and the society as a whole. This clearly establishes the higher efficacy of SPV system over the conventional SPV system to meet the load requirement of a residential building [my paper].

VI. CONCLUSION

In this paper application of renewable energy sources, particularly solar energy, for commercial load demand has been explored in view of the merits of solar energy over other types for such application. From the results it can be concluded that nano SPV system designed for single phase load of NTPC NRHQ building, Lucknow is much more economical as compared to that of conventional SPV system. This makes the consumer independent of paying the recurrent cost to the grid and in turn, also reduces the burden on the electricity grid.

A part of the total connected load especially single phase load of the NRHQ building has been considered for analysis purpose, because nano SPV system cannot be utilized for high power load on account of its low conversion efficiency. Such high power loads are still supplied by grid system. To provide a complete stand alone nano SPV system for the three phase load requirement of the whole building, the conversion efficiency is required to be high. In this light, this work can be helpful for the researches to carry out further investigations regarding improvement in conversion efficiency of nano solar cells.

APPENDIX

Assumed data:

Inverter: 30 KW; Day of Autonomy: 1; System Voltage: 220V; Peak Sun Shine: 5

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Assessment of forest density using geospatial techniques of a tropical protected area

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Abstract- The management, development and conservation of a protected area require vast knowledge of forest resources, its distribution and utilization pattern by its flora and fauna. Application of remote sensing and GIS as a tool, has assumed immense significance in assessment of these information. These applications are now widely used in conservation and management of protected areas across the globe. Forest canopy density is one of the important parameters in the management of a forest. And advancement of geospatial technologies provides a method to evaluate forest cover in the inaccessible and remote areas. In this study, the forest canopy density of Gir National Park and Sanctuary a tropical forest area was evaluated using remote sensing and GIS. The satellite imagery was utilized to generate spatial data of forest density of this protected area. Approximately 63.5percent of forest area was found as covered with forest canopy density of less than 10–40%, while 35.89percent forest area was found with the density class of 40 to more than 70%. These techniques are very much cost effective; provide information at a satisfactory accuracy level which will be beneficial for the biodiversity management and planning specially the forestry sector.

Index Terms- Forest density, Gir National Park and Sanctuary, Remote Sensing, GIS, NDVI

I. Introduction

An understanding of the relationship between spatial distribution of animals and their habitats plays an important role in conservation and management of a protected area (Lecis & Norris, 2003). Remote sensing is a technology of gathering information about objects without being in physical contact with them while using different wavelength regions of electromagnetic spectrum (Kushwaha, 2005). All the remote sensing systems, capture radiations of different wavelengths reflected by the earth surface features and record it either directly on the film as in case of aerial photography or on a digital medium such as tape; which further can be used to generate the image. Remote sensing and Geographic Information System (GIS) can be used as tool for obtaining information about the quality and status of a protected area and its utilization pattern by various wildlife species. These informations are very crucial while managing a protected area for the conservation of wildlife species. Remote sensing and GIS also help in monitoring areas of land for their suitability to wild species, through integration of various habitat variables of both spatial and non-spatial nature (Davis et al., 1990). The outputs of such systems are usually simple, easily understandable and can be used for the assessment of environmental impacts or prioritization of conservation efforts in a timely and cost-effective manner (Kushwaha et al., 2004).

Tropical forests are usually being rich in biodiversity with a variety of species richness and diversity (Alwyn & Calaway, 1987; Jacobs, 1988). These areas are also recognized as dense forests due to the high density of vegetation formed by clumped distribution of individuals and also enormously tangled undergrowth of different herbs, shrubs and climbers. Detailed and accurate maps of these forests condition and structure are required for assessment of the floral and faunal diversity as well as for sustainable forest management (Blodgett et al., 2000). Assessment of forest density and its evaluation is one of the important aspects of management and long term monitoring of protected area for meaningful biodiversity conservation. It is also helpful in planning and implementation of forest rehabilitation programs (Rikimaru et al., 2002). It has been suggested that canopy density is an essential parameter to assess and analyze the factors affecting forest growth, its regeneration and to ensure on management initiatives outputs (Chauhan, 2004). The traditional way of ground monitoring for these estimation can be costly and time consuming, whilst the use of GIS and remote sensing, as a platform for estimating the density of protected areas, may speed up the process and provide for a more efficient option (Blodgett et al., 2000). Geospatial technologies including remote sensing, GIS and Global Positioning System (GPS) provide factual data and information on quality and forest canopy density status of forest area (Schamberger & Krohn, 1982).

Various species requires different resources in terms of food, shelter and mate. Some species need dense forest cover while some need open or degraded habitat, which also governs the resource partitioning between the different species for their survival. The degree of forest canopy cover, a species required in their habitat, is crucial for suitability of the area for a particular species. The higher the resources, the better are the chances for the survival of species. Development in geospatial technologies provides a method to evaluate forest cover in the inaccessible and

remote areas. The satellite remote sensing is best suited for analysis of canopy closures, as elucidated by Roy et al. (1994). The concept of habitat analysis started with the development of habitat evaluation procedure by the U.S. Fish and Wildlife Service. Evaluation of wildlife habitats based on ecological principles is well-established in USA in connection with environmental impact assessments, where the aim was to ensure that appropriate consideration is given to the development planning process (U.S. Fish and Wildlife Service, 1981). At the same time, there has been considerable pressure for the use of standardized procedures for habitat evaluation, both for economical as well as ecological reasons, among various organizations and professionals. Many authors have used remotely sensed data along with other ecological parameters to assess the habitat in many areas (Bright, 1984; Kelly, 1987; Lyon, 1983; Parihar et al., 1986; Roy et al., 1995; Alam, 2011).

II. STUDY AREA

This study was carried out in the Gir National Park and Sanctuary (GNPS), located in Gujarat province of India (Fig. 1). GNPS is well-known for only wild population of Asiatic lion (*Panthera leo persica*) in the world. The total area of GNPS is 1412.13 km² of which the National Park comprises of 258.71 km² surrounded by 1153.41 km² of Sanctuary. It also supports a rich biodiversity *viz*., 606 recorded flowering plant species, 39 mammal species, 37 reptiles, 300 species of birds and more than 2000 species of insects (Singh & Kamboj, 1996; Alam, 2011; Meena & Kumar, 2012). Apart from the Asiatic lion, other carnivores such as leopard (*Panthera pardus*), jungle cat (*Felis chaus*), striped hyena (*Hyaena hyaena*), jackal (*Canis aureus*), Indian fox (*Vulpes benghalensis*), ratel (*Mellivora capensis*), mongoose (*Herpestes edwar*dsi), and rusty spotted cat (*Prionailurus rubiginosus*) are found in GNPS. Major herbivores include chital (*Axis axis*), sambar (*Cervus unicolor*), nilgai (*Boselaphus tragocamelus*), four horned antelope (*Tetracerus quadricornis*), langur (*Presbytis entellus*) and chinkara (*Gazella gazella*). The GNPS falls under the type 5A/Cla, i.e., very dry teak forest (Champion & Seth, 1968). The area is comprised of low hills of volcanic origin with an altitudinal range of 83-524 m.

GNPS (20°40' to 21°50' N to 70°50' to 71°15' E), lies around 40 km away from the coast in the Kathiawar or Saurashtra peninsula of Gujarat state of India. It stretches over a length of about 70 km from west to east and 40 km from north to south. The sanctuary is narrowest in the east and west. Major portion of Gir forest falls in Junagadhand Gir-Somnath districts, and the remaining in Amreli district. Three different management units can be recognized in GNPS. They are sanctuary west, national park and sanctuary east. These management units differ in terms of vegetation, topography, rainfall and degradation. The climatic condition of Gir is generally hot with an erratic monsoon. Seasons in Gir are fairly distinct. June through September is monsoon, followed by a post monsoon season. Late November to early March is winter season. It is followed by a hot dry season from mid March to mid June. The maximum and minimum temperature is 45°C in summer and 7°C in winter. Rainfall is erratic and unevenly distributed. The maximum and minimum annual rainfall being 1866 mm and 199 mm respectively, average being 980 mm. There are 45 small settlements known as Nesses are occupied by Maldharies (pastoral grazers) in some part of Gir Sanctuary.

The most important aspect of Gir forest is that it has become a very stable ecosystem with tremendous regenerating, self supporting and self sustaining capacity due to its rich and diverse fauna and flora. This ecosystem forms a part of south central highlands in Saurashtra region and is a catchment of important rivers like Shetrunji, Hiran, Saraswati, Shingoda, Machhundri, Raval and Datardi. The forest of GNPS helps in recharge the water table due to infiltration and percolation in conjunction with soil and moisture conservation. The continuous forest covers over a large tract also exert significant moderating effect on the climate in the region. The GNPS also helps in reducing the salinity problem on the southern coast of Saurashtra. Thus, GNPS is a boon to farmers inhabiting the peripheral environs by ensuring sustained agricultural and horticultural production to them.

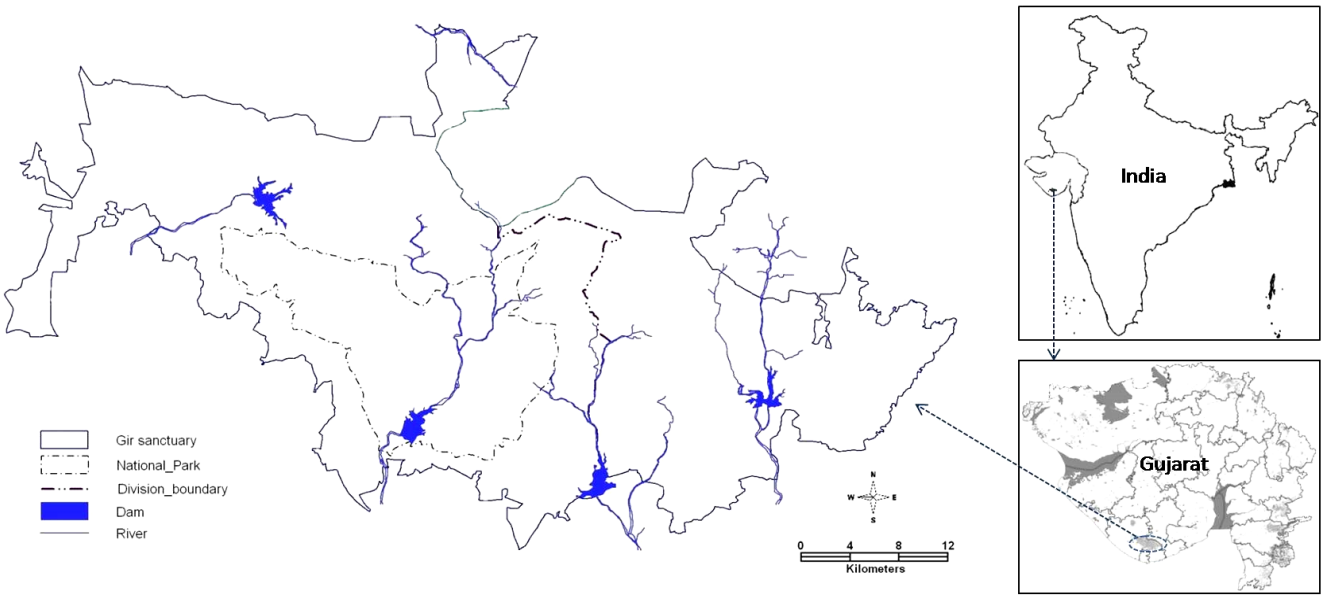

Figure 1 Location map of Gir National Park and Sanctuary.

III. DATA AND METHODOLOGY

The study was divided into two stages; the first stage was field survey (2007 to 2009), collection and processing of collateral and satellite data to create spatial data base on forest canopy density, while the second stage was geospatial analysis (Fig. 2). Random stratified vegetation sampling was carried out during the research project. Each sampling point was marked with GPS and data on canopy cover was recorded throughout the study area. In this study, computer software ERDAS Imagine 9.1, ArcGIS 9.3, ArcView 3.2a were used for data processing and GIS analysis.

Satellite data of Landsat-TM dated 15th May 2009, path-row: 149-45 was downloaded from http://glovis.usgs.gov/. A map with various attributes of GNPS with high resolution was co-registered using geometric correction techniques. This data was re-projected into Universe Transverse Mercator (UTM) World Geodetic System-84 (WGS 84) projection for further analysis. A study Area of Interest (AOI) was built around the Gir Sanctuary boundary and co-registered with sub-pixel accuracy for accurate estimation of areas. The geo-coded FCC of Landsat-TM dated 15th May 2009 (Fig. 3) was digitally analyzed. The forest canopy density of the area was prepared through digital analysis of satellite data using Normalized Difference Vegetation Index (NDVI) (Richardson & Wiegand, 1977; Huete, 1988; Crippen, 1990; Weier & Herring, 2000). The NDVI values were grouped into four canopy density classes *viz*., <10% (non-forest), 10–40% (open), 40–70% (medium) and >70% (dense). Image elements like tone, texture, shape, size, shadow, control location and association were evaluated for this purpose. These data was validated by the ground truthing and expert field experience. NDVI is a method of measuring and mapping the density of green vegetation. For its measurement satellite sensors used that observe the distinct wavelengths of visible and near-infrared sunlight which is absorbed and reflected by the plants, then the ratio of visible and near-infrared light reflected back up to the sensor is calculated. The ratio gives a number from minus one (−1) to plus one (+1). An NDVI value of zero means no green vegetation and close to +1 (0.8–0.9) indicates the highest possible density of green leaves (Weier & Herring, 2000). The 'normalized difference vegetation index' is calculated by the formula: NDVI = (IR−R)/ (IR + R), where IR = infrared and R = red. Values for forest canopy density were recorded and specified as categorical variables.

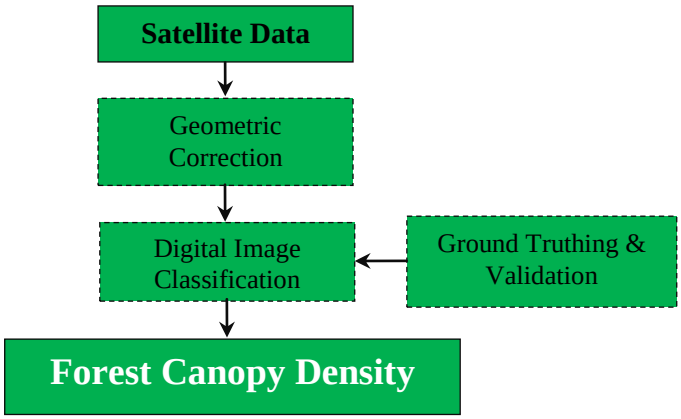

Figure 2 Paradigm of the study.

IV. RESULTS AND DISCUSSION

The present study highlights that extensive field work, sound database was utilized in predicting the forest canopy density of a protected area with acceptable accuracy. Further, the study revealed that GNPS supports diversified wildlife habitats. The forest density of the area is fairly good for biodiversity of GNPS. Result reveled that approximately 9.16 % of forest area is covered by forest canopy density of more than 70%, while 26.73 % with the density class of 40–70 %, 49.96 % with the density class of 10-40% and 13.60 % with the density class of less than 10 % (Table 1). Asiatic lion the endangered and flagship species of GNPS (Alam, 2011; Meena & Kumar, 2012), and other major prey species preferred to live in open forest habitat. And availability of more than 46.96 percent area as open forest supports the good quantity of habitat for both prey and predators. The high forest density areas are also adequately present to provide shelter and food availability to wild animals in the scares summer periods. GNPS falls in semi-arid zone of Gujarat state in India, is one of the well protected forests, having open and thorn forests that provide favorable resources for the survival and protected safe refuge for the shelter with adequate forest cover, which is the factor supporting the high density of faunal diversity in the GNPS (Meena & Kumar, 2012).

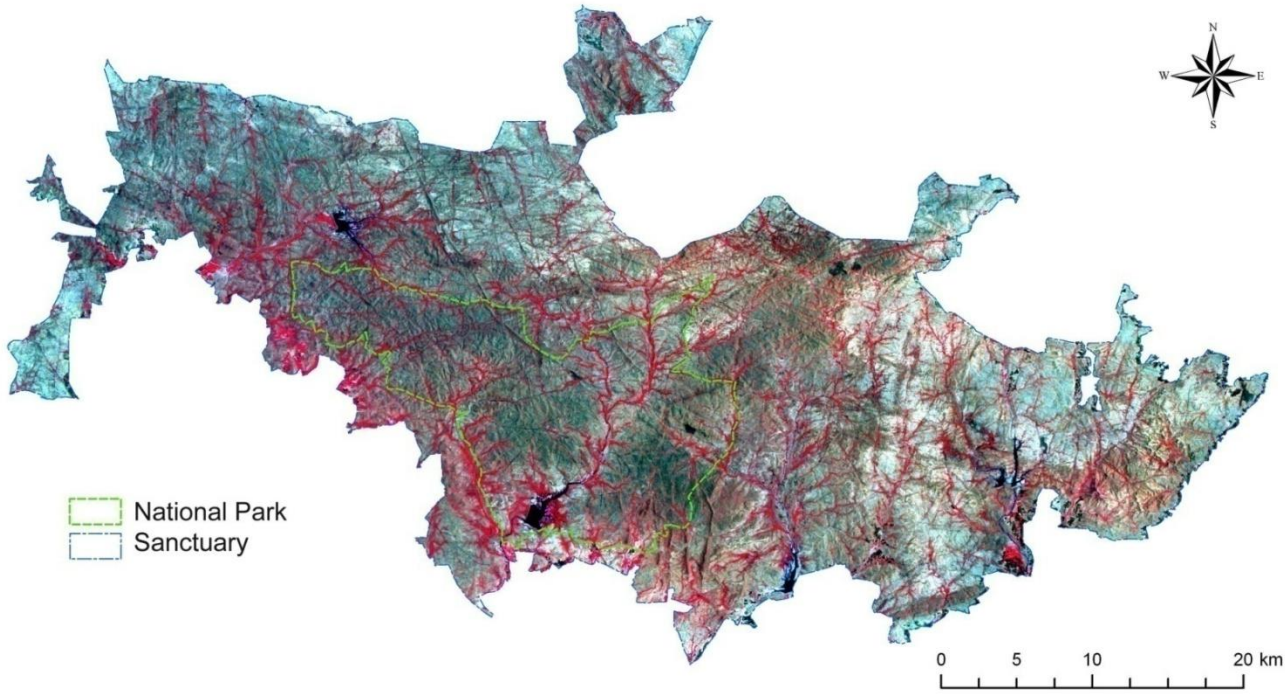

Figure 3 Landsat-TM, False Color Composite (FCC) of Gir National Park and Sanctuary.

It is suggested that further investigations will be beneficial focusing forest type wise density analysis whilst documenting the entire forest area only. The present analysis supports the significant result of the conservation and management work carried out in the GNPS since last many decades, improved the forest density of GNPS. The present result will be helpful to the managers for considering different conservation zones of priorities for management. There is a change in vegetation density and species composition after 1972 in GNPS due to regeneration and good growth of teak (*Tectona grandis*) coppice crop. The assessment of forest cover based on visual and digital interpretation of the satellite data, dense forest areas with crown density of 40% and above recorded in Amreli and Junagadh districts were 107 km² and 1028 km², respectively and major part of dense forest in two districts fall in GNPS (Meena & Kumar, 2012). Forest canopy density of GNPS was analyzed in this study using satellite data using geospatial techniques also validate the previous information (Jadav et al., 2002).

Forest canopy density is one of the important parameters in the management of a forest or protected area (Rikimaru et al., 2002). It has been suggested that canopy density is an essential parameter to assess and analyze the factors affecting forest growth, its regeneration and to keep a check on management initiatives in areas of plantations and regeneration status (Chauhan, 2004). The multi-spectral earth observation data with appropriate ground measurements can suitably extrapolate across a large geographic region, and this has significant advantages for forest management, especially in areas where forests are in remote locations or are inaccessible (Blodgett et al. 2000). Also, the geospatial techniques to measure the forest canopy density have been illustrated from different regions using a wide array of spatial and spectral resolutions (Roy et al., 1990& 1996; Rikimaru & Miyatake, 1997; Katul & Albertson, 1998; Harding et al., 2001; Marshall et al., 2002; Singh et al., 2003).

Table 1 Different category of forest canopy density in Gir National Park and Sanctuary.

Category	Area in km²	Percentage area
< 10%	191.98	13.60
10 - 40%	705.54	49.96
40 - 70%	377.42	26.73
> 70%	129.32	9.16
Waterbody	7.87	0.56

Total	1412.13	100.00

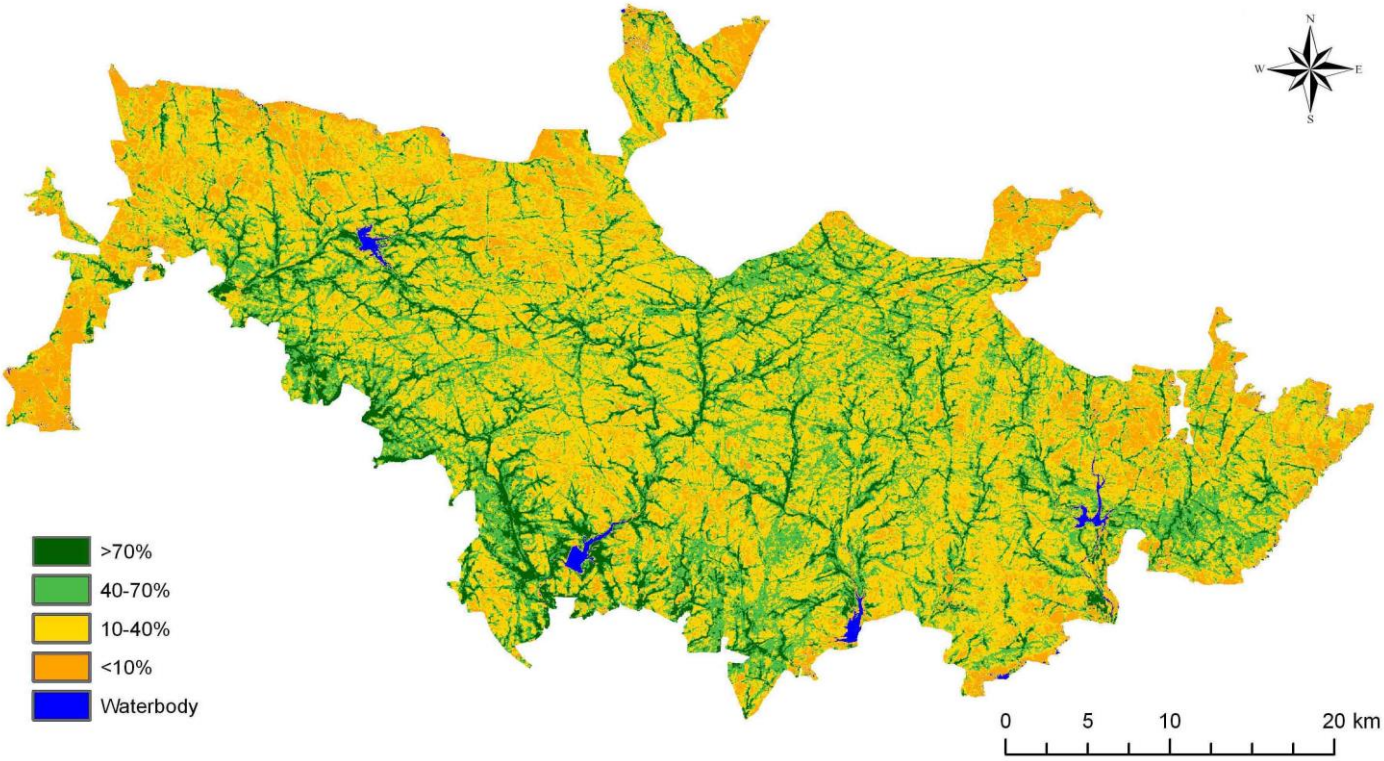

Figure 4 Forest canopy density map of GNPS generated using geospatial technique.

Advancement in geospatial technologies provides a medium to evaluate forest cover in the inaccessible and remote areas. This can also enable a multi-scalar assessment of the associated ecosystem parameters (forest canopy density, habitat diversity, etc.). The satellite remote sensing is best suited for analysis of forest canopy density (Roy et al., 1994) whilst modelling the biophysical spectral response for forest density stratification especially in dry deciduous forests.

The approach for measuring forest density is valuable whilst managing fragile and unique ecosystems of a protected area (Prasad et al., 2009). In this direction, the thematic information extracted and further fitted into ecological models would highlight and define the fundamental parameters governing biodiversity *viz*. fragmentation, disturbance and biological richness (Chauhan, 2004; Prasad, 2006). Moreover, the density stratification provides a baseline study to improvise the existing conservation policies and accordingly prioritizing the conservation needs of an area. Proper management operations that can derive basis from the present analysis can facilitate the forest managers, conservationists and scientists to maintain the diversity as well as density of forest areas.

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We are thankful to Ministry of Environment & Forests, Government of India for financial support and Gujarat State Forest Department for permission to carry out study. We are thankful to Department of Wildlife Sciences, Aligarh Muslim University for logistic and institutional support. Field assistants are also acknowledged for helping in the field work.

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Saliva as a Diagnostic Tool for Hepatitis B Infection- A Comparative ELISA Study

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***Abstract*: Background:** Hepatitis B viral infection is a major public health problem with a worldwide prevalence. Due to their increasing incidence, early detection and improved diagnoses of severe cases are of primary importance. Currently viral antigens and antibodies are detected by traditional serological tests. However, the introduction of oral fluid as an alternative has led to many researches. Its advantages over venepuncture are many. Hence this prompted us to carry out a pilot study to evaluate the diagnostic efficacy of saliva in detecting hepatitis B surface antigen using Enzyme Linked Immunosorbent Assay (ELISA).

Aim and objectives: To evaluate the presence of hepatitis B surface antigen in saliva and its sensitivity and specificity through ELISA

Methodology and Results: 20 seropositive patients and 20 seronegative patients of hepatitis B viral infection were considered individually. Saliva samples collected from these patients were subjected to ELISA test for hepatitis B surface antigen. A sensitivity of 45% and specificity of 100% was obtained for the diagnosis of hepatitis B infection.

Conclusion: Many studies have been conducted utilizing saliva as a diagnostic tool especially in western population. Its advantages over venepuncture are, being less invasive, less painful, safe (prevention of needle stick injuries), less expensive, allows large numbers of samples to be collected easily for screening and for epidemiological purposes. In a developing country like India, an intermediate endemicity zone, such a diagnostic tool has to be encouraged. Further research necessitates for the implementation of saliva as a diagnostic tool, beyond any doubt.

***Index Terms*:** Hepatitis B, Saliva, ELISA, Diagnosis, Noninvasive

I. Introduction

Ledenberg addressed "the viruses – as the enormity of the problem" are the only real competitors to the mankind for dominion of the planet. These viruses can also decimate a population.[1]One such is the Hepatitis B Virus, a DNA virus of the Hepadnaviridae family which remains a major public health problem even after decades of its discovery by Dr Baruch Blumberg1965. [2]

Despite the existence of Hepatitis B vaccination, hepatitis B virus (HBV) infection is still prevalent worldwide and accounts for significant morbidity and mortality. [3] The main ways of transmission are sexual intercourse, parenteral contact or vertical transmission. [4] Other sources of infection include surgery, dental care, contaminated surgical instruments and donor organs. Health care workers and laboratory technicians who have frequent contact with infected blood or blood products are at highest risk. [5]

The World Health Organization has estimated that there are more than 2 billion HBV infected people and about 378million chronic carriers worldwide. [4]The toll of approximately 1 million deaths from chronic liver disease and hepatocellular carcinoma per year demonstrates the scale of the global health problem it poses. [6]

It was estimated that more than 50% of liver cancers were attributable to HBV infection. [4] Although most carriers will not develop hepatic complications from chronic hepatitis B, 15% to 40% will develop serious sequelae during their lifetime. [7] In India, an intermediate endemic zone where the estimated prevalence rate of HBV in the healthy general population is around 4.7%, a recent study showed 5% HBsAg positivity in Health Care Workers, but a highest seropositivity of around 40% among laboratory technicians. [4]

The major concern at this prime hour is the need to curb the disease due to their increasing incidence, which can be achieved by early detection and improved diagnosis.

Currently viral antigens and antibodies are detected by traditional serological tests. However, the introduction of oral fluid as an alternative to venepuncture has led to many researches. A variety of studies have indicated the potential use of oral fluid for clinical diagnosis of infectious diseases and to evaluate immunity levels of important vaccine-preventable virus infections. [8] The enormous advantages saliva holds, makes it a valuable tool for screening purposes.

Hence this prompted us to evaluate the presence of hepatitis antigen, its sensitivity and specificity by ELISA using saliva as diagnostic tool.

II. MATERIALS AND METHODS

20 seropositive patients of hepatitis B infection and 20 seronegative cases who were admitted to the M S Ramaiah hospital and college were considered. Consent for the study was obtained from every individual participating in the study. Ethical committee approval was also obtained.

Unstimulated saliva samples were collected from both the groups at convenience in a 20ml wide mouthed bottle. The saliva collection was about 3ml- 5ml which were stored immediately at -20 C until analysis. Before commencing with the procedure, samples were thawed to room temperature. For hepatitis B virus surface antigen detection, SD HBs Ag ELISA 3.0 Bio-standards diagnostics was employed. The procedure was standardized for detection of the antigen in saliva by running seropositive and seronegative cases, where the serum samples were used as controls. As instructed by the manufacturer the ELISA procedure was carried out with positive and negative controls provided in the kit. On completion of the method, the readings were obtained from an ELISA reader adjusted to the wavelength of 450nm and the results were tabulated (Table 1).

With a cut off value of 0.50, a sensitivity of 45% and specificity of 100 % was obtained. Out of the 20 seropositive cases of hepatitis B infection only 9 were positive with saliva samples while the remaining 11 cases were negative. On the other hand all the 20 seronegative cases of hepatitis infection were negative with saliva samples too. The inference noted here is that saliva when used as a diagnostic tool in our study; we obtained a sensitivity of 45% and specificity of 100 %

III. DISCUSSION

A number of chronic infections contribute to the burden of cancer in humans. Chronic HBV infection alone has been estimated by the WHO to be the tenth leading cause of death globally, and HBV as the second most important known human carcinogen, after tobacco. [9] HBV seems to provide one of the examples whose genetic variability is observed both as the evolution of genotypes and as the emergence of mutations in each infected subject. [10] Volumes of research & literature exist on hepatitis B, its mode of transmission and infection.

Hepatitis B virus is present in the blood, saliva, semen, vaginal secretions, menstrual blood, and to a lesser extent, perspiration, breast milk, tears, and urine of infected individuals. A highly resilient virus, HBV is resistant to breakdown, can survive outside the body, and is easily transmitted through contact with infected body fluids.

The routine method of investigation being the blood has its own disadvantages. The relative inconvenience of obtaining blood samples, risk of disease transmission associated with needlestick injuries, requirement of consent and cooperation of the patient, the need for a trained venipuncturist, the need to separate serum before testing and the difficulty and added risk of venipuncture in children make serologic testing unattractive. Due to invasive nature of blood collection, it is also stated that contaminated needles cause 8–16 million HBV infections each year, compared with 2.3–4.7 million hepatitis C virus infections, and 80 000–160 000 human immunodeficiency virus infections. [5]

Saliva considered as the mirror of the body is an emerging biofliud for early detection of diseases. Ease, safety, and the minimally invasive nature of oral fluid collection are the major advantages of this technique. Studies have shown that saliva sample collection have a significant comfort and convenience level when compared to urine and blood. Hence our pilot study aimed to detect hepatitis B surface antigen (HBsAg), which is the hallmark of the infection; using ELISA as our screening tool and replacing serum with saliva.

Out of our 20 seropositive patients, 10 patients weren't aware of their seropositivity of hepatitis B on admission. They were admitted for other medical reasons. As most of the serology analyses do consider screening for hepatitis B as a routine, we were able to identify such patients. Our study received good response from the patients when requested for the saliva sample collection and participation when explained about the study.

The sensitivity and specificity of detection of hepatitis B surface antigen in saliva was 45% and 100% respectively. The explanation that can be derived from these results is that all the seronegative patients did not show the presence of the antigen in their saliva and results were compatible with the serum samples. Hence 100% specificity was obtained. Only in 9 seropositive patients was the antigen detected in saliva while the remaining 11 were negative presenting with only 45% sensitivity.

Literature reviews we encountered have shown studies in agreement between the results for the serum and saliva specimens with an excellent reproducibility for detection of HBsAg.

Hutse, V., et al carried out a study on forty-three HBsAg positive and seventy-three HBsAg negative paired serum/oral fluid samples. The detection of HBsAg in oral fluid was carried out using a modified ETI-MAK-4 ELISA. The validation of this oral fluid test gave a sensitivity and specificity of 90.7% and 100%, respectively. They concluded that the modified ETI-MAK-4

Table 1.Tabulated results of saliva samples for detection of Hepatitis B surface Ag

	Saliva samples			
Serum samples	Positive	Negative	Sensitivity	Specificity
Positive (n=20)	9	11	45%	100%
Negative (n=20)	--	20		

ELISA is a suitable test for oral fluid samples for epidemiological purposes. [11]

Cruz, H. M. et al carried out a study where HBsAg was detected by the ELISA in oral fluids and whole saliva samples with paired serum samples. Sensitivities of whole saliva and oral fluid were 93.6 and 85.1%, respectively, whereas specificities of whole saliva and oral fluid were 92.6 and 94.1%, respectively. They suggested the use of whole saliva and oral fluid together with the modified commercial EIA for Hepatitis B virus infection surveillance. [12]

Arora G et al conducted a study on 35 hepatitis B seropositive and seronegative subjects. The sensitivity and specificity of saliva as a diagnostic tool for detecting HBsAg antigen using ELISA was 74.29% and 100%, respectively. They concluded that because of its noninvasive nature, saliva can be effectively used for large-scale Hepatitis B virus detection. [13]

The above studies showed an appreciable sensitivity and specificity for detection of the antigen in saliva. The sensitivity in our study was comparatively low. This made us to investigate the protocol that we followed. We obtained evidence that the diminutive size of the antigen particles could be the reason. These antigens have greater chances to get entrapped within saliva, especially mucous which makes them unavailable for reaction and therefore detection. Hence pretreatment of saliva samples for digestion of mucin for studies especially related to detection of antigen and antibody is required to accomplish better results.

Investigators have detected a large number of viruses in oral samples by using an antigen, an antibody or nucleic acid targets. The literature regarding salivary-based antibody tests for detection of viral infections is extensive. Clinicians can use a number of oral samples to diagnose viruses, but the use of these tests by dental professionals has been limited. Salivary tests, although rapidly increasing in use, still constitute a minority of all diagnostic tests performed. Thus, by conducting salivary tests in a dental setting, practitioners would be able to identify infections in a cohort that might not otherwise be detected, at least in suspected individuals. [31]

IV. CONCLUSION

In our endeavor to serve the community we made an attempt to evaluate the detection of hepatitis viral infection using saliva- an emerging biofluid. We did succeed to an extent and ascertained the pretreatment of saliva samples as a cardinal step prior to analysis.

Today, a growing number of proof-of-principle assays have been established using saliva to monitor diseases or bodily conditions such as HIV infection, immune responses to viral infections and the detection of illicit drug use. [14]

Although a number of very sensitive and specific serologic tests for viral hepatitis are commercially available, the use of oral fluid samples makes it a satisfactory alternative, since the possibility to detect immunity using body fluids that can be easily and self-collected will facilitate the investigation, the follow-up of the outbreak, and the surveys of immunity in representative samples of the general population. However, despite the much progress in understanding the natural history of HBV infection, we still have a long way to go before we can conquer hepatitis B infection.

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ACKNOWLEDGMENT

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Implementation of Efficient 16-Bit MAC Using Modified Booth Algorithm and Different Adders

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Abstract- The proposed system is an efficient implementation of 16-bit Multiplier- Accumulator using Radix-8 and Radix-16 Modified Booth Algorithm and seven different adders (SPST Adder, Parallel Prefix Adder, Carry Select Adder, Error Tolerant Adder, Hybrid Prefix Adder, Modified Area Efficient Carry Select Adder, Parallel Binary Adder) are using VHDL. This proposed system provides low power, high speed and less delay.

The comparison between the power consumption (mw) and estimated delay (ns) of both Booth multipliers is calculated. The application of digital signal processing like fast Fourier transform, finite impulse response filters and convolution requires high speed and low power MAC (Multiplier and Accumulator) units to construct an adder. Speed of operation can be improved and dynamic power can be reduced by reducing the glitches (1 to 0 transition) and spikes (0 to 1 transition). The adder designed using SPST avoids the unwanted glitches and spikes, minimizing the switching power dissipation and hence the dynamic power.

The speed can be improved by reducing the number of partial products to half by grouping of bits from the multiplier term. The proposed Radix-8and Radix-16 Modified Booth Algorithm MAC with SPST reduces the delay with less power consumption as compared to array MAC.

Index Terms- Radix-8 modified booth algorithm Radix -16 modified booth algorithm, Digital Signal Processing , VHDL.

I. Introduction

Multiplication is an important operation in digital signal processing algorithms. It needs more area, and consumes considerable power. Therefore, there is requirement of designing low power Booth Algorithm is a multiplication algorithm that multiplies two signed binary numbers in two's complement notation.

Both multiplication is a technique that allows for a smaller, faster multiplication circuit, by recording the numbers that are multiplied. It is a standard technique that used in chip design and provides significant improvements over the long multiplication technique.

The performance of the multiplier depends on the type of adder which is using in the MAC. By combining the multiplication with the accumulation and development of a hybrid type of adders like Parallel prefix adder and carry save adder, performance has improved. Then the accumulator having the greatest delay parallel prefix adder as compared to carry save adder but the overall performance was high. Several commercial processors have selected the radix-8 multiplier architecture to increase their speed of operation, thereby reducing the number of partial products in the multiplication terms. Radix-8 encoding reduces the digit number length in a signed digit representation as compared to Radix-2 Multiplication. Its performance bottleneck is the generation of the term 3X (Multiplicand), also referred to as hard multiple.The proposed MAC accumulates intermediate results in the kind of sum and carry bits instead of the output of the final adder, which has optimized the pipeline system to improve performance.

Digital multiplication is an obligatory and critical element in microprocessors, signal processing and arithmetic based systems. The modified Booth's algorithm based on a radix-8, generally called Booth-2, is the most popular approach for implementing fast multipliers using parallel encoding. With the recent rapid advances in multimedia and communication system devices, real-time signal processing like audio signal processing, video/image processing, or large-capacity data processing are increasingly being demanded. Multiplication and addition arithmetic determines the execution speed and performance of the entire calculations.

Because the multiplier requires the longest delay among the basic operational blocks in digital systems, the critical path is determined by the multiplier; in general Multi-operand addition is a part of many complex arithmetic algorithms, such as multiplication and certain DSP algorithms.

One of the popular multi-operand adders is the carry-save adder capable of adding more than two operands at a time. The objective of this paper is to introduce the flexibility of adding three-input operands to a regular adder, thereby eliminating the need of a special adder to do the same.

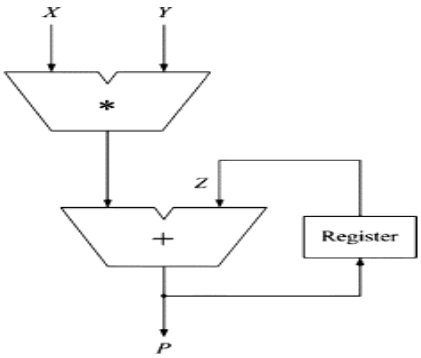

Figure 1: Hardware Architecture General MAC Array Multiplier

Here in this designing, the VHDL designing used the M o d e l S i m 6.5c software. General architecture of MAC is shown in figure 1. This executes the multiplication operation by

multiplying the multiplier and the multiplicand. Multiplier is considered as X and multiplicand is Y. This is added to the previous multiplication result Z as the accumulation step.

II. TYPES OF ADDERS

2.1 SPST ADDER

In this Adder, the 16-bit adder / Subtractor is divided into MSP (Most Significant Part) and LSP (Least Significant Part) between the 8th and 9th bits. In which the MSP of the original adder is modified to include the detection logical circuits, data controlling circuits, sign extension circuits, latch and clock circuits, logic for calculating carry-in and carry-out signals.

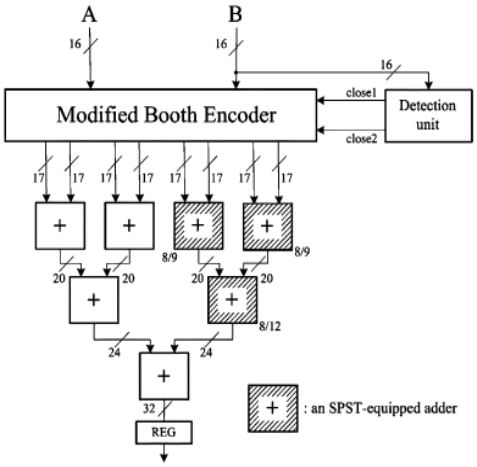

Figure 2: Proposed Low Power SPST Equipped Multiplier

Logic gates are used to implement the latches and the sign extension circuits in order to reduce the additional overhead as for as possible. Low power adder / Subtractor consists of the above blocks, Figure 2. shows the Proposed Low Power SPST Equipped Multiplier which has the following parts:

1.Latch
2.Detection logic
3.Sign extension logic

All the arithmetic operations can be implemented using Low-power VLSI system design, where the fundamental operation in the signal processing.

2.2 KONGGE STONE ADDER

The design of sparse adders relies on the use of a sparse parallel-prefix (Kongge-Stone) carry computation unit and carry-select (CS) blocks. Only the carries at the boundaries of the carry-select blocks are computed in the adder, saving considerable amount of area in the carry-computation unit. A 32-bit adder with 4-bit sparseness is shown below. The block which is used to select carry, computes two sets of sum bits corresponding to the two possible values of the incoming carry. When the actual carry is computed, it selects the correct sum without any delay overhead. The Inter Adder structure and the computation unit is shown in figure 3 and 4.

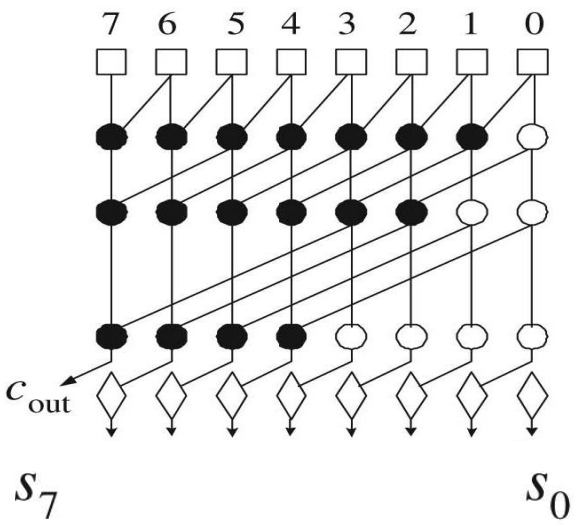

Figure 3: Parallel-prefix structures for integer adders- Kongge-Stone

2.3 CARRY SELECT ADDER

We investigate design methods to minimize the power-delay product of 16-bit adders in partially depleted (PD) silicon-on-insulator (SOI) technology. Addition is used as a benchmark here since it is one of the important tasks performed by the CPU, considering that adders are needed in the Arithmetic and Logic Units, for the memory address generation and for floating point calculations. The improvement of the power-delay product will be performed at the different hierarchical

Levels of the design: circuit design style, cell decomposition, and global architecture.

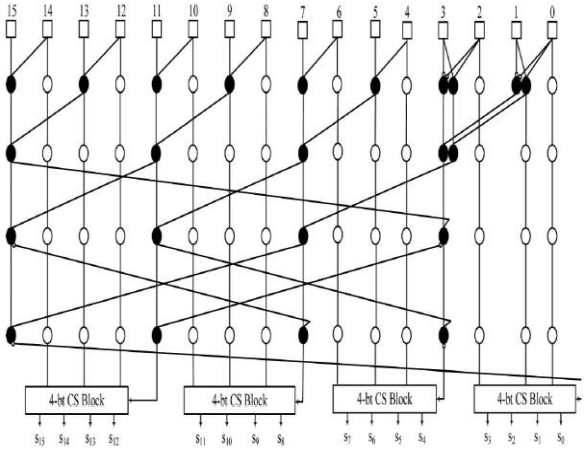

Figure 4: Using a sparse carry computation unit

In this study, we concentrate on static design styles, since the performance advantage of both dynamic logic styles and pass-gate design is expected to decrease in future deep-submicron technologies. The features of lower dynamic power consumption and higher noise margin make static CMOS particularly attractive.

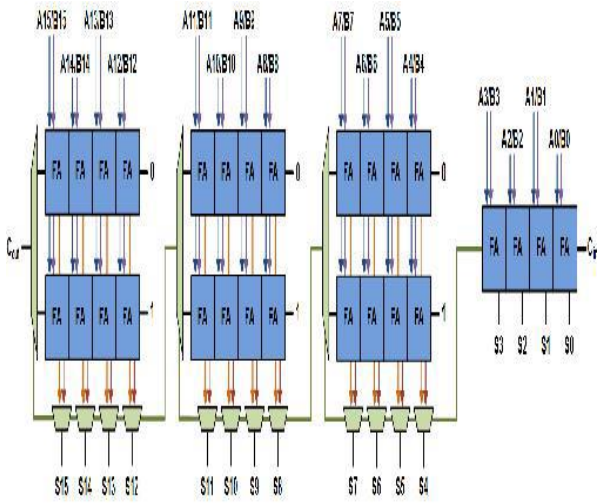

Figure 5 : Regular Fixed Size CSLA

A 16-bit carry-select adder with a uniform block size of 4 can be created with three of these blocks and a 4- bit ripple carry adder which is show in fig 5. Since carry-in is known at the beginning of computation, a carry select block is not needed for the first four bits. The delay of this adder will be four full adder delays, plus three MUX delays.

A 16-bit carry-select adder with variable size (Figure 6) can be similarly created. Here we show an adder with block sizes of 2-2-3-4-5. This break-up is ideal when the full-adder delay is equal to the MUX delay, which is unlikely. The total delay is two full adder delays, and four multiplexer delays.

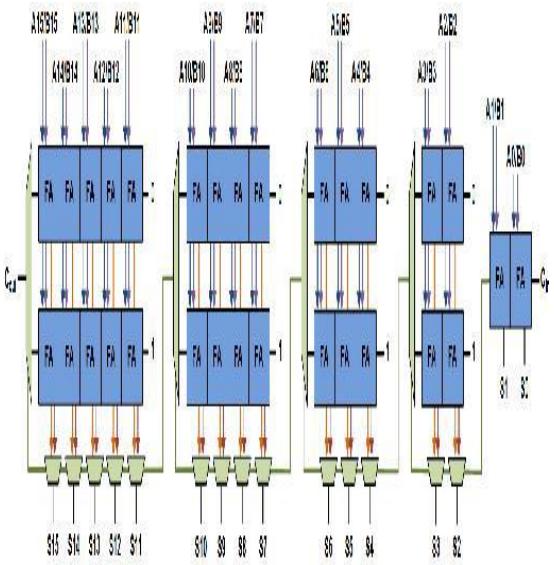

Figure 6 : Variable Sized CSLA

Moreover, the activation of the parasitic bipolar transistor in PD SOI is reported to result in fatal erroneous states in dynamic logic and to make circuit design with pass-gates more difficult. The renewed interest in static design styles like pseudo-NMOS and rationed CMOS shows that alternative design styles are investigated in SOI in order to reduce the power dissipation while still maintaining high-speed performance.

2.4 ERROR TOLERANT ADDER

A1CSA: An Energy-Efficient Fast Adder Architecture for Cell-Based VLSI Design is Error Tolerant Adder. In modern VLSI technology, the occurrence of all kinds of errors has become inevitable. By adopting an emerging concept in VLSI design and test, Error Tolerance (ET), a novel Error-Tolerant Adder (ETA) is proposed.

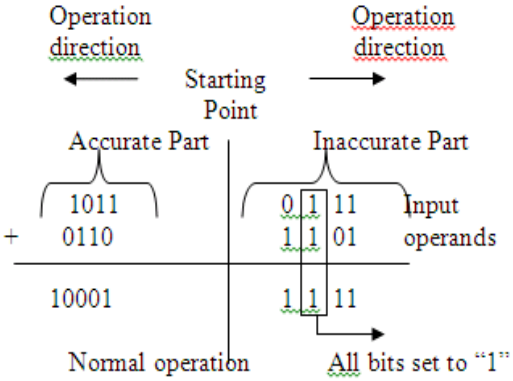

Figure 7: Arithmetic Procedure of Error Tolerant Adder

The ETA is able to ease the strict restriction on accuracy and at the same time achieve tremendous improvements in both the power consumption and speed performance.

When compared to its conventional counterparts, the proposed ETA is able to attain improvement in the Power-Delay Product (PDP).

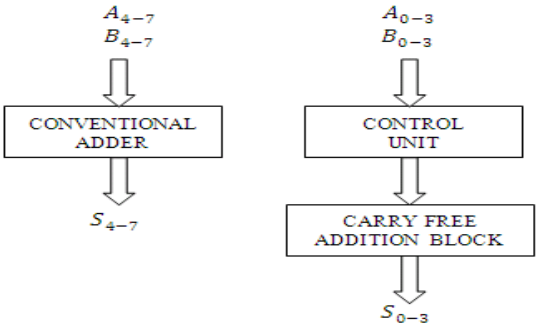

Figure 8: Block Diagram of Error Tolerant Adder

One important potential application of the proposed ETA is in digital signal processing systems that can tolerate certain amount of errors. The delay and power are compared for various adders like RCA and CLA. ETA has high speed and less power compared to its counterparts.

2.5 HYBRID PREFIX ADDER

Parallel Prefix addition is a technique for improving the speed of binary addition. Due to continuing integrating intensity and the growing needs of portable devices, high performance and high performance designs are of prime importance.

The classical parallel prefix adder structures presented in the literature over the years optimize for depth of logic, area, fan-out and interconnect count of logic circuits. A new architecture for performing 8-bit, 16-bit and 32-bit Parallel Prefix addition is proposed. The proposed prefix adder structures is compared with several classical adders of same bit width in terms of power consumed, delay calculated and number of computational nodes. The results reveal that the proposed structures have the least power delay product when compared with its peer existing Prefix adder structures.

2.6 MODIFIED AREA EFFICIENT CARRY SELECT ADDER

Carry Select adder (CSLA) is an adder which computes n+1 bit sum of two n bit numbers. When compared to earlier Ripple Carry Adder and Carry Look Ahead Adder, Regular CSLA(R-CSLA) is observed to provide optimized results in terms of area. From the architecture of Modified CSLA it is observed that there is a possibility of reducing the area further .Regular CSLA uses dual Ripple Carry Adder to perform addition operation. Modified CSLA (M-CSLA) uses BEC as add one circuit which reduces the area furthermore, such that the total gate count is reduced subsequently.

For 16bit addition, it is proposed to simple gate level modification which significantly reduces the area. It is known as Modified Area Efficient Carry Select Adder (MA-CSLA), shown in figure 9. The strategic work in MA-CSLA reduces the area using the modified XOR gates.

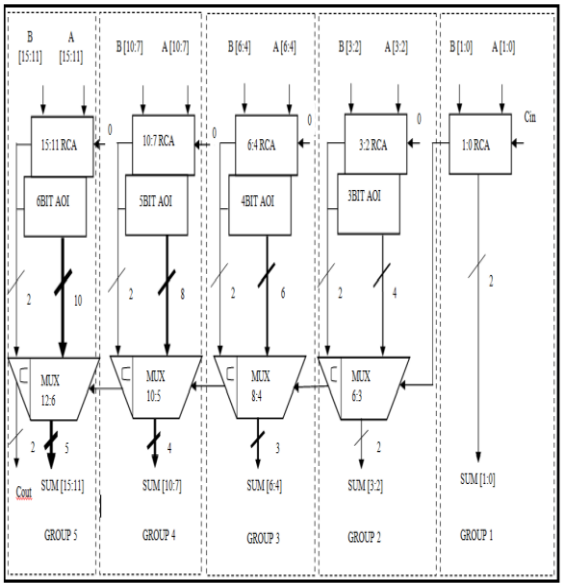

Figure 9: Modified Area Efficient Carry Select Adder (MA-CSLA)

The result analysis shows that the Modified area efficient CSLA is better than the M-CSLA for low power applications like digital signal processing and ALU.

2.7 PARALLEL BINARY ADDER

The goal of this paper is to present architectures that provide the flexibility within a regular adder to augment/decrement the sum of two numbers by a constant which is considering in the addition process.

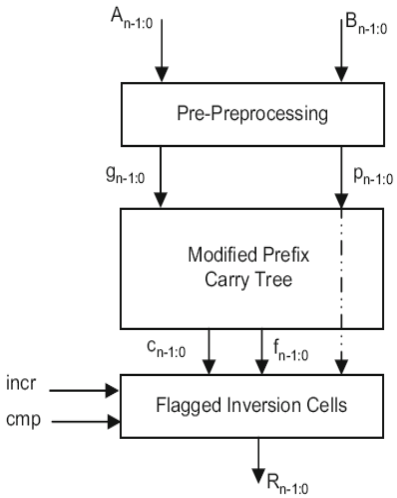

Figure 10: Modified PBA block diagram

This flexibility adds to the functionality of a regular adder, which achieving a comparable performance to conventional designs, therefore eliminating the need of having a dedicated adder unit to perform similar tasks. In this adder if the third operand is a constant, design to accomplish three-input addition. This is accomplished by the introduction of flag bits.

Such designs are called Enhanced Flagged Binary Adders (EFBA), shown in figure 10. It also examines the effect on the performance of the adder when the operand size is expanded from 16 bits to 32 and 64 bits. Detailed analysis has been provided to compare the performance of the new designs with carry-save adders in terms of delay, power dissipated and area consumes.

III. IMPLEMENTATION

Booth multiplication is a technique that allows faster multiplication by grouping the multiplier bits. The grouping of multiplier bits and Radix-8 Booth encoding reduce the number of partial products to half.

The shifting and adding for every column of the multiplier term and multiplying by 1 or 0 is commonly using. But here we take every second column, and multiply by ±1, ±2, or 0.The advantages of this method is halving of the number of partial products. In Booth encoding the multiplier bits are formed in blocks of three, such that each blocks overlap the previous block by only one bit.

Grouping is started from the LSB side, and the first lock only uses two bits of the multiplier term. Figure 3 below shows the grouping of bits from the multiplier term.

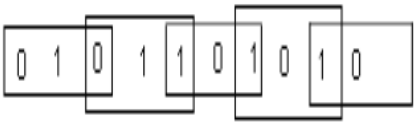

Figure 11: Grouping of bits from the multiplier term in the multiplication operation

B	Zn	Partial Product
000	0	0
001	1	1×Multiplicand
010	1	1×Multiplicand
011	2	2×Multiplicand
100	-2	-2×Multiplicand
101	-1	-1×Multiplicand
110	-1	-1×Multiplicand
111	0	0

Table 1: Operations on the multiplicand

To obtain the correct partial product each block is decoded from the grouped terms. Table 1 shows the encoding of the multiplier value Y, which using the Modified Booth Algorithm. Which generating the following five signed digits, -2, -1, 0, +1, +2. Each encoded digit in the multiplier performs a certain operation on the multiplicand X.

IV. MODIFIED BOOTH ALGORITHM FOR RADIX-8

The number of subsequent calculation stages can be decreased by enhancing the parallelism operation. So, one of the solutions of realizing high speed multipliers is to enhance parallelism operation.

The Radix-4 Booth multiplier is the modified version of the conventional version of the Booth algorithm (Radix-2), which has two drawbacks. They are: (i) Which is inconvenient in designing parallel multipliers because the number of add subtract operations and the number of shift operations becomes variable. (ii) When there are isolated 1's, the algorithm becomes inefficient. These problems are overcome by sing modified Radix-8 Booth multiplier. The Booth algorithm which scans the strings of three bits is given below:

1) If necessary to ensure that n is even, then the sign bit 1 position is extend.
2) A 0 bit is appended to the right of the LSB of the multiplier.
3) Each partial products will be 0, +M,-M, +2M,-2M,-3M,+3M,-4Mor+4M.

Table 2: Radix-8 Recoding

Quartet value	Signed digit value
0000	0
0001	+1
0010	+1
0011	+2
0100	+2
0101	+3
0110	+3
0111	+4
1000	-4
1001	-3
1010	-3
1011	-2
1100	-2
1101	-1
1110	-1
1111	0

Generation of Radix 2 and Radix 8 multiplication (referred to as a hard multiple, since it cannot be obtained via simple shifting and complementing of the multiplicand) generally requires some kind of carry propagate adder to produce. Generated carry propagate adder may increase the latency, mainly due to the long wires that are required for propagating carries from the less significant to more significant bits.

High-speed modulo multipliers using Booth encoding for partial product generation have been proposed in The Booth encoding technique reduces the number of partial products to be generated and accumulated, thereby minimizing the associated hardware. The radix-4 Booth encoding is most prevalent as all modulo-reduced partial products can be generated by mere shifting and negation. Greater savings in area and dynamic power dissipation are feasible for large word- length multipliers by increasing the radix beyond four.

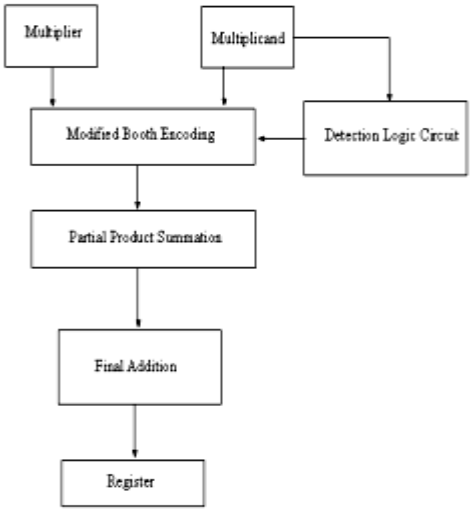

Figure 12: Block Diagram of Radix-8 MBA

In the radix-8 Booth encoding, the number of partial products is reduced by two- thirds. However this reduction in the number of partial products comes at the expense of increased complexity in their generation.

A Digital multiplier is the fundamental component in general purpose microprocessor and in DSP. Compared with many other arithmetic operations multiplication is time consuming and power hungry. Thus enhancing the performance of the circuit and reducing the power dissipation are the most important design challenges for all applications in which multiplier unit dominate the system performance and power dissipation.

The one most effective way to increase the speed of a multiplier is to reduce the number of the partial products. The number of partial products can be reduced with a higher radix Booth encoder, but the number of hard multiples that are costly to generate and which increases simultaneously.

To increase the speed of operation and performance, nowadays many parallel MAC architectures have been proposed. The technique Parallelism in obtaining partial products is the most common technique used in the above implemented architecture.

There are two common approaches that make use of parallelism to enhance the multiplication performance. The difference between the two is that the latest one carries out the accumulation by feeding back the final CSA (Carry Save Adder) output rather than the final adder results which we are obtaining. The rest of the paper is organized as follows. Section second, in which an introduction to the general MAC is given along with basic MAC algorithms. Section third, in which the entire process of parallel MAC based on radix-8 booth encodings is explained. In section four which shows implementation result and the characteristics of parallel MAC based on both of the booth encodings. At last, the conclusion will be given in section five in which provides summary of our proposed approach and discuss scope of future extensions.

V. RE SULT S

The simulation results for 16-bit Radix-2 and Radix-8 modified Booth algorithm with seven adders and MAC are trying to implement. Table below shows the synthesis report for array MAC, Radix-2 and Radix-8modified Booth algorithm with seven adders which used here in MAC.

The code is dumped onto the target device Spartan 3E (Xc3s500eft256-4), inputs (Set frequency of asynchronous nets as10MHz), signals (Set frequency of asynchronous nets as10MHz) and outputs (Set capacitive load of outputs as 28000 pf).

Table 3 shows the comparisons of power consumption and delay estimated of the Radix-2Modified Booth Algorithm with seven different adders in MAC. Table 4 shows the power dissipation and delay of Radix-8 using that same adders which used in the Radix-2 MAC. The design summary and simulation result also shown on figure 13 and 14.

VI. CONCLUSION

Here we are compared different adders by its different criteria. They worked well in either power dissipation or in delay. So the performance of each adder is different from the other. The adders avoid the unwanted glitches and thus minimizes the switching power dissipation. Radix -2 modified booth algorithm reduces the number of partial products to half by grouping of bits from the multiplier term in the multiplication operation, which improves the speed.

VII. FUTURE SCOPE

Nowadays we are dealing with the modified booth algorithm which is different from the booth algorithm which we are commonly using now. Radix-2 and Radix-8 Booth Algorithm is commonly using for all multiplication process. Which reduces the number of critical path, there by reduces power consumption. In this paper, 16- bit Radix-8 Modified Booth Algorithm using spurious power suppression technique is designed. The Radix-16 MBA also can be implemented from this designed Radix-8 MBA.

Table 3: Comparison of Radix-2 MBA

Device parameters	Array multiplier &accumulator	SPST Adder	Parallel prefix Adder	Carry Select Adder	Error tolerant Adder	Hybrid prefix Adder	Mod. Area Efficient CSL Adder	Parallel Binary adder
Number of 4 input LUTs	636 out of 29504	1093 out of 29504	1083 out of 29504	657 out of 9312	539 out of 9312	631 out of 9312	735 out of 9312	549 out of 9312
Number of gate count for design	4209	5987	7167	4593	3741	4425	4926	3768
Estimated delay(ns)	217.8	39.69	24.936	54.959	36.041	50.086	57.724	53.084
Power consumption (mw)	154	144	138.80	16.746	16.338	16.631	16.508	16.533

Table 4: Comparison of Radix-8 MBA

Device parameters	Array multiplier &accumulator	SPST Adder	Parallel prefix Adder	Carry Select Adder	Error tolerant Adder	Hybrid prefix Adder	Mod. Area Efficient CSL Adder	Parallel Binary adder
Number of 4 input LUTs	636 out of 29504	1093 out of 29504	1083 out of 29504	1212 out of 9312	1083 out of 9312	1178 out of 9312	1257 out of 9312	1222 out of 9312
Number of gate count for design	4209	5987	7167	7875	6942	7629	7998	7155
Estimated delay(ns)	217.8	39.69	24.936	59.723	39.150	54.450	60.934	66.106
Power consumption (mw)	154	144	138.80	19.980	22.906	20.019	19.982	19.935

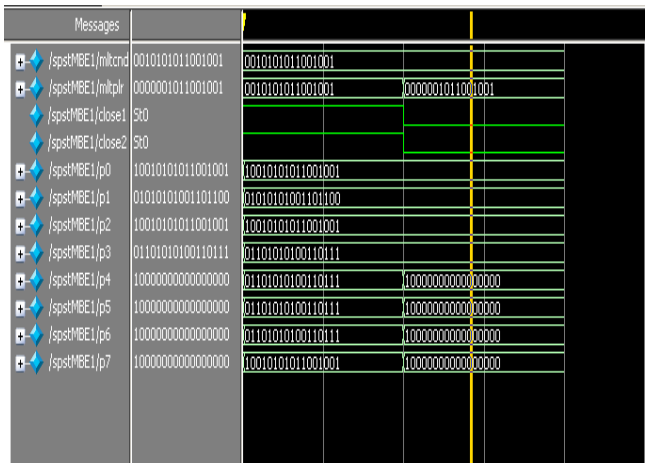

Figure 13: Simulation results for a 16-bit multiplier using radix-8 modified Booth algorithm with Parallel Prefix adder

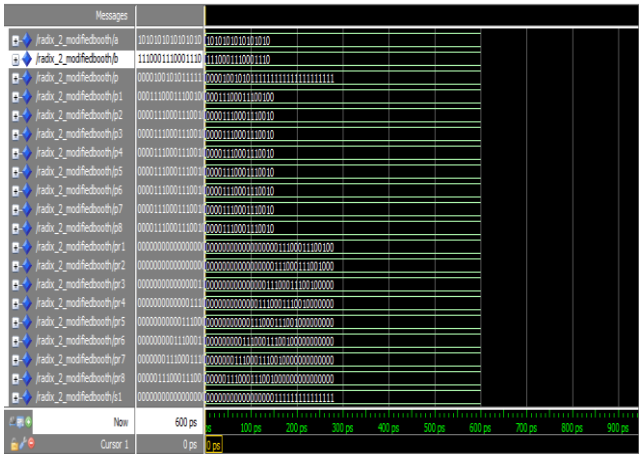

Figure 14: Simulation results for a 16-bit multiplier using radix-2 modified Booth algorithm with Error Tolerant Adder

Device Utilization Summary				
Logic Utilization	**Used**	**Available**	**Utilization**	**Note(s)**
Number of 4 input LUTs	1,088	29,504	3%	
Logic Distribution				
Number of occupied Slices	568	14,752	3%	
Number of Slices containing only related logic	568	568	100%	
Number of Slices containing unrelated logic	0	568	0%	
Total Number of 4 input LUTs	1,095	29,504	3%	
Number used as logic	1,088			
Number used as a route-thru	7			
Number of bonded IOBs	64	250	25%	
Total equivalent gate count for design	7,167			
Additional JTAG gate count for IOBs	3,072			

Figure 15: Design Summary of Radix-2 MBA for Parallel Prefix Adder

Device Utilization Summary				
Logic Utilization	**Used**	**Available**	**Utilization**	**Note(s)**
Number of 4 input LUTs	1,745	9,312	18%	
Logic Distribution				
Number of occupied Slices	902	4,656	19%	
Number of Slices containing only related logic	902	902	100%	
Number of Slices containing unrelated logic	0	902	0%	
Total Number of 4 input LUTs	1,749	9,312	18%	
Number used as logic	1,745			
Number used as a route-thru	3			
Number of bonded IOBs	83	190	43%	
Total equivalent gate count for design	10,983			
Additional JTAG gate count for IOBs	3,984			

Figure 16: Design Summary of Radix-8 MBA for Parallel Prefix Adder

The benefits of miniaturization are high packing densities, good circuit speed and low power consumption. Binary multiplier is an electronic circuit used in digital electronics such as a computer to multiply two binary numbers, which is built using binary adders. A fixed-width multiplier is attractive to many multimedia and digital signal processing systems which are desirable to maintain a fixed format and allow a minimum accuracy loss to output data.

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Monitoring of Heavy Metal in Textile Waste Water of Sanganer, Jaipur (Rajasthan)

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Abstract- The textile industry represents a range of industries with operations and processes as diverse as its products. Textile industry effluents account for several point sources of water pollution thus posing negative effects on aquatic lives and human health. The paper contains results of a study carried out in agricultural fields of Sanganer town. This paper contains results of physico-chemical analysis of waste water collected from Sanganer town. The town is situated about 20 kms away from the city center, Jaipur. In the study area (Amanishah Nalla Sanganer ,Jaipur) vegetables are grown in the fields receiving sewerage and textile waste water. Random samples were collected during different periods of the year Amanishah nallah and analyzed for various physic-chemical parameters such as Ph, Electrical Conductvity, Total Solids, chloride, Total Hardness ,Ca Hardness, and heavy metals such as Cr, Cu, Pb, Zn, Fe, Ni and Cd.This waste water is used in several nearby located agricultural fields. Results revealed that pH of the waste water ranges between 7.45 to 9.43 and Electrical Conductivity between 0.97 to 1.25 umho/cm and total solids from 965.8 to 1562 mg/L .Calcium and Magnesium ranges between 54.76 to 123.24mg/L and 466.23 to 941.64mg/L respectively. The total Hardness ranges between 568 to 1138mg/L. Chloride and D.O. values ranges between 295 to 578.3 mg/L and 17.1 to 36.20 mg/L respectively. Heavy metals were also analysed. This waste water contains Pb 1.098,mg/L, Fe 0.191mg/L, Cu 4.66 mg/L, Cd 1.98 mg/L, Zn 3.29 mg/L, Ni 0.076 mg/L and Cr 3.96 mg/L.

Index Terms- Sanganer, textile industries, Physico-chemical, Waste water.

I. Introduction

Cleaner production has spread to almost every industrial sector and many researchers have devoted themselves to the development of clean technologies in the textile printing industry. Cleaner production, which has beendeveloped in recent years as a tool for environmental protection and for higher efficiency, has shown its ability to decrease environmental pollution, preserve natural resources from excessive depletion and generally to limit the adverse environmental impact of economic activities(Li et al. 2011). The current problem with polluted industrial waters indeveloping nations is the absence of treatment prior to environmental discharge, combined with the formation of large amounts of wastes when treatment is processed. Indeed, whether the treatment method uses chemical, biologicalor electrical means, large amounts of sludge are produced which are difficult to handle and dispose of (El Quardi et al 2009). Industrial progress and development of global population have led to an excessive contamination of ecosystems ,particularly marine environment, by metals over the last three decades (Franca et al. 2005). Environmental pollution has become a worldwide phenomenon .Pollution of water bodies is a phenomenon of concern in the developing countries of the world including India (Awomeso et al; 2010). Industrial effluents urban runoff, direct disposal of wastes into the water bodies agricultural fertilizer and animal wastes remain the major water contaminants .It is also reported that textile and dyeing industry pose a major environmental threat because of the large amounts of water and dyes involved in the manufacturing process .Large amount of chemically different dyes are employed for various industrial applications including textile dyeing(Pal and Brijmohan1990).Textile and dying industry in the world pose a major environmental threat because of the large amounts of water and dyes involved in the manufacturing process(Abd El Rahim et al 2008).Large amount of chemically different dyes are employed for various industrial applications including textile dyeing(Pal and Brijmohan1990).The waste water contains heavy metals because the water comes from the printing industries. The dye used in these industries contain synthetic chemicals, which are generally metal based .Many of the metals are harmful for human body above permissible limits (Orebiyi et al.2010).Metals occur naturally in our environment, especially in the Earth's crusts where they contribute to the balance of the planet. However, as a result of human activities they are distributed, concentrated and chemically modified, which may increase their toxicity (Mihaly et al. 2005).). Environmental pollution and continuous exposure of human beings to toxic heavy metals such as Hg, Cd, and Pb is serious growing problem throughout the world (Yusuf and Sonibare 2004).Textile industries contribute significantly toward the economy of developing countries such as India, but they also pollute the aquatic environment through wastewaters released at various steps of dyeing and printing. Textile wastewater is a mixture of colorants (dyes and pigments) and various organic compounds used as cleaning solvents, plasticizers, etc. It also contains high concentrations of heavy metals, total dissolved solids, and has high chemical and biological oxygen demand. The major metal pollutants such as copper, zinc, chromium, etc. come mainly from the metal complex dyes and chromium salts used in wool dyeing or as oxidizing agents in sulfur dyeing (Chavan 2001). In India, textile printing and dyeing industries have expanded rapidly in recent years. Their effluents are discharged either directly (mostly untreated/partially treated) or along with domestic wastewater. The application of such wastewaters to agricultural fields is quite common in rural India, which has led to biomagnifications of heavy metals in vegetables and cereals (Sharma et al. 2001). The

toxicity of dyes has mostly been investigated with vertebrates, mostly fish, whereas the effects on invertebrates and plants are least explored (Sharma et al. 2005) Industrial waste and effluents are undesirable by-products of economic development and environment and when these products handled and disposed improperly, they cause serious threat to human health and environment. Such as use of dye stuffs in textile paper, paint and printing industries and improper disposal of these stuffs into the water sources cause serious problem of pollution and health hazards due to presence of heavy metals above permissible limits (Khan et al. 2001). Amanishah Nala which is of great importance to Jaipur city particularly Sanganer area has effluent water (polluted water) from textile industries. The ground water is used in the cottage industries (Khan et al. 2003).Waste water effluents from textile dyeing and printing industries from Sanganer which contains dyes, bleaching agents, salts, acids and heavy metals like Cr, Cu, Pb, Zn, Fe are discharged continuously without any treatment into Amanishah Nala. The effluent water takes the dissolved toxicants to crop plants and its consumers (Khan et al. 2009). Azo dyes and Cu are the most common pollutants in the textile wastewater of Sanganer, Jaipur (Sharma et al. 1999). This waste water cause many problems including ground water pollution and adverse effects on agricultural products, animals and health of the people.

II. STUDY AREA

Sanganer town is situated nearly 20 km away from the main city of Jaipur. Sanganer town lies between 26° 49’ to 26°51’N latitude and 75°46’ to 75°51’E longitude. The total area of Sanganer is about 635.5 sq km. various industries discharge untreated waste water in Amanishah Nala.Sanganer is famous for its textile hand printing work.Mainly Chhipas community is engaged in dyeing and printing of textile as small scale industry.Sanganer is very famous for a special type of printing known as ‘Sanganer Printing’.This type of printing requires water based process for color fixation and it creates water pollution. The chipas either wash clothes at their wells in the city or bring the cloth on wells dug on bank of Amanishah Nallah.The Amanishah Nallah gets polluted due to discharge of trade effluent into it and due to inflowing domestic waste water of Jaipur city.

III. MATERIAL AND METHODS

The sample were collected from different location of Amanishah Nallah. These samples were collected periodically from April 2012 to January 2013.Water samples were collected in different glass bottles. Physico-chemical parameters for the collected samples were studied by standard methods.

Heavy Metal Analysis By Atomic Absorption Spectrophotometer.

Atomic absorption Spectrophotometer (AAS Model GBC 932) was used for analysis of heavy metals in water. The 25ml of the sample was digested in di acid mixture of HNO3 and per chloric acid in the ratio of (10:1). The digestion was performed in 100 ml conical flasks and to facilitate complete digestion the samples in di acid mixture were kept overnight at room temperature .These flasks containing samples and di acid mixture were heated at hot plate until a clear solution was obtained .This was followed by a slow but complete evaporation of acids. Then, the volume of the digested samples was made up to 100 ml with the help of the double distilled water .Finally these solutions were analyzed by Atomic Absorption Spectrophotometer.

IV. RESULT AND DISCUSSION

Textile industry effluents collected from several point sources of water pollution. The results related to physico-chemical characteristics of textile effluents are given in the table no.1. In the present study pH was found to be maximum in July. The results indicated that pH values range between *7.45±0.02to 9.44±0.10* Minimum pH (7.45) was found in January 2012 and maximum pH (9.44) was in July 2013. E.C. ranged between *0.67±0.05 to1.26±0.06* mmhos its maximum concentration i.e. 1.26 was found in July 2013 and minimum in January 2012 i.e. 0.67. Total solids ranged from *937.8±9.59* mg/L was found in January 2012 and maximum *1852±22.33* mg/L in July 2013. Similarly Chloride values ranged between *276.6±16.21* mg/L in April 2012 and *572±27.5* mg/L was maximum in July 2013. Calcium and Magnesium hardness ranged between *42.46±5.19* was minimum in January 2013 and *124.2±24.25* mg/L was maximum in July 2012 and *540.72±2.28* mg/L minimum in. January 2013 to *1165.94±2.16*mg/L Maximum in July 2013. The Total Hardness was between *583.18±17.38 to1251.8±22.55* mg/L .In the present study the maximum concentration 1.107 ±0.034 mg/L of lead was recorded from textile waste water maximum permissible limits of lead is 0.1 mg/L. Desirable limits of lead is .05 mg/L beyond this limit water becomes toxic. Average concentration of copper 4.794 ±0.17 mg/L found in the textile water samples is more than the permissible limits. Average concentration of cadmium 2.058±0.16 mg/L cadmium level was found high in industrial area. Average concentration of ferrous 0.152±0.017 mg/L found in textile water samples is more than permissible limits. Chromium metal was found 3.64 ±0.22 mg/L it was higher than permissible limits. The permissible limit for Cr is 0.05 mg/L. Average concentration of zinc and nickel was 3.264 ±0.07 mg/L to 0.078 ± 0.01 mg/L.

RECOMMENDATION

There is a need of treating effluent water by central effluent treatment plant and removing heavy metals before utilizing this water for crop plants.

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Analysis of Textile Waste Water Samples from Amanishah Nallah(Sanganer

Parameter s	***2012***				***2013***				
	April	***July***	***October***	***January***	***April***	***July***	***October***	***January***	
PH Hydrogen ion concentratio n	*8.53±0.26*	*9.27±0.15*	*8.21±0.14*	*7.45±0.02*	*8.79±0.07*	*9.44±0.10*	*8.29±0.09*	*7.60±0.16*	
Electrical Conductivity m mhos / cm	*0.95±0.07*	*1.13±0.05*	*0.82±0.07*	*0.67±0.05*	*1.04±0.08*	*1.26±0.06*	*0.86±0.04*	*0.79±0.06*	
Total solids mg/L	*960.5±8.66*	*1774.4±18.9 5*	*1518.8±21.1 8*	*937.8±9.59*	*1486.2±14.3 4*	*1852±22.33*	*1560±24.97 7*	*1166.2±16.15*	
Chloride mg/L	*276.6±16.21*	*538.42±8.24*	*385.2±28.58*	*326±25.4*	*299.2±16.35*	*572±27.5*	*391±26.48*	*360.34±16.48*	
D.O. Mg/L	*24.32±1.13*	*39.76±1.53*	*21.86±2.04*	*19.7±1.51*	*22.64±2.48*	*35.28±1.48*	*20.32±0.74*	*16.8±1.013*	
Ca –H mg/L	*77.22±12.32*	*124.2±24.25*	*62.66±10.65*	*46.96±6.81*	*66.94±7.40*	*85.86±8.6*	*57.6±11.01*	*42.46±5.19*	
Mg-H mg/L	*1109.38±3.7 2*	*1119.2±3.49*	*723.94±1.32*	*567.64±2.3 2*	*849.02±2.21*	*1165.94±2.1 6*	*714±2.99*	*540.72±2.28*	
Total Hardness mg/L	*1186.6±21.5 7*	*1243.4±8.04*	*786.6±22.81*	*614.6±21.3 7*	*915.96±10.3 1*	*1251.8±22.5 5*	*771.6±24.88*	*583.18±17.38*	

(Mean ± SEM of 5 values)
Ca-H – Calcium Hardness
Mg-H – Magnesium Hardness

Analysis of Textile Waste Water Samples from Amanishah Nallah(Sanganer)

	Pb (mg/L)	**Fe(mg/L)**	**Cu(mg/L)**	**Cd(mg/L)**	**Zn(mg/L)**	**Ni(mg/L)**	**Cr(mg/L)**
*	1.107 ±0.034	0.152±0.017	4.794 ±0.17	2.058±0.16	3.264 ±0.07	0.078 ± 0.01	3.64 ±0.22
**	0.1	0.3	1	0.05	5	-	0.05

(Mean ± SEM of 5 values)
*Showing analysed value of heavy metals concentration in water sample from textile effluent discharging sites of Amanishah Nalla.
** Showing maximum permissible limit of WHO for particular metal.

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Relevancy Classification System for Video Search Results

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Abstract- *Now a day's Internet is becoming one of the basic needs of human being. Day by day different technologies are coming to enhance the experience of user. Our system will also enhance this experience little bit. This system will enhance the video searching experience of the user by providing different categories, dimensions and last but most important, better and most Holocene searching algorithm that is hummingbird algorithm. We are trying to implement one new algorithm, which includes some features of the hummingbird algorithm and also considers user's area of interest to provide more relevant search result. This algorithm searches for results on the basis of user's area of interest. The goal is that matching the meaning do better, rather than matching just a few words.*

Index Terms- Hummingbird algorithm, Relevant, Search engine, Session

I. INTRODUCTION

The main goal of the system is providing most relevant videos to the user. To fulfill this requirement, we will implement Hummingbird algorithm. In this is the gem of the system. By using this algorithm system will provide most relevant search results than existing system. For classification of search results system will use ranking algorithm. It will display results according to ranks given to the videos by users. For the convenience of user, the system will provide different fields like news, music, sports and many other while searching for videos. User can search any of those fields after entering keyword. User can select dimension and extension of videos too while searching. Thus by selecting all settings while searching, user can enjoy his video without doing any settings when it gets played.

Currently there are many websites present for video searching like YouTube, Dailymotion. But these websites don't give relevant result according to user's area of interest. For example, if user want to search for video of coffee band, the existing system will shows results like how to make instant coffee, coffee the greatest addiction ever. But in our system it will ask about field, so user can enter his field to get relevant results.

II. LITERATURE SURVEY

To understand the technical contribution of Relevancy Classification System let us take overview of the related work-

It is possible to build relevant classification system using keyword matching and keyword scoring algorithm. For keyword matching users comment can be used. Videos are classified by applying both algorithms and search results are provided to the user [1].

Online resources present document retrieval systems return long list of ranked documents that users are forced to sift through to find relevant documents. All search engines uses ranking and clustering techniques for presenting the result to the user. But, still it needs improvements. Instead of reducing number of results, it is most important to provide relevant and required search results to the users. Currently Simple ranking algorithm is used by the search engines, which provides scattered results in their search results. To overcome these problem different areas will be provided to the user by the system. For this purpose list of different areas will be provided [2].

Web pages can be efficiently collected using Web information classification system (WICS) and classified into several subject and search result are provided to user. Before extracting the feature phrases of the subject, automatic segmentation of words and frequency statistic will be done [3].

Powerful method for representing videos is decomposing video frames into coherent two dimensional motion layers. Intermediate description is provided by such representation that enables application such as object tracking, video summarization, visualization, video insertion and sprite-based video compression [4].

III. EXISTING SYSTEM

YouTube is a video-hosting website that allows users to upload videos to the site and allowing visitors to search and watch videos anytime they want, conveniently, quickly, and at no cost. A search function allows visitors to search videos by keywords or topics whatever they want. They can be watched in the normal screen mode or full screen mode. One special feature of YouTube that has made it gained such widespread use is its enabling of users to embed videos in their own websites and blogs. YouTube does this by putting up an HTML code for visitors to merely copy and input it into their websites' source code to allow visitors to their own websites watch the videos there and then.

Unlike many other video-hosting websites, YouTube was one of the first to offer videos in streaming media format. With streaming media, viewers do not have to wait to download a large file before watching the video. Instead, the media is sent in a continuous stream and is played as it arrives. Unlike many other video-hosting websites, YouTube was one of the first to offer videos in streaming media format.Thus, this significantly shortens waiting time and as all things go, makes the entire YouTube experience a smooth and enjoyable one.

Currently YouTube is third most visited website after Google and the Facebook. Conventional video searching systems return long list of ranked videos. The login is not required to view any video. But for uploading any video, to do comment, to give ratings login is necessary.

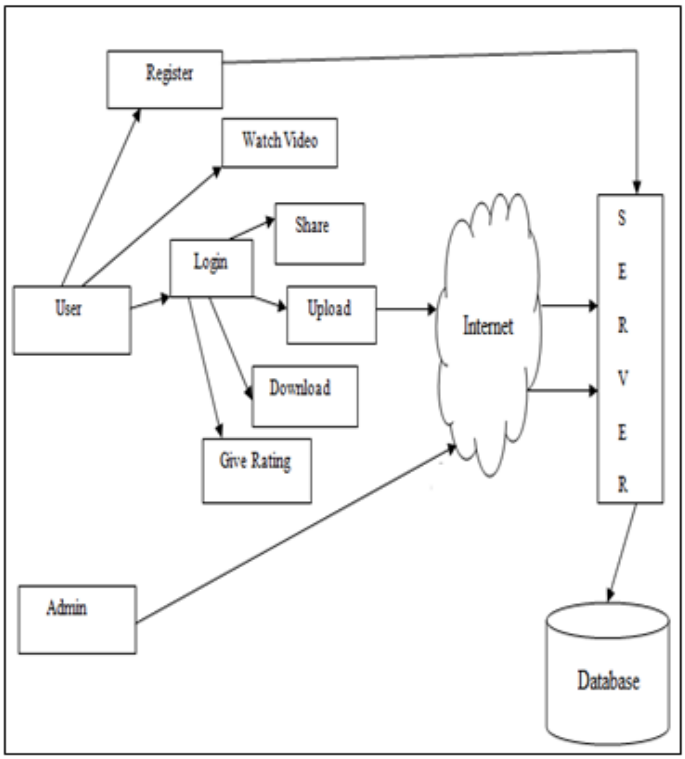

Figure 1: Existing System

IV. PROPOSED SYSTEM

For using this system user must do registration first. At the time of registration different information like name, email id, date of birth and user's area of interest is taken form user. The next time while using this system only login is required. After login system will provide two options for searching the video and for uploading the video. When user wants to search the video, system will provide many options like category, dimensions, keyword facility, most ranked video, previous search history of user etc. When user enters the keyword for searching the video, one drag down list will be provided so that user will get most relevant result. For example user wants to search the video of band journey; the meaning of journey is travelling also. In that case drag down list will show you options like band, travelling. By choosing related option user can get the result that he actually want. User can also give rating to the video. In case if the required video is not present in the database, system will show you default YouTube result. When user wants to upload any video, video will get uploaded first then it will go to the administrator for categorisation purpose. Admin will categorise it according to its dimensions, quality, rate etc.

Analyze and understand all the provided review comments thoroughly. Now make the required amendments in your paper. If you are not confident about any review comment, then don't forget to get clarity about that comment. And in some cases there could be chances where your paper receives number of critical remarks. In that cases don't get disheartened and try to improvise the maximum. To use this system user must do registration first. At the time of registration different information like name, date of birth and user's area of interest is taken from the user. Then next time while using this system only login is required. The session is maintained in this way.

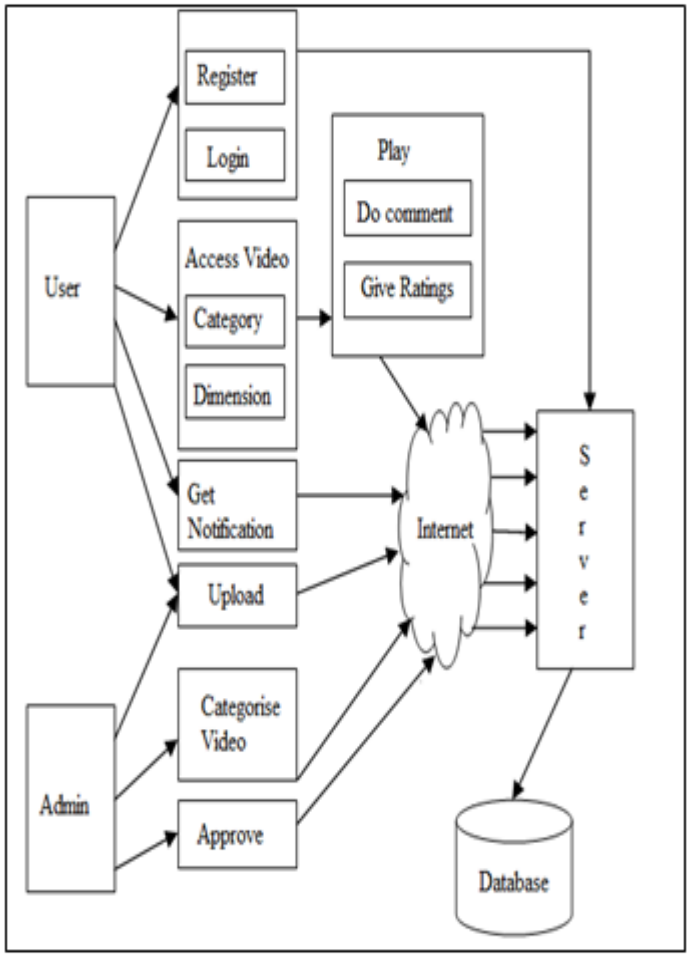

Figure 2: System Architecture of project

The modules of the relevancy classification system for video search result will be:

a] Admin module: This module will be used by Admin only. The admin can upload different videos according to their quality, type, dimensions. He will also approve the request of video approval made by user. Approval is required to neglect the irrelevant search results. Sometimes while uploading any video user can enter wrong information about its field. So if any other user is searching for video of that field, that user will gate irrelevant results. So to avoid this, admin will just check whether that tags are appropriate or not.

b] User Module: This module will be used by all users to view all videos and to upload videos. To access this module user first requires opening an account on this website. The uploaded videos are sending to the admin for approval. User also can share, upload videos as well as can do comments and give rating to the video. When user shares or uploads any video, the notification of that will be send to the user's friends. For this purpose this system requires access to the user's face book friend list. User can decide whether he wants to add all of his facebook friends or some of them to get notification from the system. When user will login, on the home page of the system, he will be able to see search bar, list of suggested videos, list of videos watched by him.

c] Database Module: All data will be stored in this module. It is most important module of the system. It stores all information regarding users, also stores all videos. This module help in transformation of information in terms of videos form Admin to user and vice-versa.

d] All these modules are independent of each other. API's will be used to communicate between database and user interface.

After building the main modules of the system, these modules will be combined together to form an effective system in video searching field.

The user is required to enter the following search criteria for locating a given video:

- Video's name
- Video's field
- Dimensions

The customised implementation steps required for the classification of the most frequently viewed videos are:

1. Searching for relevant videos.
2. Sorting of the videos.
3. Displaying list of relevant result.

1. Searching for relevant videos:

For searching purpose, system will calculate the weight of an each video. When user enters any keyword, system will calculate the weight by using following steps:

- The total weight of ball search results will be 1.
- Out of total weight, 0.3 weights will be given if the video is present in user's area of interest.
- 0.2 weight will be given to the most recent videos.
- 0.5 weight will be given to the videos having more number of views.
- If videos are present in the area of interest of the user and they match to the keyword entered by the user, 0.3 weight will be given to them by system.
- i.e. weigh t= 0.3 depending upon if category exist in the area of interest of the user.
- System will calculate the difference between the present time and the time when video was uploaded.0.2 weight will be given to the most recent videos.
- Now in the next step, weight will be decided according to the number of views to the video. System will calculate it by using following formula:
- Weight = (video views/total views) * 0.5

So the most important aspect for weight calculation is timestamp. The timestamp will be calculated by the system and the half weight has been given to it. User can give ranking to the system. These ranks will be used by the system for weight calculation. 30% of weight has been given to it.

To understand users query more effectively, we are using one feature of the hummingbird algorithm. For example, suppose user enters keyword "Satya Nandella" in his first search, and for second search if user enters "His Education" the system will show results which contain keyword education. As search engine is a machine it doesn't understand human language. It just takes keyword from user and matches it to find the results. To make better communication between searching system and the user we are implementing this feature. In above example suppose user enters keyword "Satya Nandella" in his first search, and for second search if user enters "His Education" the system will take "Satya Nandella" instead of " his". Thus system will give more relevant search results and the communication between user and the search system will be more efficient.

For this purpose system will extract noun from the keyword entered by the user and will replace it with a words like "he, his, she, her, it", to understand users query in the better way. It indexes search result more efficiently. Hummingbird should better focus on the meaning behind the words. Knowing all these meanings may help search engine go beyond just finding pages with matching words. In particular, search engine said that Hummingbird algorithm is paying more attention to each word in a query, ensuring that the whole query-the whole sentence or conversion or meaning-is taken into account, rather than particular words. The goal is that pages matching the meaning do better, rather than pages matching just a few words. So by using this algorithm the list of most relevant videos will be searched for user.

2. Sorting of the videos:

System will sort the videos according to the weight calculated during searching and will display the search results according to the weight in descending order. The weight of the videos will be less than 1. The sum of total weight of the videos will be 1.

It is impossible to have weight 0.99 to 1 to any video. If video is present in user's area of interest, have more number of views and it is more recently uploaded then only it is possible. Similarly it is impossible to have negative weight to any video. Sorted list will be displayed to the user.

User can also click on watch later option to watch the selected video later. User will be able to see list of suggested videos when after logging in.

We are not too bothered about the security aspect of the system as it does not deal with any kind of sensitive data such as banking norms, etc. So we don't need to bother about the security aspect of our system. The login will only be used in case of accessing and uploading of the videos. The data handled in this system is not too vital. There is no need of servers that always be confirmed to run properly.

The important aspect of system is time constrain. This system is real time and hence should be performed. The accountability is not a vital feature in this system and this could be assured if the system is working in its full capability. The system should not be too lagging. It is not possible to develop a system like this without any kind of lag, but the best we can do is to minimize that as much as possible so that we can deliver best performance.

The table is given below. It contains the keyword and the expected result from the system. When user will enter any keyword, which results are supposed to display is given in the table. System will also display the number of results available for the user's query.

Table I: Expected results

Input			Process		Output
Keyword	**Category**	**Dimensions**	**Searching**	**Sorting**	
Coffee	Music	480*360	Videos in music field.	Top 10 weighted videos of coffee band in music field.	Number of search results found & list in descending order.
Rafael Nadal	Sports	640*360	Videos in sports field.	Top 10 weighted videos of Rafael Nadal in sports field.	Number of search results found & list in descending order.
Ahjhkngv	Music	-	Videos in music field.	No search results.	0 results found.
Rahul	-	-	All videos.	Top 10 weighted videos of Rahul in all fields.	Number of search results found & list in descending order.
Al	Educational	480*360	Videos in educational field containing “al”.	Top 10 weighted videos containing “al” in educational field.	Number of search results found & list in descending order.
Coffeee	Music	-	Videos in music field.	No search results.	0 results found.

V. CONCLUSION

The system is still being built, so we can’t conclude anything at this moment. But the table of expected result shows the result expected by the system.

FUTURE WORK

After implementation of this project, we are thinking to develop an android app and ios app for this work. Also we are planning to develop the relevancy classification system for normal web search, so that user can get more relevant results. At present we are providing some standard dimensions, but in future we are thinking to provide all dimensions.

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Role of Cd and Hg on biochemical contents of fennel and its reduction by exogenous treatment of nitrogen

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Abstract- Heavy metal contamination is a serious environmental problem that limits crop production and endangerous for human health. The present study was conducted at Department of Botany, School of Life Sciences, Dr. B.R. Ambedkar University, Agra for assessing the toxic effect of cadmium and Mercury at different concentration viz. 10, 20 and 50 µm on the chlorophylls, proline and protein content of *Foeniculum vulgare* L. The standard solution was prepared using standard metal of inorganic ventures. These heavy metals affected the chlorophylls, carotenoids, protein and proline content of fennel seedlings as compared to control. Carotenoids were less effected as compared to chlorophyll 'a' and 'b' at low concentration (10µm), while at higher concentrations i.e. 20 and 50µm, the chlorophylls, carotenoids and protein content of the seedlings were reduced drastically. However the addition of nitrogen (5 mM) minimize the effect of these heavy metals to some extent. The proline content of plants was increased under Cd and Hg treatments at all concentrations. However in this case additional supply of nitrogen in the form of Ammonium nitrate decreased proline content of plants at all concentrations of these heavy metals (Cd and Hg).

Index Terms- Chlorophyll, Fennal, Heavy metals, Proline and Protein

I. Introduction

Foeniculum vulagre (L.) is a biennial or short lived perennial herb attaining a height of up to 2 meter. Fennel prefers loamy soil, rich in organic matter with a pH between 6.5 and 8.0 and soil temperature between 50 – 75 ºF. It is a native of mediterranean region and Europe but is commonly cultivated through out India especially in Assam, Maharashtra, Punjab and Gujarat (Kaur and Arora, 2006). It is used as a spice and also as an important ingredient in various folklore medicines throughout the world. India is well known historically as a land of spices and aromatic plants and continues to be one of the leading producers of spices and medicinal plants in the world (Prajapati *et al*., 2005). Spices are dried parts of the plants, which have been used as diet components often to improve colour, arome and acceptability of food. With the current emphasis of eating healthy diets that are low in fat and salts, people are turning to various herbs and spices to flavour their food. But the overall growth and productivity of these plants have been reduced to considerable extent by the heavy metal pollution in the air, soil and water (Husain *et al.,* 1995). **T**oxic heavy metal interfere with several metabolic processes, causing toxicity to the plants revealed by reduced root growth and phytomass, chlorosis, photosynthetic impairing, stunting and finally plant death (Sinha *et al*., 2007). Among list of various heavy metals, the Cd and Hg top the relative toxicity of metals to flora and fauna. Mercury has been found to reduce phytomass, total chlorophyll, photosynthesis, nitrogen and phosphorous contents in aquatic plants. Mercury (Hg) has become a problem of current interest as a result of environmental pollution on global scale (Aliu *et al*., 2013). Cd is a non essential heavy metal that does not have any metabolic function in plants (Bavi *et al*., 2011). It can be incorporated and accumulated by all organisms in large amounts and disturb physiological metabolism in plants like transpiration, photosynthesis, respiration and nitrogen assimilation (Wang *et al*., 2008). Proteins are the main components of nucleic acid, cell membrane and other cell organelles. Heavy metals are known to reduce protein content of various plants (Bavi *et al*., 2011; Balestrasse *et al*., 2003). Most common form of nitrogen i.e. NO_3^- are highly reactive and mobile and are generally susceptible to losses to heavy metal stress condition. NH_4^+, which are water soluble and are easily available for absorption by plants.

II. Material and Methods

The seeds of *Foeniculum vulgare* L. were obtained from National Seed Corporation, Sikandara, Agra. Seeds with uniform size, colour and weight were chosen for the experimental purpose. Two types of experiments – petridish experiment and pot and sand culture experiment were conducted in triplicate form. The seeds were surface sterilized with 0.1% mercuric chloride ($HgCl_2$) to prevent any contamination. After washing with distilled water they were soaked in 5% bavistin (a systemic fungicide) for 10 – 12 minutes. The selected seeds were placed in 10 cm diameter petridishes lined with filter paper Whatman No. 1 to this 5 ml solution of $NH_4(NO_3)$ at different levels (control, 5 mM) with various concentration of Cd and Hg (control, 10, 20 and 50 µM) was applied. Distilled water was used as control. The seeds were allowed to germinate for studying various parameters for 10 – 15 days. Three replicates of each treatment were maintained. The chlorophyll and carotenoids were estimated by Arnon's (1949) technique using double beam UV-visible spectrophotometer (Systronics). Proline estimation was carried out by Bates *et al.,* (1973) method, transmittance was read at 520 nm by using double beam UV-visible spectrophotometer (Systronics) and the standard curve was prepared by using pure proline (BDH). Protein estimation was carried out by Folin and Lowry (1975) method, transmittance was read at 750 nm by

using double beam UV-visible spectrophotometer (Systronics) and the standard curve was prepared by using BSA.

III. Result and Discussion

The effect of Hg was more pronounced than Cd and all concentration and among different types of chlorophyll, chlorophyll 'b' was more effected than chlorophyll 'a'. Data presented in Table 1 indicate that chlorophyll 'a' was reduced upto 0.320 and 0.343 mgg^{-1} Fw at 10µM concentration of Hg and Cd respectively as compared to control (0.354 mg g^{-1} Fw). Chlorophyll 'b' was reduced upto 0.330 and 0.376 mgg^{-1} Fw at 10µM concentration of Hg and Cd treatment as compared to control (0.421mg g^{-1} Fw). Similarly at 20µM concentration chlorophyll 'a' reduced upto 0.288 and 0.330 mgg^{-1} Fw for Hg and Cd as compared to control (0.354 mgg^{-1} Fw), while chlorophyll 'b' was reduced upto 0.311 and 0.347% mgg^{-1} Fw as compared to 0.421mgg^{-1} Fw (control) under Hg and Cd treatment respectively and at 50µM concentration chlorophyll a was reduced upto 0.252 and 0.290 mg g^{-1} Fw as compared to control (0.354 mg g^{-1} Fw), while chlorophyll 'b' was reduced upto 0.290 and 0.309 mg g^{-1} Fw as compared to control (0.421mg m^{-1} Fw). The application of nitrogen (Ammonium nitrate) in the nutrient medium proved beneficial for all pigments. Increase in chlorophyll 'b' was more than the chlorophyll 'a'. Carotenoids appears to be more tolerant to heavy metals as compared to other pigments thus showed an increase in the presence of the nitrogen. Thus chlorophyll a, b, and total chlorophyll were drastically reduced under both metal treatments especially at higher level. Similar results have been obtained by Xin Chen *et al*., 2011 working under Cd stress on pakchoi and mustard plants. Tantrey and Agnihotri (2010) found total chlorophyll reduced considerably due to heavy metal Cd and Hg on Gram (*Cicer arietinum*). Shekar *et al*. (2011) have shown a reduction in chlorophyll content in tomato plants when treated with mercury. With the application of nitrogen carotenoids showed about 4% and 3% increase as compared to control at 50 µM concentration of Cd and Hg . From the data presented in Table 1 it is clear that after the supply of nitrogen all the chlorophyll and carotenoid contents increased as compared to control. Thus in agreement with earlier reporter (Sun *et al*., 2008, Vajpayee *et al*., 2000; Mobin and Khan, 2007). Similar results have been obtained in other laboratory studies (Jiang *et al*., 2007). In this study we find that chlorophyll 'a' content exceeded that of chlorophyll 'b' in all treated plants, which has been proven by other researchers (Mobin and Khan, 2007; Singh *et al.,* 2012). Moreover, the application of heavy metals shows that there occurs a decline in the carotenoid contents in all treated plants and has been proven by various workers (Thapar *et al*., 2008; Da-Lin *et al*., 2011; Xin-Chen *et al*., 2011; Singh *et al*., 2012). Proline, an amino-acid is well known to get accumulated in wide variety of organisms ranging from bacteria to higher plants on exposure to abiotic stress (Saradhi *et al*., 1993). A kind of amino acid which could play a therapeutic role in plants. Fennal Plants shows an increase of upto 0.207, 0.268 and 0.468 mg g^{-1} proline as compared to control (0.182 mg g^{-1} proline) when treated with the 10µM, 20µM and 50µM concentration of Cd. When treated with Hg, the proline concentration was further enhanced and it was 0.221, 0.282 and 0.498 mg g^{-1} proline when treated with 10, 20 and 50µM of Hg as compared to control (0.182 mg g^{-1}) proline. However with the application of nitrogen the proline content was reduced to some extent. At higher concentration of Cd and Hg (50µM) proline was reduced upto 64% and 65% over control under the application of nitrogen. Similar results were reported by (John *et al.,* 2009; Singh *et al.,* 2012). Heavy metals are known to reduce the protein content of the plants. Data presented in the Table2 demonstrated the deleterious effects of Cd and Hg on protein content. This detrimental effect was more due to Hg as compared to the Cd. As evident from the Table 2 control plants exhibit maximum 0.60 mg/g, protein content and the minimum 0.42 mg/g and 0.39 mg/g, reported in 50µM Cd and Hg concentration. Protein content was reduced upto 0.55 mg/g under 10µM concentration of Cd, 0.50 mg/g under 20µM concentration of Cd. Hg proved more harmful for protein content, and reduced it by 0.52 mg/g under 10µM Hg, 0.48 mg/g under 20µM of Hg. In contrary to Cd and Hg, inclusion of nitrogen (NH_4NO_3) 0.5mM in nutrient medium increases protein content and proved to be beneficial for plants. Plants showed 24% increases in protein content at 50µM concentration of Cd and 38% increase at 50µM of Hg when treated with nitrogen. Our findings are similar to the findings of various workers that there occurs reduction in the protein content by the application of heavy metals (Balestrasse *et al*., 2003; Bavi *et al*., 2011). The reduction in the amount of protein could be due to decrease in protein synthesis or an increase in protein degradation (Balestrasse *et al*., 2003).

IV. Conclusion

In the present study, exposure of heavy metals (Cd and Hg) to fennel plants affected different parameters like chlorphyll, carotenoids, proline and protein content of this plant. Exposure of metals to the seedlings decreased the total chlorophyll content, carotenoids and proteins contents as the metal concentration goes on increasing. The present results shows that Cd and Hg toxicity increases the proline content of the fennel seedlings with the imposition of low concentration of Cd and Hg (10µm) less amount of proline was increased and as the plants are treated with higher doses (20 and 50 µm) of Cd and Hg there seems to be more increase in the accumulation of proline. In contract to other parameters, in this case the additional supply of nitrogen reduces proline content of the plant.

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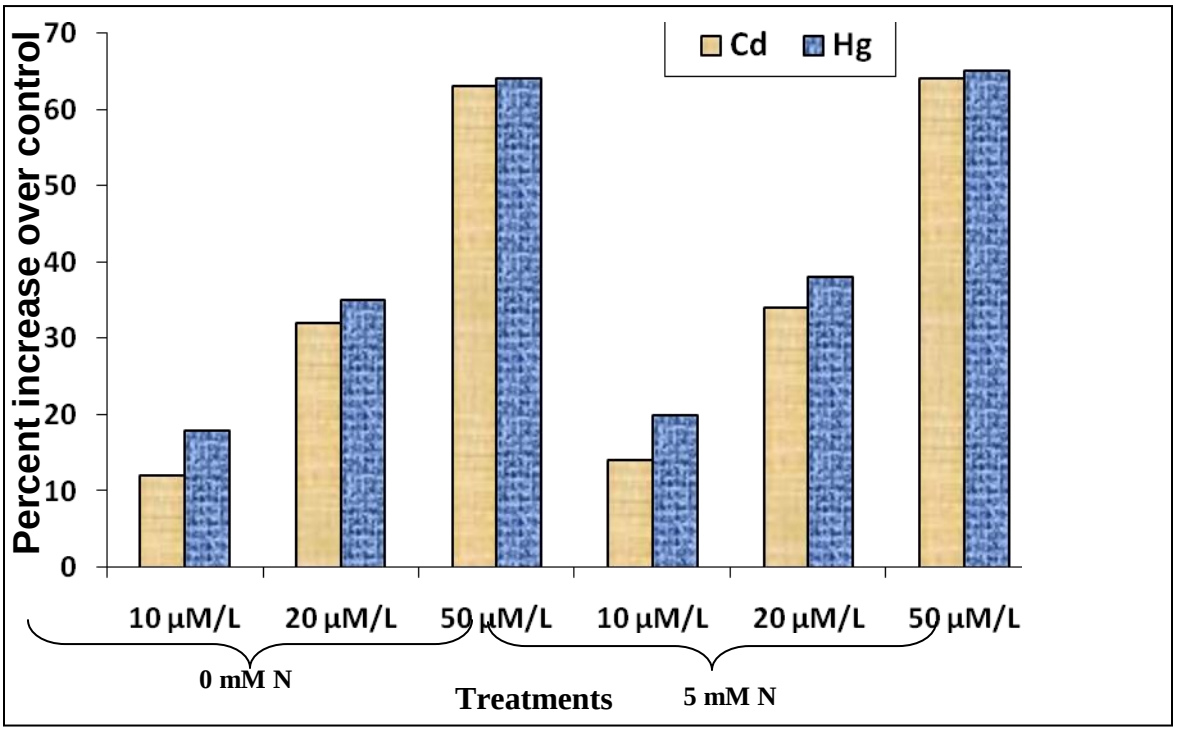

PROLINE CONTENT

Fig 1. : Effect of heavy metals and nitrogen interaction on proline content (mg g^{-1} FW) in *Foeniculum vulgare* L.

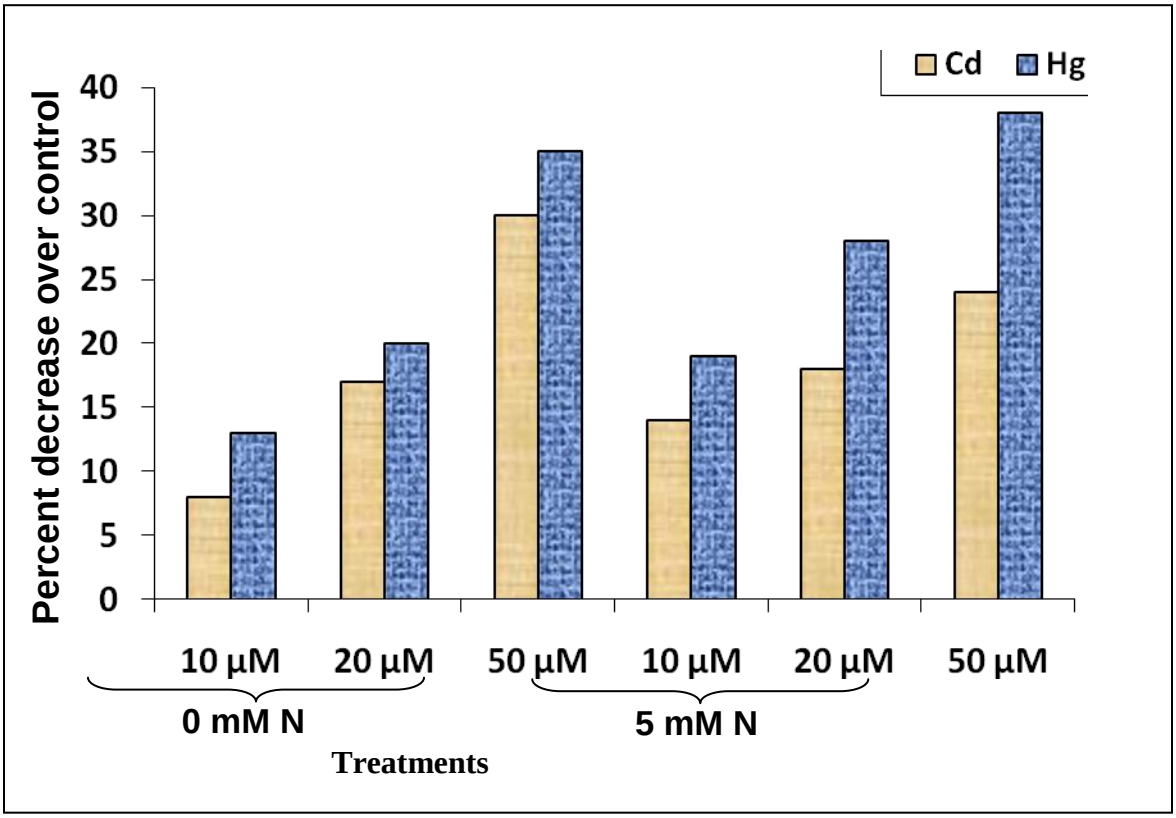

Fig. 2 : Effect of heavy metals interaction on protein content in *Foeniculum vulgare* L. with and without nitrogen

Table 1 : Effect of Cadmium and mercury on pigment composition (mg g^{-1} FW) in Fennel (*Foeniculum vulgare* L.) grown with or without nitrogen.

Metals	Concentration (µM)	Chlorophyll a		Chlorophyll b		Total Chlorophyll		Carotenoids	
		0 mM N	5 mM N	0 mM N	5 mM N	0 mM N	5 mM N	0 mM N	5 mM N
Control	0	0.354	0.402	0.421	0.483	0.775	0.885	1.547	1.646
Cd	10 µM	0.343	0.389	0.376	0.465	0.719	0.854	1.520	1.603
	20 µM	0.330	0.370	0.347	0.412	0.677	0.782	1.492	1.562
	50 µM	0.290	0.350	0.309	0.391	0.599	0.741	1.418	1.497
Hg	10 µM	0.320	0.380	0.330	0.415	0.650	0.795	1.485	1.579
	20 µM	0.288	0.337	0.311	0.400	0.599	0.737	1.439	1.490
	50 µM	0.252	0.310	0.290	0.363	0.542	0.673	1.376	1.421

N – Nitrogen
Data are average of 3 replicates.

Table 2 : Effect of Cadmium and mercury on proline content (mg g^{-1} FW) and protein content in Fennel (*Foeniculum vulgare* L.) in shoots grown with or without nitrogen.

Metals	**Concentration (µM)**	**Proline content (mg g^{-1} FW)**		**Protein content (mg g^{-1} FW)**	
		0 mM N	**0 mMN**	**5 mMN**	**5 mM N**
Control	0	0.182	0.60	0.72	0.165
Cd	10 µM	0.207	0.55	0.62	0.192
	20 µM	0.268	0.50	0.59	0.250
	50 µM	0.486	0.42	0.55	0.462
Hg	10 µM	0.221	0.52	0.58	0.206
	20 µM	0.282	0.48	0.52	0.265
	50 µM	0.498	0.39	0.45	0.477

N – Nitrogen
Data are average of 3 replicates.

X-ray Peak Broadening Analysis of ZnO Nanoparticles Derived by Precipitation method

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Abstract- In the present report ZnO nanocrystals were prepared by precipitation method from Zinc Chloride and Ammonia in aqueous solutions at a pH value 8.0 .ZnO nanocrystals were then synthesized by heating the precursor in a muffle furnace at temp 350°C for 3 hours and allowed to cool to room temperature. The obtained ZnO nanoparticles have been studied using characterization techniques like X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), and Energy dispersive analysis Of X-ray (EDAX). XRD results reveal that the sample is crystalline with a hexagonal wurtzite phase. X-ray peak broadening analysis was used to evaluate the crystallite sizes and lattice strain by the Williamson-Hall (W-H) analysis. Further appropriate physical parameters such as strain, stress, and energy density values were also calculated using W-H analysis with different models, viz, uniform deformation model, uniform deformation stress model and uniform deformation energy density model. SEM and EDAX study confirms the preparation of ZnO nanoparticles.

Index Terms- Nanoparticles, Scanning electron microscopy (SEM), X-ray diffraction (XRD),W-H analysis, ZnO

I. Introduction

ZnO is a II-VI group semiconductor material with wide band gap (~3.37 eV) and high excitation binding energy (~60 meV) [1, 5] at room temperature. It exhibits numerous

Characteristics suited for various technological applications such as antireflection coatings, transparent electrodes in solar cells [6], piezoelectric devices [7], gas sensors [8], varistors [9], UV and blue light emitters [10] and even thin film transistors [11].

Various chemical synthesis methods have been employed by several workers to synthesize nano / micro crystals such as solvothermal, hydrothermal, self assembly and Sol-gel, etc [12-16]. In this work, ZnO nanoparticles were synthesized using the cost competitive and simple precipitation process. The characterization was done using X-Ray diffraction, SEM, and EDAX.

A perfect crystal would extend in all directions to infinity, so no crystals are perfect due to their finite size. This deviation from perfect crystallinity leads to a broadening of the diffraction peaks. The two main properties extracted from peak width analysis are the crystallite size and lattice strain. Crystallite size is a measure of the size of coherently diffracting domain. The crystallite size of the particles is not generally the same as the particle size due to the presence of polycrystalline aggregates [17]. The most common techniques used for the measurement of particle size, rather than the crystallite size, are the Brunauer Emmett Teller (BET), light (laser) scattering experiment, scanning electron microscopy (SEM) and TEM analysis. Lattice strain is a measure of the distribution of lattice constants arising from crystal imperfections, such as lattice dislocation. The other sources of strain are the grain boundary triple junction, contact or sinter stresses, stacking faults, coherency stresses etc. [18]. X-ray line broadening is used for the investigation of dislocation distribution. Crystallite size and lattice strain affect the Bragg peak in different ways. Both these effects increase the peak width, the intensity of the peak and shift the 2θ peak position accordingly. W-H analysis is a simplified integral breadth method where, both size induced and strain induced broadening are deconvoluted by considering the peak width as a function of 2θ [19]. Although X-ray profile analysis is an average method, they still hold an unavoidable position for grain size determination.

The strain associated with the prepared samples at 350 °C due to lattice deformation was estimated by a modified form of W-H, namely, uniform deformation model (UDM).The other modified models, such as uniform deformation stress model (UDSM) and uniform deformation energy density model (UDEDM), gave an idea of the stress-strain relation and the strain as a function of energy density 'u'. In UDM, the isotropic nature of the crystal is considered, whereas UDSM and UDEDM assume that the crystals are of an anisotropic nature.

II. Experimental Details

In this experiment 1M $ZnCl_2$ solution was kept under constant stirring using magnetic stirrer for 1 hour to completely dissolve and 25% ammonia solution was added here drop by drop touching the walls of the vessel to make the pH of the solution 8.0. The reaction was allowed to proceed for 45 minutes at temperature 50°C. The beaker was sealed and the solution was allowed to settle for overnight and further the precipitate was filtered using whatman filter for three times. The precipitate was heated to dry it completely in a hot air oven and grinded with a mortar. Next it was heated in a muffle furnace at 350 °C for 3 hrs and allowed to cool to room temperature. X-ray diffraction pattern was recorded using Philips –X'pert Pro X-ray diffractometer using CuK_α radiation of wavelength λ = 0.1541 nm. Morphology of the sample was investigated using SEM and EDAX.

III. Results and Discussion

3.1. XRD Analysis

The XRD patterns of calcined samples of ZnO nanoparticles in the range of 2θ =30°to 70°are shown in Fig. 1. All evident peaks could be indexed as the ZnO wurtzite structure (JCPDS Data Card No: 36-1451). Wurtzite lattice parameters such as the values of d, the distance between adjacent planes in the Miller indices (hkl) (calculated from the Bragg Equation, $\lambda=2d\sin\theta$), lattice constants *a*, *b*, and *c*, inter- planar angle and unit cell volumes are calculated from the Lattice Geometry equation [20]. The lattice parameters of the powders calcined at 350°c are shown in table 1.

$$d_{hkl} = \frac{1}{\sqrt{\frac{4}{3}\left(\frac{h^2+k^2+hk}{a^2}\right)+\frac{l^2}{c^2}}} -----(1a)$$

$$a = \frac{\lambda}{\sqrt{3}\sin\theta_{100}} --------(1b)$$

$$c = \frac{\lambda}{\sin\theta_{002}} ------(1c)$$

$$V = \frac{\sqrt{3}a^2c}{2} --------(1d)$$

Table 1 – The structural parameters of ZnO nanoparticles

data	2θ	hkl	d_{hkl} (Å)	Structure	Lattice parameters(Å)	V (Å^3)
My sample	32.063 34.720	(100) (002)	2.788 2.580	Hexagonal	a =3.219 c =5.161 c/a =1.6033	46.31
Jcpds (36-1451)	31.770 34.422	(100) (002)	2.814 2.603	Hexagonal	a =3.250 c =5.207 c/a =1.6021	47.63

3.2 Crystallite Size and Strain

3.2.1 Scherrer Method

XRD can be utilized to evaluate peak broadening with crystallite size and lattice strain due to dislocation [21]. The crystallite size of the ZnO nanoparticles was determined by the X-ray line broadening method using the Scherer equation:

$$D = \frac{K\lambda}{\beta_{hkl}COS\theta} ------(2)$$

Where k denotes Scherrer constant (the shape factor) =.09, λ= 1.5418 nm is the wavelength of the incident CuK_α radiation; β represents full-width at half maximum of the respective peak and θ is the Bragg diffraction angle.

The breadth of the Bragg peak is a combination of both instrument- and sample-dependent effects. To decouple these contributions, it is necessary to collect a diffraction pattern from the line broadening of a standard material (e.g., silicon) to determine the instrumental broadening. The instrument-corrected broadening β corresponding to the diffraction peak of ZnO was estimated using the relation

$$\beta_{hkl}^{\ 2} = (\beta)^2_{measured} - (\beta)^2_{instrumental} ----(3)$$

3.2.2 Williamson- Hall Method

The strain induced in powders due to crystal imperfection and distortion was calculated using the formula:

$$\varepsilon = \frac{\beta_{hkl}}{4\tan\theta} ----(4)$$

From Equations (2) and (4), it was confirmed that the peak width from crystallite size varies as $\frac{1}{\cos\theta}$, strain varies as tanθ. Assuming that the particle size and strain contributions to line broadening are independent to each other and both have a Cauchy-like profile, the observed line breadth is simply the sum of Equations 2 and 4.

$$\beta_{hkl} = \frac{k\lambda}{D\cos\theta} + 4\varepsilon\tan\theta --------(5)$$

By rearranging the above equation, we get

$$\beta_{hkl}\cos\theta = \frac{k\lambda}{D} + 4\varepsilon\sin\theta ----(6)$$

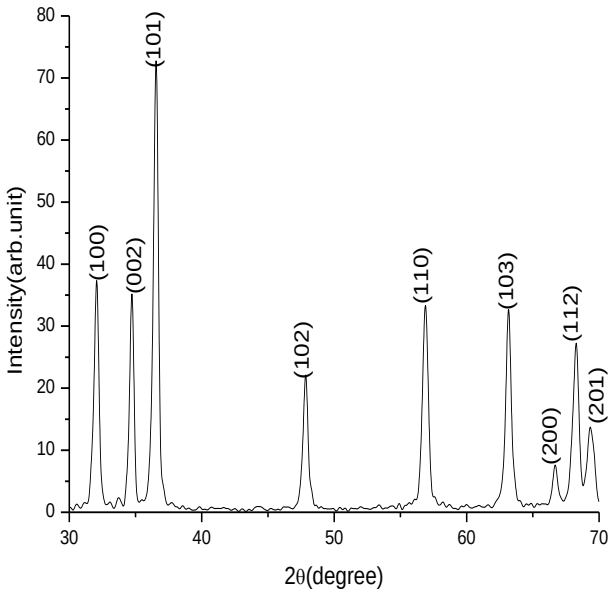

Figure1:XRD of ZnO nanoparticles

The above equations are W-H equations. A plot is drawn with $4\sin\theta$ along the x-axis and $\beta_{hkl}\cos\theta$ along the y-axis for prepared ZnO nanoparticles as shown in Figure 2.

From the linear fit to the data, the crystalline size was estimated from the y-intercept, and the strain ε, from the slope of the fit. Equation 6 represents the UDM, where the strain was assumed to be uniform in all crystallographic directions, thus considering the isotropic nature of the crystal, where the material properties are independent of the direction along which they are measured. The uniform deformation model for ZnO nanoparticles is shown in Figure 2.

In the Uniform Stress Deformation Model, USDM, a generalized Hooke's law refers to the strain, keeping only the linear proportionality between the stress and strain as given by $\sigma = \mathrm{Y}\varepsilon$, where σ is the stress of the crystal and *Y* is the modulus of elasticity or Young's modulus. This equation is valid for a significantly small strain. Assuming a small strain to be present in ZnO nanoparticles, Hooke's law can be used here. With a further increase in the strain, the particles deviate from this linear proportionality.

Applying the Hooke's law approximation to the above equation (6), we get

$$\beta_{hkl}\cos\theta = \frac{k\lambda}{D} + \frac{4\sigma\sin\theta}{\mathrm{Y}_{hkl}} ----(7)$$

For a hexagonal crystal, Young's modulus is given by the following relation [12, 13]:

$$\mathrm{Y}_{hkl} = \frac{[h^2 + \frac{(h+2k)^2}{3} + \left(\frac{al}{c}\right)^2]^2}{S_{11}\{h^2 + \frac{(h+2k)^2}{3}\} + S_{33}\left(al/c\right)^4 + (2S_{13}+S_{44})\{h^2 + \frac{(h+2k)^2}{3}\}(\frac{al}{c})^2} -----(8)$$

where S_{11}, S_{13}, S_{33}, S_{44} are the elastic compliances of ZnO with values of 7.858 x10^{-12}, 2.206 x10^{-12}, 6.940x10^{-12}, 23.57 x10^{-12} m^2N^{-1}, respectively [22].

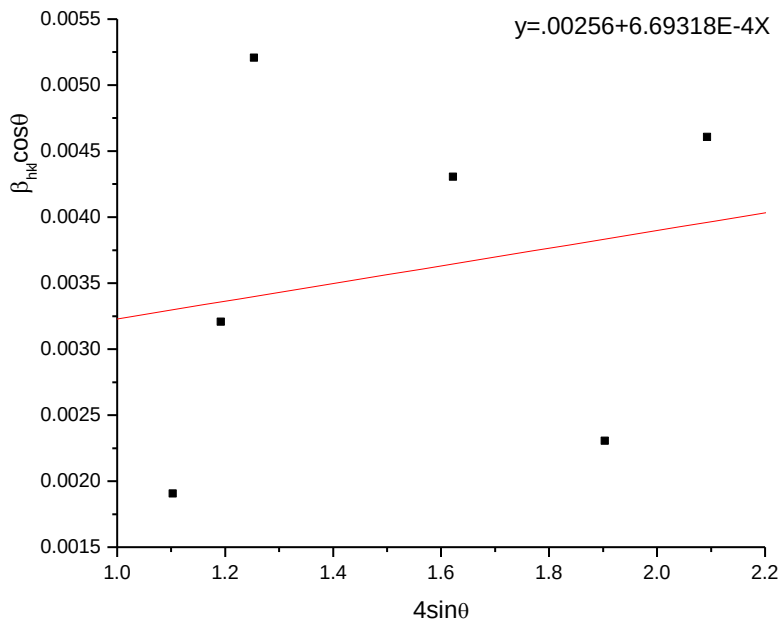

Figure2: Plot of $\beta_{hkl}\cos\theta$ vs 4sinθ Of ZnO nanoparticles

Young's modulus, *Y*, for hexagonal ZnO nanoparticles was calculated as ~ 127 GPa. Plots were drawn with $\frac{4\sin\theta}{Y_{hkl}}$ on the x-axis and $\beta_{hkl}\cos\theta$ on the y-axis for the ZnO-nanoparticles. The USDM plots for ZnO nanoparticles calcinations at 350°C are shown in Fig. 3.The stress is calculated from the slope of the fitted line.

There is another model that can be used to determine the energy density of a crystal called the Uniform Deformation Energy Density Model, UDEDM. In Equation (7), the crystals are assumed to have a homogeneous, isotropic nature. However, in many cases, the assumption of homogeneity and isotropy is not justified. Moreover, the constants of proportionality associated with the stress -strain relation are no longer independent when the strain energy density *u* is considered. According to Hooke's law, the energy density u (energy per unit volume) as a function of strain is $u = \frac{\varepsilon^2 Y_{hkl}}{2}$. Therefore, Equation (7) can be modified to the form

$$\beta_{hkl}\cos\theta = \frac{k\lambda}{D} + \{4\sin\theta(\frac{2u}{Y_{hkl}})^{\frac{1}{2}}\} ----(9)$$

The uniform deformation energy density (UDEDM) can be calculated from the slope of the line plotted between $\beta_{hkl}\cos\theta$ and $4\sin\theta(2/Y_{hkl})^{\frac{1}{2}}$. The lattice strain can be calculated by knowing the Y_{hkl} values of the sample. W-H equations modified assuming UDEDM and the corresponding plot is shown in Figure 4.

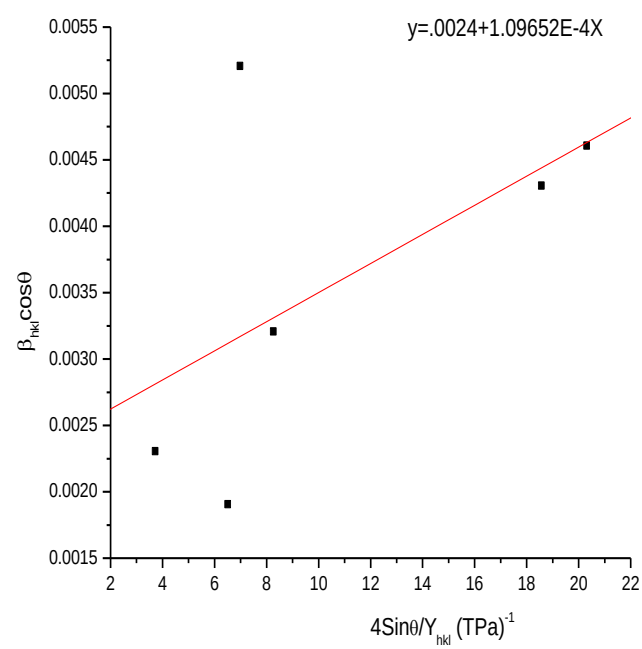

Figure3: Plot of $\beta_{hkl}\cos\theta$ vs 4sinθ/Y_{hkl} of ZnO nanoparticles

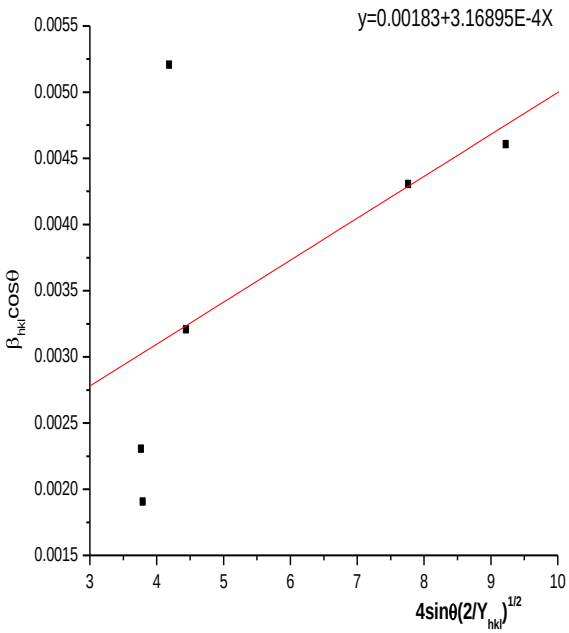

Figure4: Plot of $\beta_{hkl}\cos\theta$ vs $4\sin\theta(2/Y_{hkl})^{1/2}$ of ZnO nanoparticles

From Equations (7) and (9), the energy density and the stress can be related with UDSM and UDEDM, but approaches are different, based on the assumption of uniform deformation stress, according to Equation (7). The assumption of uniform deformation energy is as per Equation (9), even though both models consider the anisotropic nature of the crystallites. From Equations (7) and (9), the deformation stress and deformation energy density are related as $u = \sigma^2 / Y_{hkl}$. It may be noted that though both Equations (7) and (9) are taken into account in the anisotropic nature of the elastic constant, they are essentially different. This is because in Equation (4), it is assumed that the deformation stress has the same value in all crystallographic directions allowing u to be anisotropic, while Equation (9) is developed assuming the deformation energy to be uniform in all crystallographic directions treating the deformation stress σ to be anisotropic. Thus, it is clear that from Williamson-Hall plots using Equations (7) and (9), a given sample may result in different values for lattice strain and crystallite size [23].

Table 2 – The geometric parameters of prepared ZnO nanoparticles

Scherer method	**Williamson method UDM**		**UDSM**			**UDEDM**			
***D* nm**	***D* nm**	**ε x10^{-3}**	**D nm**	**ε x10^{-3}**	**σ (MPa)**	**D nm**	**ε x10^{-3}**	**σ (MPa)**	**u (KJm^{-3})**
36.2	53.3	0.70	57.7	0.85	109	75.7	1.25	159	100

3.3 SEM & EDAX Study

The morphology of the prepared nanoparticles was examined using scanning electron microscopy. Figure 5 shows the surface morphology of the particles prepared in our report. The shapes of the particles are nearly spherical and obviously demonstrate aggregation of the particles. The aggregation of particles should had been originated from the large specific surface area and high surface energy of ZnO nanoparticles [24].The aggregation occurred probably during the process of drying [25,26] .

The EDAX Study of the prepared sample is shown in Figure 6. This shows that the sample contains only Zinc and Oxygen and no other impurity are present in the sample.

IV. Conclusions

The ZnO nanoparticles with hexagonal structure have been synthesized by simple cost competitive precipitation method after annealing the precursor at 350°C. The prepared ZnO particles were characterized by XRD, SEM, and EDAX.The line broadening of ZnO nanoparticles due to the small crystallite size and strain was analysed by Scherrer's formula. The size and strain contributions to line broadening were analyzed by the

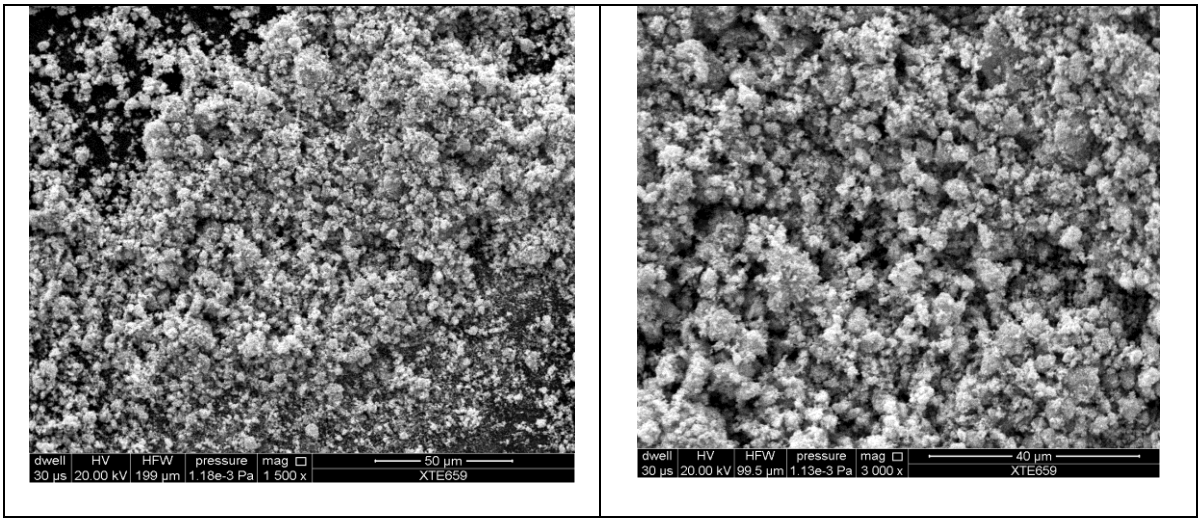

Fig5: SEM image of ZnO nanoparticles

Element	Weight percentage	Atomic percentage
O K	18.96	48.87
Zn K	81.04	51.13
Total	100	100

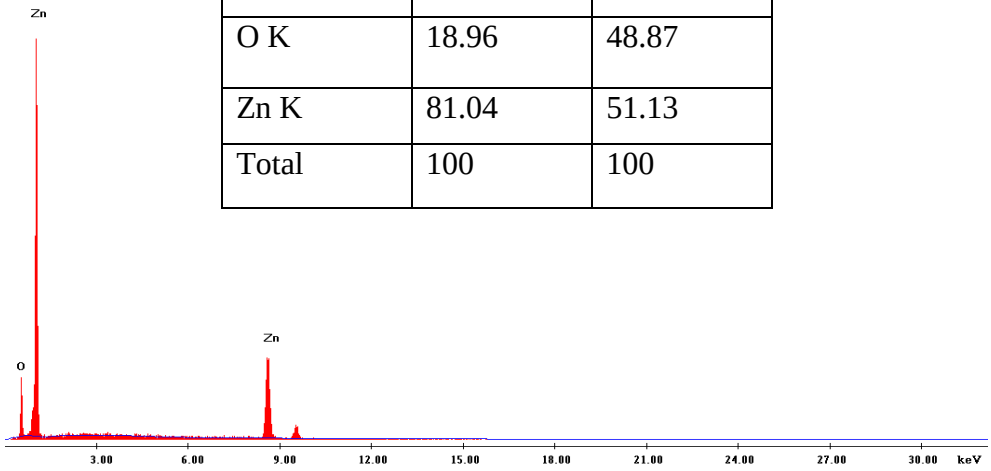

Fig 6: EDAX of ZnO nanoparticles

method of Williamson and Hall using uniform deformation, uniform deformation stress, and uniform deformation energy density models. The three modified forms of W-H analysis were helpful in determining the strain, stress, and energy density value with a certain approximation, and hence, these models are highly preferable to define the crystal perfection.

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Multicriterion Fuzzy Decision Making in Irrigation Planning

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Abstract- Relative importance or weight of criterion indicates the priority assigned to the criterion by the decision-maker while ranking the alternatives in a multicriterion decision-making (MCDM) environment. Multicriterion decision making (MCDM) has emerged as an effective methodology due to its ability to combine quantitative and qualitative criteria selection of the best alternative. Concurrently, fuzzy logic is gaining importance due to its flexibility in handling imprecise subjective data. In the present study two fuzzy logic-based MCDM methods, namely similarity analysis (SA) and decision analysis (DA), are adopted and developed as a fuzzy decision system (FUDS) and applied to a case study of the Aringar Anna Sugar Project (AASP), Tamil nadu, India, for selecting the best-performing irrigation subsystem. It is found that both SA and DA suggested the same irrigation subsystem as the best. It is concluded that application of fuzzy logic methodology for real-world decision-making problems is found to be effective.

Index Terms- Multi criteria Decision making, fuzzy logic

I. Introduction

Multicriterion decision making (MCDM) has emerged as an effective methodology due to its ability to combine quantitative and qualitative criteria for selection of the best alternative (Pomerol and Romero, 2000). Concurrently, fuzzy logic is gaining importance due to its flexibility in handling imprecise subjective data. In the present study concepts of fuzzy logic and MCDM are integrated and applied to a case study for selecting the best performing irrigation subsystem. Numerous studies on fuzzy logic are reported by various researchers for decision-making analysis in water resources planning. Raj and Kumar (1998, 1999) used maximizing and minimizing set concepts of fuzzy logic to select the best reservoir configuration for the cavuery river basin in India. Yin et al, (1999) employed fuzzy relation analysis for multicriteria water resource management for a case study of Greal Lakes St Lawrence River basin, USA, Raju and Kumar (1999) applied the MCDM approach for selection of suitable irrigation planning strategy for a case study in Tamil Nadu, and employed PROMETHEE and EXPROM for ranking. Bender and Simonovic (2000) applied fuzzy compromise programming to water resource systems planning under uncertainty and compared it with ELECTRE. Very little work is reported on performance evaluation studies in a multicriterion environment. Heyder et al, (1991) explored 11 distinct long-term, system-wide alternative strategies and their impacts upon irrigation delivery performance. The alternatives that were considered involve structural, managerial and/or policy changes. These are compared with respect to relative cost, social acceptability, institutional acceptability and environmental impact, as well as water delivery performance, and applied to the case study of Alamosa River and La Jara Creek irrigation systems in the San Luis Valley of south-central Colorado. Two multicriterion decision-making techniques, namely PROMETHEE and weighted average, were applied to rank the alternative strategies. Similar studies are reported by Karamouz et al.(2000) where they developed an algorithm to monitor and evaluate drip and pressure irrigation projects in Iran. Different indicators are identified and an analytical hierarchy process is used for evaluation. The objective of the present study is to explore the use of fuzzy decision-making algorithms in performance evaluation studies and to develop a simple, interactive decision support system.

II. Study Area

The Aringar Anna Sugar Project (AASP) is a state sector major irrigation project in, Tamil Nadu, India, located on the river cauvery. The project is mainly meant for irrigation. Global coordinates of the site are 20,60 latitude north and 65,25 longitude east. The ASSP project has canal system, namely the, cauvery and Grand river, vennar, serving a number of irrigation subsystems (distributaries). Crops grown in the command area are paddy (rice), groundnut, sugarcane and pulses in both summer (kharif) and winter (rabi) seasons. Soils of the command area are categorized under red soils and black soils. Climate of the area is subtropical and semi-arid. There is extreme variation in temperature with average maximum and minium values of 36.5^o and 27.8^{o}C. The relative humidity varies from 70 to 85%. In the present study, four irrigation subsystems (choices set) under the Cauvery canal are considered and these are denoted as I_1, I_2, I_3 and I_4. These irrigation subsystems differ from each other in terms of acreages, farmers and other conditions. Figure 1 presents the location map of the Aringar Anna Sagar Project, Tamil Nadu, India.

Farmers' response survey

A farmers' response survey is conducted to understand the irrigation management characteristics, constraints in the irrigation subsystem and to identify performance indicators. Responses from 47 farmers from the four irrigation subsystems are documented. Questions, were asked regarding canal gate opening details, timing, adequacy and distribution pattern 9such as equitable, etc.) of water supply, status of supplementing canal

supplies with groundwater, usage of high-yield variety seeds, knowledge of critical periods of crops, cost of canal water, participation in operation and management works, relationship with co-farmers and authorities and role of farmers' associations for effective participatory irrigation management. Question were also asked about constraints which may reduce yield such as poor drainage, land development work, availability of marketing facilities, fertilizers and water, and the corresponding effect on economic and social scenarios. Suggestions from farmers are also solicited which can be useful for further improvement of the project. The main conclusion emanating from the response survey are: (1) all farmers have expressed their satisfaction with the performance of the project and agreed that they benefited from the project; (2) they also agreed that the participatory approach in the developmental aspects of the projects yielded very good results in terms of increasing coordination among themselves and expressed that more is to be done in this regard; (3) formation of farmers' associations helps to organize themselves to utilize the resource such as water, fertilizers and seeds more effectively. The response survey also helped the authors to get acquainted with the project in terms of farmers' interaction, interview responses and formulation of performance criteria (indicators).

Formulation of indicators and payoff matrix

In the present study, instead of a single indicator of how the input (water) is being used, other indicators such as agricultural, economic and social issues are also considered. Eight performance criteria, namely ON form developments work (C1), Supply inputs (seeds, fertilizers) (C2), conjunctive use of surface and groundwater resources (C3) , participation of farmers (C4), social impact (C5), productivity (C6) and economic impact (C7), Environmental impact (C8) are formulated and evaluated for selecting the best irrigation subsystem. Out of the Eight, three criteria, namely environmental impact, conjunctive use of surface and groundwater resources and social impact, are related to sainability (Raju and Duckstein, 2002). Even though many of the criteria such as productivity and economic impact are correlated or interdependent to some extent, these are assumed to be independent to asses their effect on the overall planning scenario. Brief details of the criteria are give below.

Environmental impact issues analysed after introduction of irrigation facilities are rise in groundwater table and salinity level.

Conjunctive use of surface and groundwater is essential to provide more reliable supply of water to crops when needed as well as to reduce the water logging effect.

Table 1. Payoff matrix on fuzzy rating basis given by individual experts

Irrigation sub System	Expert	criterion							
		C1	C2	C3	C4	C5	C6	C7	C8
I 1	E1	0.4	0.6	0.6	0.8	0.8	1.0	0.6	0.6
	E2	0.6	0.4	0.4	0.8	0.8	0.8	1.0	0.6
	E3	0.4	0.2	0.4	0.6	0.6	1.0	0.6	0.4
I 2	E1	0.2	0.4	1.0	1.0	1.0	0.8	0.6	1.0
	E2	0.2	0.2	1.0	0.8	0.8	0.8	0.6	0.8
	E3	0.2	0.2	0.8	1.0	1.0	0.6	0.4	0.8
I 3	E1	0.4	0.2	0.8	0.8	0.6	0.8	1.0	0.8
	E2	0.6	0.0	0.6	0.8	0.4	0.6	0.8	0.8
	E3	0.4	0.2	0.6	0.6	0.6	0.6	0.8	1.0
I 4	E1	0.4	0.2	0.4	0.8	0.8	0.8	0.8	0.6
	E2	0.4	0.0	0.0	0.6	1.0	0.8	0.8	1.0
	E3	0.4	0.0	0.6	0.6	0.8	0.6	1.0	0.6

Participation of farmers: farmers' knowledge of technology and new developments and participation are essential for optimum utilization of resources. It is the way in which farmers use the irrigation water that determines the success of an irrigation project.

Social impact includes labour employments, which is measured in terms of man days employed per hectare for each crop grown.

Productivity of various crops for various seasons for various landholdings are to be determined.

Economic impact includes farmers' income and revenue collected for supply of irrigation water.

In formation on the above criteria has been obtained from primary sources such as marketing societies and irrigation, groundwater and agricultural departments. Additional information is also obtained from secondary sources such as interviews with farmers, discussions with officials of the project, economic and statistics reports etc. Criteria C1, C2, C3,C4 are qualitative in type. Though the remaining criteria C5, C6,C7,C8 are quantitative in type, these criteria are also assumed to be qualitative, as converting productivity (yield) values of Eight crops to a base equivalent for two seasons under surface and wel irrigation for different landholdings becomes complex and similar difficulties are faced for C7 and C8 also (Raju, 1995). All the above irrigation systems and have a good knowledge of

working of the subsystem are requested to fill in the payoff matrix with evaluations ranging from 1 for excellent to 0 for unsatisfactory. Farmers' involvement is not considered for formulating this payoff matrix as they may possess les or no information about other irrigation subsystems. However, responses from their interviews and discussions with them form the backbone of the formulation process. Table I presents the payoff matrix corresponding to the four irrigation subsystems and the eight performance indicators on a fuzzy rating basis for three experts.

Estimation of weights of the criteria

The analytic hierarchy process is used to estimate weights of the criteria (Saaty and Gholamnezhad, 1982). The method deals with complex problems, which involve the consideration for multiple criteria simultaneously. The methodology is capable of:

(a) Breaking down a complex, unstructured situation into its component parts,
(b) Arranging these parts or variables into a hierarchic order,
(c) Assigning numerical values 1 to 9 to subjective judgements on the relative importance of each criterion (1=equally important or preferred;

3=slightly mor important or preferred; 5=strongly or important or Preferred;
7=very strongly more important or preferred;
` 9=extremely more important or preferred;
2, 4, 6, 8=intermediate values between the two adjacent judgements)

(d) Synthesising the judgments to determine the overall priorities of the criteria.

Table II. Pairwise comparison matrix and weights of criteria

Criteria	C1	C2	C3	C4	C5	C6	C7	C8	Weights
C1	1.000	0.166	1.000	0.333	0.333	0.500	0.166	0.333	0.0367
C2		1.000	2.000	3.000	0.500	2.000	0.111	0.200	0.0923
C3			1.000	2.000	0.200	2.000	0.125	0.166	0.0511
C4				1.000	0.333	1.000	0.166	0.143	0.0456
C5					1.000	2.000	0.333	0.333	0.1267
C6						1.000	0.333	0.500	0.0616
C7							1.000	2.000	0.3496
C8								1.000	0.2365

An eigenvector approach that can be solved by the power method is used to compute the priorities of the criteria in a pairwise comparison matrix. The eigenvector corresponding to maximum eigenvalue (λmax) is computed. Since small changes in elements of a pairwise comparision matrix imply a small change in λmax, the deviation of the latter from matrix size N is a deviation of consistency. This is represented by [(λmax-N)/(N-1)] and termed as the consistency index (CI). Random index (RI) is the consistency index of the random matrix obtained by calculating the consistency index for a randomly filled matrix of size N. The ration of CI to average RI for the same order matrix is called the consistency ratio (CR). A CR of 0.1 or less is considered acceptable.

Interaction with farmers and discussion with officials helped the decision maker to asses the importance of criteria. For example, it was mentioned during discussion and interactions that the economic impact was slightly more important than the environmental impact. Accordingly, values were chosen from Saaty's scale and noted. Table II presents the pairwise comparison matrix for criteria.

Maximum eigenvalue, consistency index, random index and consistency ration for the pairwise comparison matrix are 8.937, 0.134, 1.41 and 0.09599 respectively. It is found that the consistency ration is less than 0.1, indicating that judgements give by the decision maker are satisfactory. Weights of the criteria for environmental impact, conjunctive use of water resources, farmers' participation, social impact, productivity and economic impact are found to be 0.0367, 0.0923, 0.0511, 0.0456, 0.1267, 0.0616, 0.2365, 0.3496 respectively as shown in Table II. It is observed that economic impact and productivity are give the top two priorities by the decision maker, whereas farmers' participation occupied the last position. These weights are further used in decision-making analysis. However, equal weights are also considered to examine the sensitivity of ranking.

III. FUZZY MULTICRITERION DECISION MAKING APPROACH

Two fuzzy multicriterion decision making methods, namely similarity analysis (SA) and decision analysis (DA), are applied to the present planning problem.

Similarity analysis (SA)

Similarity analysis (SA) uses the concept of degree of similarity measure and the alternative with a higher degree of similarity with respect to a reference alternative is considered to be the best (Chen, 1994). In this methodology, criteria are represented by interval-valued fuzzy sets (real interval) between

zero and one. Characteristics of the alternative a(a=1,2,…A) for various criteria C1,C2,…Cj (with weightage of the criteria W=w1,w2,,…wj) are represented as interval-valued fuzzy sets as below:

a=(C1[ya1,y'a1], C2[ya2, y'a2],….cj[yaj, y'aj]) (1)

where [yaj, y'aj] represents the fuzzy interval for the ath alternative for then jth criteria within the ranges of [0≤yaj≤y'aj≤1] with 1≤a≤A. Here A and j represent the number of alternatives and criteria. Equation (1) can, also be represented in matrix notation as below:

A=[ya1,y'a1], [ya2,y'a2],….[yaj, y'aj] (2)

The objective is to choose such an alternative as the best, whose characteristics are most similar to the interval-valued fuzzy reference alternative set, R, which is expressed in the matrix notation as below:

R=[x1,x'1], [x2,x'2],….[xj, x'j] (3)

Where [xj, x'j] represents the fuzzy interval for the reference alternative for jth criteria. Similarity between the interval-alued fuzzy reference alternatives set Ra dn give alternative A for a specified weight set W is computed in the form of similarity measure, S (A,R,W), as follows (Chen, 1994):

$$S(A,R,W)= \frac{\sum_{j=1}^{J} [1-(|yaj-xj|+|y'aj-x'j|)/2*wj]}{\sum_{j=1}^{J} wj} \quad (4)$$

Similarity measure values vary from zero to one. The higher the value of S(A,R,W), the higher the similarity between the interval-valued fuzzy sets A and R. In the present study the similarity measure is aimed at for selection of the best alternative. More information about similarity measures.

Decision analysis (DA)

Decision analysis (DA) uses the concept of decision (membership) function and the alternative with a higher value of decision function is considered to be the best (Ross, 1995). In this methodology the decision function D is defined as

D=M(C1,w1)∩ M(C2,w2) ∩ …….∩M(Cj,wj) (5)

Where M () is a decision measure involving criteria and weights. The decision measure for a particular alternative a is defined as

M(Cj(a),wj)=wj→Cj(a)= w̄ j U Ci(a) (6)

The decision function for the above scenario is given as

D=∩ j=1 to J (w̄ j U Cj) (7)

and the optimum solution a* is the alternative that maximizes D.

Defining dummy variable Ej as

Ej=(w̄ j U Cj) (8)

the membership function form μej(a) for variable Ej is

$\mu_{Ej}(a)=\max[\mu wj(a), \mu_{cj}(a)]$ (9)

The optimum decision function, expressed in membership form, is give as

$\mu D(a^*)=\min\{\mu_{E1}(a), \mu_{E2}(a),\ldots\mu_{Ej}(a)\}$ (10)

IV. RESULTS AND DISCUSSION

Two fuzzy MCDM methods, viz. similarity analysis (SA) and decision analysis (DA), are programmed in a Visual Basic environment (Cornell, 2001) in the form of a decision support system and named as FUDS (Fuzzy Decision Systems).

Table III. Payoff matrix in the fuzzy interval form.

Irrigation Sub system	C1	C2	C3	C4	C5	C6	C7	C8	Degree of similarity and rank	Decision function and rank
I1	[0.4,0.6]	[0.2,0.6]	[0.4,0.6]	[0.6,0.8]	[0.6,0.8]	[0.8,1.0]	[0.6,1.0]	[0.4,0.6]	0.68064(3)	0.466(3)
I2	[0.2,0.2]	[0.2,0.4]	[0.8,1.0]	[0.8,1.0]	[0.8,1.0]	[0.6,0.8]	[0.4,0.6]	[0.8,1.0]	0.64963(4)	0.266(4)
I3	[0.4,0.6]	[0.0,0.2]	[0.6,0.8]	[0.6,0.8]	[0.4,0.6]	[0.6,0.8]	[0.8,1.0]	[0.8,1.0]	0.77538(2)	0.666(2)
I4	[0.4,0.4]	[0.0,0.2]	[0.0,0.6]	[0.6,0.8]	[0.8,1.0]	[0.6,0.8]	[0.8,1.0]	[0.6,1.0]	0.81177(1)	0.866(1)

.

Figures 2 and 3 present the sample screen of SA and DA approach modules of FUDS respectively. In both the modules common inputs are number of alternatives, criteria, payoff matrix and weights of criteria. Provision for changing the payoff matrix values and weights are also incorporated in both the modules. Provision for graphical representation of ranking pattern in the form of a bar chart is also made.

Similarity analysis (SA) module

Based on the evaluations give by the three experts (Table I) for each criterion for each alternative (i.e. three values), the lowest and highest values are considered for the interval for that scenario. For example, for alternative 1 and criterion 2, three experts have given their fuzzy rating as 0.4, 0.6 and 0.4. Accordingly the interval was given as [0.4, 0.6]. If all the experts gave the same rating such as 0.2, 0.2 and 0.2 then the interval was given as [0.2, 0.2]. Table III presents the payoff matrix in the interval form. Weights of the criteria are estimated from the analytic hierarchy process. The reference alternative for each criterion is taken as (1, 1). The module computes the degree of similarity between the give alternative and the reference alternative (as per Equation 4). A high degree of sample calculation of degree of similarity of I_1 isshown in the Appendix. Similarity measures for irrigation subsystems I_1 to I_4 are computed and found to be 0.68064, 0.64963, 0.77538 and 0.81177 indicating that $I_4$is the best. Table III presents degree of similarity measures and corresponding ranking pattern the four irrigation subsystems.

Decision analysis (DA) module

This methodology requires only one value as input for each alternative versus criterion instead of interval. For this purpose average values of the payoff matrix in Table I are used as input. For example for alternative 1 and criterion 2, an average of 0.6, 0.4, 0.2 is taken. Similarly, other elements of the payoff matrix are computed. The decision (membership) function is obtained using Equations (7)-(10). See sample calculation of I_1 in the appendix. The alternative having the highest value of decision (membership) function is taken to be the best (Equation 10). Remaining alternatives are ranked accordingly. It is observed that irrigation subsystem $I_4$is found to be the best with decision membership function value of 0.866, followed by I_3 with a value of 0.666 with rank 2.

V. SENSITIVITY ANALYSIS

The effect of changing the weights of criteria on the ranking pattern for both SA and DA is also studied. These changes of weights may also represent scenarios that refer to different situations that may be expected in the planning situation. For this purpose, the value of each weight of the criterion is increased and then decreased as much as possible without changing the relative order of the criteria. Productivity is the second-largest criterion occupying a weightage of 0.202. The nearer values are 0.331 (economic impact) and 0.187 (social impact). Therefore two sensitivity runs are performed for this criterion to investigate the influence of values up to 0.330 and 0.188 on the ranking respectively. This represents the range that maintains the same order. Similar studies are also done for other criteria. Table IV shows the ranges of weights of criteria employed. In total, 10 combinations of weight are evaluated for each method.

Table IV. Ranges of weights for sensitivity analysis.

Criteria	Weight	Min	Max		
Economic impact		0.3496	0.3496		------
Productivity		0.2365	0.2161	0.3495	
Social Impact		0.1267	0.1966		0.2364
Environmental impact		0.0923	0.0997		0.1266
Conjunctive use of water resources		0.0616	0.0717		0.0921
Farmers' Participation	0.0511	0.0410	0.0615		
On form developments works		0.0456	0.0396		0.0510
Supply of inputs (seeds etc)		0.0367	--------		0.0366

Weight are evaluated for each method. It is observed that all 10 combinations fell into two groups of ranking pattern 3, 4, 2, 1 and 4, 3, 2, 1 (in the order of alternatives) for SA and one group 3, 4, 2, 1 in case of DA. Similarly, study is also made with equal weight for each of the criterion. It is found that the ranking pattern is 1, 2, 4, 4 in the case of SA and 1, 1, 1, 1 (tie for all alternatives) in the case of DA. Sensitivity analysis indicated that the rankings of the irrigation subsystems remained essentially the same as far as the first position is concerned. It is thus observed that integration of fuzzy logic with real-world irrigation planning problems is very effective, particularly with multiple experts and in a subjective data environment.

VI. CONCLUSIONS

A decision support system, FUDS, is developed involving two fuzzy multicriteria decision-making methods and applied to an existing irrigation system inTamil nadu, India. It is found that weights of the criteria have a significant effect on the ranking pattern. However, the first position remains unchanged. It is observed that integration of fuzzy logic with real-world irrigation planning problems is very effective, particularly with multiple experts and in a subjective data environment. The fuzzy decision support system, FUDS, is found to be useful due to its interactive nature, flexibility in approach and evolving graphical features and can be adopted for any similar situation to rank alternatives. The present study is limited to four irrigation subsystems due to resource limitations. However, more

irrigation subsystems may be studied in a multicriterion context to explore the full potential of FUDS.

VII. APPENDIX

Description of similarity measure

Chen (1994) proposed the concept of similarity measure. These are explained in three situations.

Case 1.

Similarity measure S(X,Y) between two real values X and Y can be measured S(X,Y)=1-|X-Y| where S(X,Y)€(0,1). Larger value of S(X,Y) represents higher similarity between X and Y. If S(X,Y) equals 1, it indicates that X and Y are the same.

Case 2.

If X and Y are two real intervals in [0,1], where X=[x1, x2] and Y=[y1, y2], then

S(X,Y) or S([x1,x2], [y1,y2])=1-|x1-y1|+|x2-y2|/2

Case 3. Similarity measure S (A,R,W) of alternative A with reference to R for a given weight set W (W=w1,w2,……wj) is given as (Chen, 1994)

$$S(A,R,W)= \frac{\sum_{j=1}^{J} [1-(|yaj-xj| + |y'aj-x'j|)/2*wj]}{\sum_{j=1}^{J} wj}$$

Where A and R are two real intervals in [0,1] and represented as

A=[ya1,y'a1], [ya2,y'a2],…..[yaj, y'aj]

R=[x1,x'1], [x2, x'2]….[xj,x'j]

Sample calculations for similarity analysis (SA)

Calculation of degree of similarity are with reference to Table III using Equation (4). Normalized weighted of the Eight criteria are 0.3496, 0.2365, 0.1267, 0.0923, 0.0616, 0.0511, 0.0456, 0.0367. Substituting values in Table III for irrigation subsystem I_1 and substituting $\sum_{j=1}^{J}$wj=1, in Equation (4), the degree of similarity for irrigation subsystem I_1 is computed as follows:

[1-(|0.4-1.0| + |0.6-1.0|)/2]x0.0367 + [1-(|0.2-1.0| + |0.6-1.0|)/2]x0.0923
+ [1-(|0.4-1.0| + |0.6-1.0|)/2]x0.0511 + [1-(|0.6-1.0| + |0.8-1.0|)/2]x0.0456
+ [1-(|0.6-1.0| + |0.8-1.0|)/2]x0.1267 + [1-(|0.8-1.0| + |1.0-1.0|)/2]x0.0616
+ [1-(|0.6-1.0| + |1.0-1.0|)/2]x0.3496 + [1-(|0.4-0.8| + |0.6-1.0|)/2]x0.2365 =0.68064
'

Sample calculations for decision analysis (DA)

Calculations of decision measure and based on average value in Table I. $\bar{w}$ j=1-wj where wj are weights of eight criteria. (0.0367, 0.0923, 0.0511, 0.0456, 0.1267, 0.0616,0.3496,0.2365); Wj values for eight criteria are 0.963, 0.907, 0.949, 0.954, 0.873, 0.938, 0.650,0.763)

= [($\bar{w}$ 1 U C1) ∩ ($\bar{w}$ 2 U C2) ∩ ($\bar{w}$ 3 U C3) ∩ ($\bar{w}$ 4 U C4) ∩ ($\bar{w}$ 5 U C5) ∩ ($\bar{w}$ 6 U C6) ∩ ($\bar{w}$ 7 U C7) ∩ ($\bar{w}$ 8 U C8)]

Ej=($\bar{w}$ j U Cj) (8)

Equation (8) can be expressed in the memberships function from resulting equation (9)

μEj(a) = max [μ $\bar{w}$ j(a), μcj(a)]

μEj(a) = {max[$\mu_{\bar{w}1}$(a), μ_{c1}(a)] max[$\mu_{\bar{w}2}$(a), μ_{c2}(a)] max[$\mu_{\bar{w}3}$(a), μ_{c3}(a)]
max [$\mu_{\bar{w}4}$(a), μ_{c4}(a)], max [$\mu_{\bar{w}5}$(a), μ_{c5}(a)], max[$\mu_{\bar{w}6}$(a), μ_{c6}(a)],
max [$\mu_{\bar{w}6}$(a), μ_{c6}(a)], max [$\mu_{\bar{w}7}$(a), μ_{c7}(a)], max[$\mu_{\bar{w}8}$(a), μ_{c8}(a)]}
=[(0.963 U 0.2)(0.907 U 0.466)(0.949 U 0.866)(0.954 U 0.266)
(0.873 U 0.666)(0.938 U 0.866)(0.933 U 0.533)(0.866 U 0.333)]
=[0.963, 0.907, 0.949, 0.954, 0.873, 0.938, 0.933, 0.866]

As per equation (10)

μ_D(a*) = min{μ_{Ej}(a)}
= min {μ_{E1}(a), μ_{E2}(a),….., μ_{Ej}(a)}
= min [(0.963, 0.907, 0.949, 0.954, 0.873, 0.938, 0.933, 0.866)]
= 0.866.

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Dipropyl Sulphide as Corrosion Inhibitor for Zinc in Sulphuric Acid Medium

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Abstract- In this work, dipropyl sulphide was evaluated as a corrosion inhibitor for zinc in 0.5N sulphuric acid by weight loss, gasometry and thermometry methods. Results obtained revealed that the inhibitor performed well in the acid solution. The inhibition efficiency increased with increase in the concentration of the inhibitor. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- Dipropyl sulphide, zinc corrosion, weight loss, gasometry, thermometry and acid solutions.

I. Introduction

Generally acids such as hydrochloric acid and sulphuric acid are employed to remove the millscale and rust formed on the surface of the metals before their use. Corrosion inhibitors are used in these processes to minimize the metal loss and acid consumption[1-10]. Corrosion inhibitors retard the corrosion of metals by getting adsorbed on the metal surface there by blocking active sites on the metal surface. In the present work, we have evaluated dipropyl sulphide as an inhibitor for the corrosion of zinc in 0.5N sulphuric acid using weight loss, gasometry and thermometry methods. Five different concentrations of the inhibitor are used to evaluate the inhibition efficiency of dipropyl sulphide.

II. EXPERIMENTAL

The zinc metal specimens used in this work has the following composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc. Zinc metal specimens of size 4cm*2cm* 0.08cm were polished with a series of emery papers of various grades from 400- 1200, degreased with absolute ethanol and air dried. The corrosion medium used was 0.5N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water.

Weight loss, gasometry and thermometric studies were carried out as reported earlier[11-15]. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\,100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where Tm is the maximum temperature , Ti is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Values of inhibition efficiency obtained from the weight loss gasometry and thermometry experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the inhibitor are presented in the table-1

Table-1 Values of inhibition efficiency (I.E(%)) obtained from the weight loss and gasometry experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the inhibitor.

Method employed	Values of I.E(%) for different concentrations (mM) of dipropyl sulphide				
	1	5	10	50	100
Weight loss	54.8	66.8	72.2	81.6	86.9
Gasometry	55.2	66.1	73.8	80.9	86.4
Thermometry	56.1	67.2	73.5	81.2	86.0

It can be observed from the table 1 that there is very good agreement between the values of inhibition efficiency obtained from weight loss, gasometric and thermometric methods. The results also show that the inhibition efficiency increases with increase in the inhibitor concentration. The dependence of inhibition efficiency of the inhibitor on its concentration is shown in figure-1

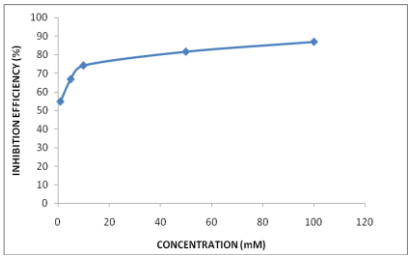

Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

Values of corrosion rates obtained from the weight loss experiments are presented in the table-2

Table 2 Values of corrosion rates obtained from the wight loss measurements.

Corrosion rate (mm/y) for different concentrations (mM) of inhibitor				
1	5	10	50	100
46.6	34.1	28.6	19.0	13.5

From table-2 in can be observed that the corrosion rate of zinc in 0.5N H_2SO_4 decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure-2.

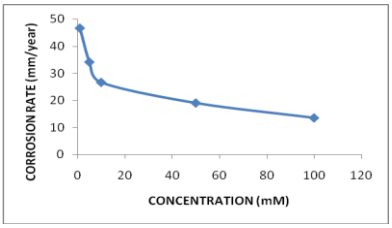

Figure 2 Variation of corrosion rate with concentration of the inhibitor

The inhibitor used in this study contains two propyl groups attached to a central sulphur atom. Adsorption of the inhibitor molecule on to the metal surface occurs through the two lone pairs of electrons present in the sulphur atom. The presence of two propyl groups facilitates the adsorption process due to the electron releasing nature of the propyl groups (+Ieffect). The two propyl groups release electrons towards the sulphur atom and makes it more electron rich, which results in enhanced adsorption. Due to adsorption of the inhibitor molecules on to the metal surface, a uniform and strongly adherent layer is formed on the metal surface which protects the metal from the aggressive acid environment. Apart from the electron releasing nature of the propyl groups, it offers higher surface coverage to the metal surface after getting adsorbed on to the metal surface because of their bulkier nature. This factor also contributes to the good inhibition efficiency exhibited by the inhibitor.

IV. ADSORPTION ISOTHERMS

Adsorption of inhibitor molecules on the metal surface is characterized by various adsorption isotherms such as Langmuir, Temkin, Freundlich etc., From the weight loss measurements, the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Langmuir's isotherm was tested by plotting C/ θ vs C for all concentrations which does not give a straight line indicating that the adsorption of the inhibitor on the surface of the zinc from 0.5N H_2SO_4 does not obey Langmuir's adsorption isotherm. Temkin's adsorption isotherm was tested by plotting logC vs θ which resulted in a straight line thereby showing that the adsorption of the inhibitor on the surface of zinc from 0.5N H_2SO_4 obeys Temkin's adsorption isotherm. Figure-3 shows the Temkin adsorption isotherm plot for zinc in 0.5N H_2SO_4 containing different concentrations of the inhibitor.

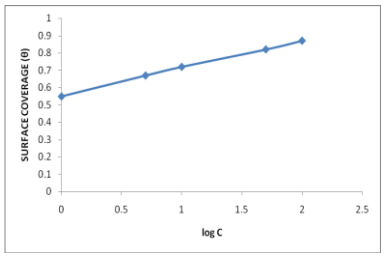

Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N H_2SO_4 containing different concentrations of the inhibitor

V. CONCLUSIONS

The dipropyl sulphide used as a corrosion inhibitor for zinc in 0.5N H_2SO_4 performed well and gave high percentage of inhibition efficiency. It exhibited a maximum inhibition efficiency of 86.0 % at 100 mM concentration. The adsorption of the inhibitor on zinc surface obeyed Temkin adsorption isotherm.

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Ethyl Phenyl Sulphide as Corrosion Inhibitor for Zinc Metal in Acid Solutions

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Abstract- In this work, ethyl phenyl sulphide was evaluated as a corrosion inhibitor for zinc in 0.5N H_2SO_4 by weight loss, gasometric and therometric methods. Results obtained reveals the fact that ethyl phenyl sulphide exhibited high inhibition efficiencies. The inhibition efficiency increased with increase in the inhibitor concentration. The adsorption of the inhibitor molecules on to the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- Ethyl phenyl sulphide, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry

I. Introduction

In order to remove the undesirable scale and rust formed on the surface of the metals acid solutions are widely used. Among the various acids, sulphuric acid is used often. During this process, unexpected metal dissolution and excess consumption of the acid occurs. To avoid these, inhibitors are generally used[1-12]. Inhibitors bring down the corrosion of metal dissolution by adsorption process whereby the inhibitor molecules are adsorbed on the metal surface and block the active sites. In the present work we have investigated ethyl phenyl sulphide as a corrosion inhibitor for zinc metal corrosion in 0.5N H_2SO_4 using weight loss, gasometric and therometric methods.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 4cm*2cm* 0.08cm with a small hole of approximately 3mm near the end of the specimen were used in the present study. Zinc metal specimens were polished with a series of emery papers of various grades from 400- 1200, degreased with absolute ethanol and air dried. The inhibitor compound, ethyl phenyl sulphide was imported from the Sigma Aldrich chemicals of the USA. The corrosion medium was 0.5N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water.

Weight loss , gasometry and thermometry studies

Weight loss , gasometry and thermometry studies were conducted as reported earlier[13,17].From the weight loss experiments, the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency was calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\,100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where Tm is the maximum temperature , Ti is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Values of inhibition efficiency obtained from the weight loss , gasometry and thermometry studies for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of ethyl phenyl sulphide are presented in the table1

Table 1 Values of inhibition efficiency obtained from various experiments.

Method employed	Values of I.E(%) for different concentrations (mM) of ethyl phenyl sulphide				
	5	10	30	50	100
Weight loss	46.1	59.4	73.5	80.6	88.4
Gasometry	45.2	58.4	72.9	80.9	87.5
Thermometry	44.6	58.1	73.1	79.8	88.1

The results presented in the table1 shows that the inhibition efficiencies increase with increase in the inhibitor concentration.

The dependence of inhibition efficiency of the inhibitor on its concentration is shown in figure 1.

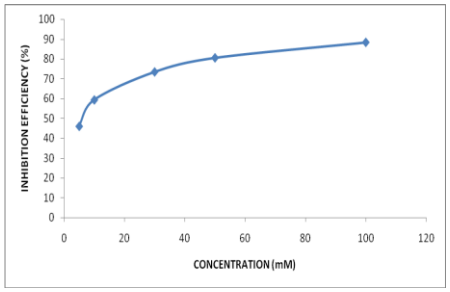

Figure- 1 Variation of inhibition efficiency with concentration of the ethyl phenyl sulphide for zinc in 0.5N H_2SO_4

Values of corrosion rates(mm/year) obtained from the weight loss experiments for the inhibition for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of ethyl phenyl sulphide is presented in the table 2.

Table 2 Values of corrosion rates(mm/year) from the weight loss measurements

Values of corrosion rates (mm/y) for different concentrations (mM) of ethyl phenyl sulphide				
5	10	30	50	100
55.5	42.8	27.3	19.9	11.9

From the table 2 it can be observed that the corrosion rates for the corrosion of zinc in 0.5N H_2SO_4 decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure 2.

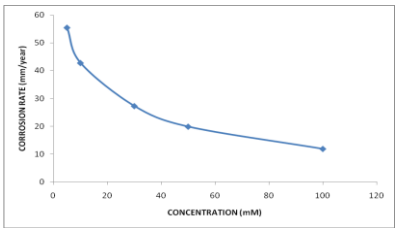

Figure- 2 Variation of corrosion rates with concentration of the ethyl phenyl sulphide inhibitor for zinc in 0.5N H_2SO_4.

The inhibitor molecule contains one phenyl group and one ethyl group attached to a central sulphur atom. The sulphur atom with its two lone pairs of electrons can get adsorbed on the metal surface leading to the formation of a thin film, which protects the metal from the acid solution. The ethyl group being electron releasing in nature (+Ieffect) releases electrons towards the sulphur atom making it more electron rich and facilitating the adsorption process resulting in more protection to the metal. The phenyl group which is also attached to the sulphur atom is a rich source of π-electrons. The adsorption of the inhibitor molecules can also take place via the π-electrons of the aromatic ring leading to enhanced protection to the metal. As both the phenyl group and the ethyl group are bulkier in nature, they offer more surface coverage to the metal resulting in enhanced protection to the metal against the corrosive attack of the acid solution.

IV. ADSORPTION ISOTHERMS

From the weight loss values the degree of surface coverage (θ) for various concentration of ethyl phenyl sulphide inhibitor were determined and plotted against log C for different concentrations of the inhibitor. A straight line was obtained indicating that the adsorption of the inhibitor on the zinc metal surface follows Temkin adsorption isotherm. Figure 3 shows the Temkin adsorption isotherm.

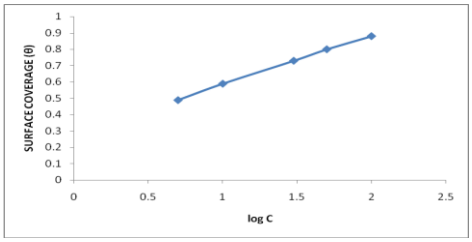

Figure-3 Temkin adsorption isotherm plot for corrosion of zinc in 0.5N H_2SO_4 containing different concentrations of inhibitor.

V. CONCLUSIONS

The inhibitor, ethyl phenyl sulphide used in this work exhibited good inhibition efficiency. It gave 88% of inhibition efficiency at a concentration of 100 mM. Inhibition efficiency increased with increase in inhibitor concentration. The adsorption

of the inhibitor molecules on the metal surface obeys Temkin's adsorption isotherm.

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Inhibitive Action of Phyllanthus amarus Extract on The Corrosion of Zinc in 0.5N H_2SO_4 Medium

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[3]Department of Chemistry, Kongunadu college of Engineering and Technology, Thottiam, Anna University, Tamil Nadu.

Abstract- In this work, the extract of the leaves of *Phyllanthus amarus* was investigated as a green corrosion inhibitor for zinc in 0.5N H_2SO_4 by using weight loss, gasometric and thermometric methods. Results obtained showed that the extract of *Phyllanthus amarus* exhibited high inhibition efficiencies against corrosion of zinc metal. The inhibition efficiency was found to increase with increase in the extract concentration. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- *Phyllanthus amarus*, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry.

I. Introduction

Deterioration of a metal due to its interaction with the environment is referred to as corrosion. Generally organic compounds containing hetero atoms are widely used as corrosion inhibitors for many metals and alloys in various aggressive environments. The hazardous nature, non biodegradability and cost of these organic compounds motivated the researchers to focus their attention on developing cheap, non-toxic, biodegradable and environment friendly natural products of plant origin as corrosion inhibitors[1-22].

Phyllanthus amarus is a plant found throughout Tamil Nadu, India and belongs to the family euphorbiaceae. The extract of the leaves of *phyllanthus amarus* is used to cure jaundice. In the present work we have investigated the extract of the leaves of *phyllanthus amarus* as a green corrosion inhibitor for zinc metal in 0.5N H_2SO_4 employing weight loss, gasometry and thermometry techniques.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 3cm*1.5cm* 0.08cm were used in all the experiments. Zinc metal specimens were polished with a series of emery papers of various grades from 200- 1200, degreased with absolute ethanol and air dried. The corrosion medium employed was 0.5N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water.

The *Phyllanthus amarus* plant was obtained from the local market. It is cleaned with tap water to remove mud particles. The leaves of the plant were first shade dried and then dried in an oven for 2 hours at 80^0C and ground to get the powder form of the material. 250 ml of alcohol was then added to 10 gram of this powder and left standing for two days with occasional shaking. The solution was then filtered and the alcohol was evaporated to get a brown sticky mass. 1 gram of this sticky mass was then dissolved in 1L of 0.5N H_2SO_4 to get the stock solution. From this stock solution concentrations of 200, 400, 600, 800 mg/L of the extract were prepared by dilution.

Weight loss, gasometry and thermometric studies were carried out as reported earlier[23-27]. The experiments were conducted in triplicate and the average of the three values is obtained to ensure accuracy of the results. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency was calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\,100$$

Where V_o and V_i represent the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where T_m is the maximum temperature , T_i is the initial temperature and t is the time taken to attain the maximum temperature.
The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Weight loss, gasometry and thermometric experiments were carried out at five different concentrations of the extract and the inhibition efficiency(IE) values were calculated. Values of inhibition efficiency obtained from these experiments are presented in the table-1

Table 1 Values of inhibition efficiency(I.E(%)) obtained experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the extract.

Method employed	Values of I.E(%) for different concentrations (mg/L) of the extract				
	200	400	600	800	1000
Weight loss	26.8	50.4	61.5	70.2	76.8
Gasometry	26.2	49.5	62.4	69.8	77.1
Thermometry	25.9	50.2	62.1	69.4	77.4

From the table it can be seen that there is very good agreement between the values of inhibition efficiency obtained from these three methods. The results also indicate that the inhibition efficiency of the *phyllanthus amarus* extract increases with increase in the concentration. The dependence of inhibition efficiency of the extract on the concentration is shown in figure-1

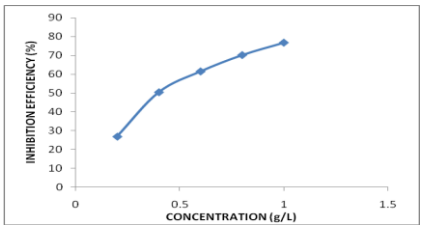


Figure 1 Variation of inhibition efficiency with concentration of the plant extract.

Values of corrosion rates obtained from the weight loss experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the extract are presented in the table-2

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates (mm/y) for different concentrations (mg/L) of the extract				
200	400	600	800	1000
75.4	51.1	39.6	30.7	23.9

From the table-2 it can be seen that the corrosion rates for the corrosion of zinc in 0.5N H_2SO_4 decreases with increasing concentration of the plant extract. The effect of extract concentration on the corrosion rates is shown in figure-2.

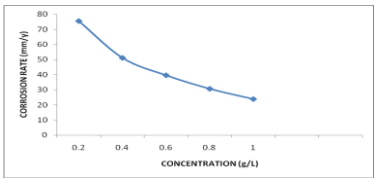
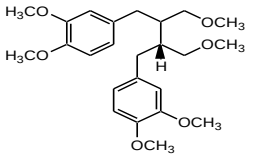
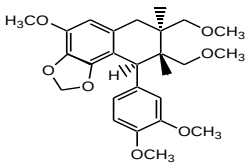
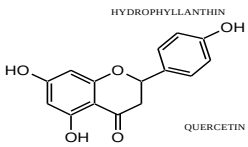


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

The inhibitive action of *phyllanthus amarus* extract can be attributed to the presence of various organic compounds . These include phyllanthin, hypophyllanthin, quercetin, tannins-phyllanthusiin, amariin, amarulone, amarinic acid: alkaloids- ent-norsecurinine, sobubbialine, epibubbaialine, nyrphyllin etc. The molecular structures of some of these compounds are shown below.







From the molecular structures it can be observed that the these compounds possess lot of hetero atoms and aromatic rings which are responsible for the adsorption of these compounds on to the metal surface. Organic compounds containing π-electrons, hetero atoms and multiple bonds have been reported to function as effective inhibitors for the corrosion of many metals in various media[28-32]. Since the *phyllanthus amarus* extract contains many organic compounds, it is very difficult to mention a particular

compound for the inhibition activity. The inhibitive activity of the extract is attributed to the combined action of all the compounds present in the extract.

IV. ADSORPTION ISOTHERMS

To study the mechanism of corrosion inhibition, attempts were made to fit the data available to the various adsorption isotherms such as Langmuir, Temkin, Freundlich, Bockris-Swinkels and Flory-Huggins. From the weight loss values the degree of surface coverage (θ) values were determined and plotted against log C of the extract which results in a straight line. This indicates that the adsorption of the inhibitor on the zinc metal surface follows Temkin adsorption isotherm. Figure 3 shows the Temkin adsorption isotherm.

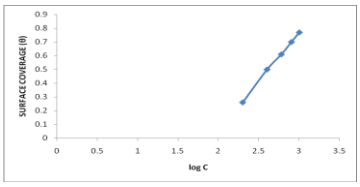


Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N H_2SO_4 containing different concentrations of the extract.

V. CONCLUSIONS

The extract of the leaves of *Phyllanthus amarus* used in this work exhibited good inhibition efficiency. The inhibition efficiency increases with increase in the concentration of the extract. The adsorption of the components of the extract on to the metal surface in 0.5N H_2SO_4 follows the Temkin adsorption isotherm.

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Sudan-III Dye as a Novel Corrosion Inhibitor for Zinc Metal in Acidic Solutions

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Abstract- The anticorrosion property of sudan-III dye was evaluated for zinc metal in 0.5N HCl using weight loss, gasometric and thermometric methods. Parameters such as inhibition efficiency and corrosion rates were evaluated to assess the performance of the dye as a corrosion inhibitor. The inhibition efficiency was found to increase with increase in the inhibitor concentration. To study the adsorption of the inhibitor on the metal surface, adsorption isotherm was plotted.

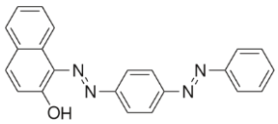
Index Terms- Sudan-III, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry.

I. INTRODUCTION

In our day-to-day life, the role of metals and alloys is significant. Metals and alloys find numerous applications in various fields. When they are exposed to different environments, most of them have a strong tendency to undergo oxidation to form their stable compounds, which is termed as corrosion. Due to corrosion of metals and alloys, many important properties such as malleability, ductility and conductance are lost. In order to prevent this corrosion process many synthetic organic compounds with hetero atoms, multiple bonds and aromatic rings, called corrosion inhibitors, are added in small quantities to the corrosive environment. A review of the literature clearly brings out the fact that many organic compounds were used as corrosion inhibitors for zinc metal in various environments[1-18]. In this work, we have examined sudan-III dye as a corrosion inhibitor for zinc metal in 0.5N HCl acid solution by weight loss, gasometry and thermometric methods.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 4cm*2cm* 0.08cm were used for weight loss gasometry and thermometry studies.. Zinc metal specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. The inhibitor compound, sudan-III dye was obtained from the Loba chemicals, India. The corrosion medium was 0.5N HCl prepared from A.R grade HCl and deionised water. The structure of the inhibitor molecule is given below.



Weight loss, gasometry and thermometric studies were carried out as reported earlier[19-23]. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.
The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\ 100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where T_m is the maximum temperature , T_i is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Weight loss, gasometry and thermometric studies were carried out at five different concentrations of the inhibitor and the inhibition efficiency(IE) values were calculated. Values of inhibition efficiency obtained from these experiments for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor are presented in the table-1

Table 1 Values of inhibition efficiency(I.E(%)) obtained from the weight loss, gasometry and thermometric experiments for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor.

Method employed	Values of I.E(%) for different concentrations (mM) of sudan-III inhibitor				
	10	20	30	40	50
Weight loss	40.6	57.0	67.4	76.2	81.5
Gasometry	40.9	57.6	67.9	75.8	81.6
Thermometry	41.3	58.4	68.2	76.6	82.8

It can be observed from the table 1 that there is very good agreement between the values of inhibition efficiency obtained from these three methods. The results also show that the inhibition efficiency increases with increase in the inhibitor concentration. The dependence of inhibition efficiency of the inhibitor on the concentration is shown in figure-1

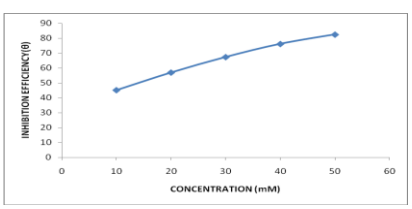


Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

Values of corrosion rates obtained from the weight loss experiments for the inhibitor for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor are presented in the table-2

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates for different concentrations (mM) of sudan-III inhibitor				
10	20	30	40	50
83.1	60.2	45.6	33.3	25.9

From the table-2 it can be seen that the corrosion rates for the corrosion of zinc in 0.5N HCl decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure-2.

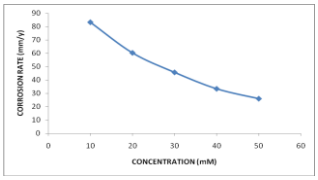


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

The inhibitor molecule contains four nitrogen atoms, two double bonds, one oxygen atom in its molecular structure. All these are potential adsorption centres, through which the inhibitor molecule can get adsorbed on the metal surface leading to the formation of a layer on the metal surface. This layer acts as a barrier between the metal and the corrosive media giving protection to the metal. The inhibitor also contains many aromatic rings with lot of π electrons through which also adsorption of the inhibitor molecules on the metal surface can take place leading to enhanced protection. In addition to these, the azo groups present in the molecule can be easily protonated in acid medium to form the cationic form of the inhibitor. The chloride ions present in the acid medium gets adsorbed specifically on the positively charged metal surface due to its lesser degree of hydration leading to the creation of excess negative charges on the metal surface which favours the adsorption of these cationic form of the inhibitor molecules on the metal surface resulting in the enhanced protection of the metal. Another important factor responsible for the higher inhibition efficiency of the inhibitor is the large surface area of the inhibitor molecules which provides higher surface coverage to the metal after getting adsorbed on the metal surface.

IV. ADSORPTION ISOTHERMS

Adsorption of inhibitor molecules on the metal surface is characterized by various adsorption isotherms such as Langmuir, Temkin, Freundlich etc., From the weight loss measurements, the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Langmuir's isotherm was tested by plotting C/ θ vs C and no straight line was obtained which indicated that the adsorption of the inhibitor on the surface of the zinc from 0.5N HCl does not obey Langmuir's adsorption isotherm. Temkin's adsorption isotherm was tested by plotting logC vs θ which resulted in a straight line thereby showing that the adsorption of the inhibitor on the surface of zinc from 0.5N HCl obeys Temkin's adsorption isotherm. Figure -3 shows the Temkin adsorption isotherm plot for zinc in 0.5N HCl containing different concentrations of the inhibitor.

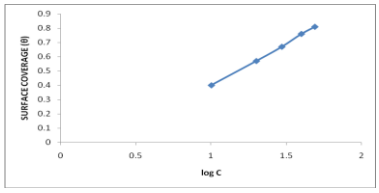


Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N HCl containing different concentrations of the inhibitor

V. CONCLUSIONS

The sudan-III dye used as a corrosion inhibitor for zinc in 0.5N HCl performed well and gave high percentage of inhibition efficiency. It exhibited a maximum inhibition efficiency of 81.5 % at 50mM concentration. The inhibition efficiency of the inhibitor increased with the increase in the concentration of the inhibitor. The adsorption of the inhibitor on zinc surface obeyed Temkin adsorption isotherm.

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Cystein as a Corrosion Inhibitor for Zinc in Acidic Solutions

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Abstract- The amino acid, cystein was examined as an inhibitor for zinc in 0.5N HCl was using weight loss and potentiodynamic polarization studies. Corrosion parameters such as inhibition efficiency, corrosion rates, corrosion potential and corrosion current were evaluated. The inhibition efficiency was found to increase with increase in the inhibitor concentration. The adsorption of the inhibitor on the zinc surface followed Temkin adsorption isotherm.

Index Terms- cystein , acidic solutions, zinc corrosion, weight loss , potentiodynamic polarization.

I. Introduction

Zinc metal corrosion attracted the attention of many researchers because of its use in many fields. One of the efficient and effective method of controlling corrosion is the use of inhibitors. Inhibitors are usually organic compounds with hetero atoms and multiple bonds. These compounds inhibit the corrosion of metals by adsorption process. A review of literature revealed that many organic compounds were employed as inhibitors for the corrosion of zinc in various aggressive environments[1-15]. In this work, the influence of cysteine as a corrosion inhibitor for zinc in 0.5N HCl acid solution was examined by weight loss and potentiodynamic polarization studies.

II. EXPERIMENTAL

The zinc specimens (≈ 98% purity) of size 5cm*2cm* 0.025cm were used for weight loss studies. Zinc specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. For polarization studie, zinc rod of the same composition, embedded in araldite, with an exposed area of 0.283 cm^2 was used. The inhibitor compound, cystein was obtained from the Loba chemicals, India. The corrosion medium was 0.5N HCl prepared from A.R grade HCl and deionised water.

Weight loss studies were carried out as reported earlier[16].From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of zinc in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the zinc was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc (mg), A is the surface area of the zinc specimen(cm^2), t is the exposure time (h) and D is the density of the zinc metal (g/cm^3).

III. RESULTS AND DISCUSSION

The inhibition efficiency values and corrosion rates for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor are presented in table-1.

Table 1Values of inhibition efficiency (%) and corrosion rates(mm/y) for the corrosion of zinc in 0.5N HCl.

Parameter	Cystein concentration (mM)				
	10	20	30	40	50
Inhibition efficiency	40.1	60.4	72.1	81.2	88.2
Corrosion rates	83.8	55.4	39.1	25.5	12.8

The results show that the inhibition efficiency increases and corrosion rates decreases with increase in the inhibitor concentration. The dependence of inhibition efficiency and corrosion rates on the concentration of the inhibitor is shown in figures-1and 2.

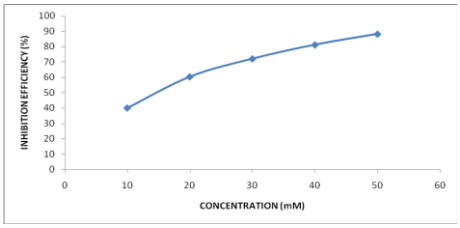

Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

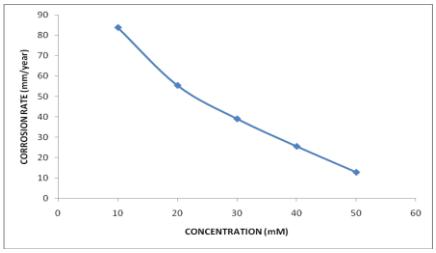

Figure 2 Variation of corrosion rates with concentration of the inhibitor.

Table-2 gives the various corrosion kinetic parameters such as corrosion potential (E_{corr}), corrosion current(I_{corr}) and anodic and cathodic Tafel slopes (b_a and b_c) obtained from the potentiodynamic polarization studies.

Table-2 The corrosion kinetic parameters obtained from polarization studies.

Inhibitor conc. (mM)	E_{corr} mV	Tafel slopes mV dec^{-1}		I_{corr} mA cm^{-1}	I.E (%)
		bc	ba		
Blank	-996	128	48	2.90	-
10	-960	134	52	1.71	40.9
20	-948	138	56	1.13	60.8
30	-941	144	59	0.78	73.1
40	-934	151	63	0.52	81.9
50	-929	158	68	0.35	87.5

From the table it can be observed that with the increase in the concentraton of the inhibitor, the values of E_{corr} for zinc becomes less negative indicating the strong adsorption of the inhibitor molecules on the metal surface leading to the reduction in corrosion of the metal. The values of I_{corr} decreases with the increase in the concentration of the inhibitor. This also indicates the reduction in the corrosion of the zinc in the presence of the inhibitor. The values of both ba and bc increases with increase in the concentration of the inhibitor .Both the values increase almost equally which indicates that the corrosion inhibition of zinc in 0.5N HCl is under mixed control. The values of inhibition efficiency obtained from the weight loss and polarization studies agree very well.

Cystein molecule possess sulphur, nitrogen and oxygen atoms which are potential adsorption centers due to the presence of lone pair of electrons on these atoms. With these electron pairs, these atoms can easily get attached with the metal surface by adsorption. This leads to the formation of strong, uniform layer of the inhibitor molecules on the metal surface. This layer acts as a barrier between the metal and the aggressive media, thus the metal gets protected.

IV. ADSORPTION ISOTHERMS

From the weight loss measurements the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Langmuir's isotherm was tested by plotting C/ θ vs C and no straight line was obtained which indicated that the adsorption of the inhibitor on the surface of the zinc from in 0.5N HCl does not obey Langmuir's adsorption isotherm. Then Temkin adsorption isotherm was tested by plotting log C Vs θ and a straight line was obtained, this shows that Temkin isotherm was followed. Figure -3 shows the Temkin adsorption isotherm plot for zinc in in 0.5N HCl.

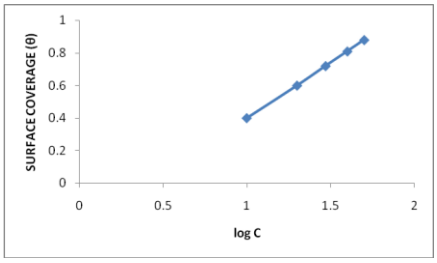

Figure 3 Temkin adsorption isotherm plot for zinc in 0.5 N HCl containing different concentrations of the inhibitor

V. CONCLUSIONS

The main conclusions drawn from this study are.

1.The inhibitor , cystein performed well in 0.5 N HCl and exhibited 88% of inhibition efficiency at 50 mM concentration of the inhibitor.

2. The inhibitor affects both the anodic and cathodic processes and hence the inhibitor is of mixed type.

3. The adsorption of the inhibitor on zinc metal surface from 0.5N HCl obeyed Temkin adsorption isotherm.

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Reactive Blue Dye as a Novel Corrosion Inhibitor for Mild Steel in Acidic Solutions

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Abstract- The anti-corrosion characteristics of reactive blue dye for mild steel in 1N H_2SO_4 was investigated using weight loss and potentiodynamic polarization studies. Corrosion parameters such as inhibition efficiency, corrosion rates, corrosion potential corrosion current and Tafel slopes were evaluated. The inhibition efficiency was found to increase with increase in the inhibitor concentration.

Index Terms- Reactive blue dye, acidic solutions, mild steel corrosion, weight loss, potentiodynamic polarization.

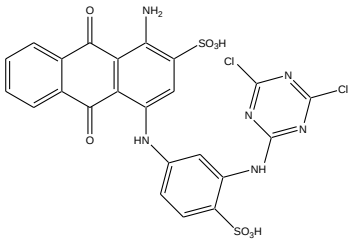
I. Introduction

In industries, acid solutions are widely used in cleaning, oil well acidification and pickling processes. The corrosion of steel in such environments is of great importance, since it involves loss of material and wastage of acids. For the inhibition of mild steel in acid solutions organic inhibitors has been extensively studied . Literature survey reveals the fact that most organic compounds employed as corrosion inhibitors adsorb on the metal surface through hetero atoms such as nitrogen, oxygen, sulfur and phosphorus, multiple bonds or aromatic rings and block the active sites leading to the decrease in corrosion rate[1-15].

Many organic dyes possess the above mentioned characteristics and that initiated us to use reactive blue dye as a novel corrosion inhibitor for mild steel in hydrochloric acid solutions. In this work, the inhibitive activity of reactive blue dye as a corrosion inhibitor for mild steel in 1N H_2SO_4 acid solution was examined by weight loss and potentiodynamic polarization studies.

II. EXPERIMENTAL

The mild steel specimens of composition: carbon 0.07%, phosphorous 0.008%, manganese 0.34% and the remainder being iron and size of 5cm*2cm* 0.025cm were used for weight loss studies. Mild steel specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. For polarization studies mild steel rod of the same composition, embedded in araldite, with an exposed area of 0.502 cm^2 was used. The inhibitor compound, reactive blue dye was obtained from the Alfa-Aesar chemicals of UK.. The corrosion medium was 1N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water. The structure of the reactive blue dye is given below.



Weight loss studies were carried out as reported earlier[16].From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of mild steel in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the mild steel was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the mild steel (mg), A is the surface area of the mild steel specimen(cm^2), t is the exposure time (h) and D is the density of the mild steel (g/cm^3).

III. RESULTS AND DISCUSSION

Weight loss studies were carried out at four different concentrations of the inhibitor and the inhibition efficiency(%) and corrosion rate values were calculated and are presented in table-1.

Table 1Values of inhibition efficiency (%) and corrosion rates(mm/y) obtained from the weight loss experiments for the corrosion of mild steel in 1N H_2SO_4in the presence of different concentrations of the inhibitor.

Parameter	Reactive blue dye concentration (mM)			
	10	30	50	100
Inhibition efficiency	32.2	57.6	68.5	83.8
Corrosion rates	43.9	27.4	20.4	10.5

The results show that with the increase in concentration of the inhibitor, the inhibition efficiency increases and corrosion rates decrease. The dependence of inhibition efficiency and corrosion rates on the concentration of the inhibitor is shown in figures-1and 2.

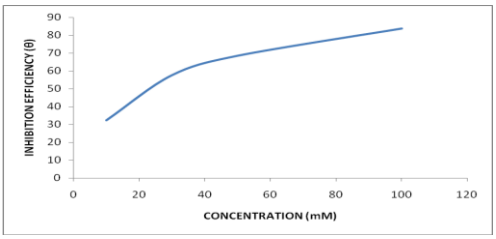


Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

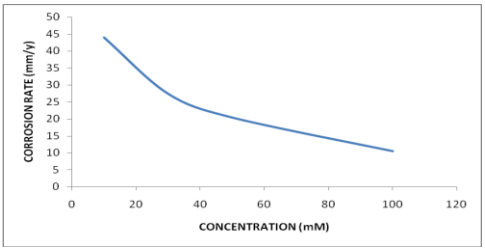


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

The various corrosion kinetic parmeters such as corrosion potential (E_{corr}), corrosion current(I_{corr}) and anodic and cathodicTafel slopes (b_a and b_c) obtained from the potentiodynamic polarization studies are presented in the table-2.

Inhibitor conc.(mM)	E_{corr} mV	Tafel slopes mV dec^{-1}		I_{corr} mA cm^{-1}	I.E (%)
		bc	ba		
Blank	-916	126	78	1.76	-
10	-880	149	83	1.18	33.0
30	-886	158	89	0.76	56.8
50	-898	176	92	0.57	67.6
100	-909	191	97	0.30	84.6

Table-2 The corrosion kinetic parameters obtained from polarization studies.

From the table it can be seen that the values of E_{corr} for mild steel becomes less negative with increase in the concentration of the inhibitor compound. This indicates the strong adsorption of the inhibitor molecules on the metal surface leading to the formation of a layer , preventing the contact of the mild steel with the acid, which results in the reduction of the corrosion of the metal. The values of I_{corr} decreases with the increase in the concentration of the inhibitor. This also indicates the reduction in the corrosion of the mild steel in the presence of the inhibitor. The values of both ba and bc increases with increase in the concentration of the inhibitor.This suggests that the inhibitor reduces both the anodic dissolution and cathodic hydrogen evolution reactions. But it can be observed that increase in the value of bc is more than that for ba which indicates that the corrosion of mild steel in 1N H_2SO_4 is under mixed control , but predominantly under cathodic control.

IV. ADSORPTION ISOTHERMS

From the weight loss measurements the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Langmuir's isotherm was tested by plotting C/ θ vs C and a straight line was obtained which indicated that the adsorption of the inhibitor on the surface of the mild steel from 1N H_2SO_4obey Langmuir's adsorption isotherm. Figure -3 shows the Langmuir's adsorption isotherm plot for mild steel in 1N H_2SO_4containing different concentrations of the inhibitor.

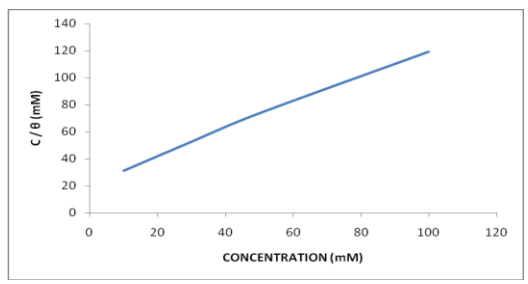


Figure 3Langmuir's adsorption isotherm plot for mild steel in 1N H_2SO_4 containing differentconcentrations of the inhibitor

V. CONCLUSIONS

The reactive blue dye used as a corrosion inhibitor for mild steel in 1N H_2SO_4 performed well and gave high percentage of inhibition efficiency. The inhibition efficiency of the inhibitor increases with the increase in the concentration of the inhibitor. The corrosion of mild steel in 1N H_2SO_4 is under mixed control , but predominantly under cathodic control. The adsorption of the inhibitor on mild steel surface obeyed Langmuir's adsorption isotherm.

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Ethyl Methyl Sulphide as a Corrosion Inhibitor for Zinc Metal in Acidic Solutions

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Abstract- Ethyl methyl sulphide was investigated as a corrosion inhibitor for zinc in 0.5N H_2SO_4 by weight loss, gasometric and thermometric methods. The inhibition efficiency was found to increase with increase in the inhibitor concentration. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- Ethyl methyl sulphide, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry.

I. Introduction

Zinc metal finds wide applications such as electrode material in batteries, sacrificial anodes and metallic coatings. Therefore it is very important to find ways to protect zinc metal from aggressive environments. In industries various acids are widely used for the cleaning of metals and alloys. In this process metal loss occurs due to the dissolution of the metals in acids. In order to avoid metal loss and for reducing acid consumption many organic compounds are used as corrosion inhibitors. The presence of hetero atoms such as sulphur, oxygen and nitrogen, multiple bonds, aromatic rings in the molecular structure makes these compounds effective corrosion inhibitors. Literature survey shows that many organic compounds were used as corrosion inhibitors for zinc metal in various environments[1-15]. In the present work we have examined ethyl methyl sulphide as a corrosion inhibitor for zinc metal in 0.5N H_2SO_4 by weight loss, gasometry and thermometric methods.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 4cm*2cm* 0.08cm were used for weight loss gasometry and thermometry studies.. Zinc metal specimens were abraded with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. The inhibitor compound, ethyl methyl sulphide was obtained from the sigma aldrich chemicals of United States.. The corrosion medium was 0.5N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water.

Weight loss, gasometry and thermometric studies :

Weight loss, gasometry and thermometric studies were carried out as reported earlier[16-20]. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\,100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where T_m is the maximum temperature , T_i is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Values of inhibition efficiency obtained from weight loss, gasometry and thermometry experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the inhibitor are presented in the table-1

Table 1 Values of inhibition efficiency(I.E(%)) obtained from the weight loss, gasometry and thermometric experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the inhibitor.

Method employed	Values of Inhibition .Efficiency(%)				
	5	10	30	50	100
Weight loss	44.2	54.0	65.2	72.1	76.8
Gasometry	43.8	54.9	64.8	71.5	75.6
Thermometry	44.4	53.4	65.7	72.8	75.2

It can be seen from the table 1 that there is very good agreement between the values of inhibition efficiency obtained from these three methods. The results also show that the inhibition efficiency increases with increase in the inhibitor concentration. The dependence of inhibition efficiency of the inhibitor on the concentration is shown in figure-1

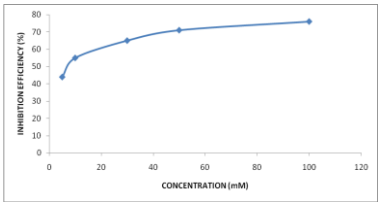

Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

Values of corrosion rates obtained from the weight loss experiments for the inhibitor for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the inhibitor are presented in the table-2

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates (mm/y)				
5	10	30	50	100
57.5	47.3	35.8	28.7	23.8

From the table-2 it can be seen that the corrosion rates for the corrosion of zinc in 0.5N H_2SO_4 decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure-2.

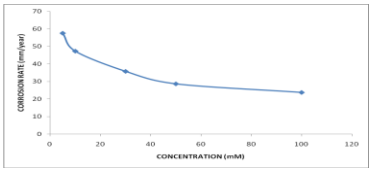

Figure 2 Variation of corrosion rates with concentration of the inhibitor.

The inhibitor used in this study contains one ethyl and one methyl groups attached to a central sulphur atom. Adsorption of the inhibitor molecule on to the metal surface occurs through the two lone pairs of electrons present in the sulphur atom. The presence of two alkyl groups facilitates the adsorption process due to the electron releasing nature of the alkyl groups (+Ieffect). The two alkyl groups release electrons towards the sulphur atom and makes it more electron rich, which results in enhanced adsorption. Due to adsorption of the inhibitor molecules on to the metal surface, a uniform and strongly adherent layer is formed on the metal surface which protects the metal from the aggressive acid environment. Apart from the electron releasing nature of the alkyl groups, it offers higher surface coverage to the metal surface after getting adsorbed on to the metal surface because of their bulkier nature. This factor also contributes to the good inhibition efficiency exhibited by the inhibitor.

IV. ADSORPTION ISOTHERMS

Basic information regarding the interaction between the metal surface and the inhibitor molecules can be obtained from the adsorption isotherms. Adsorption of inhibitor molecules on the metal surface is characterized by various adsorption isotherms such as Langmuir, Temkin, Freundlisch etc., From the weight loss measurements the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Temkin's adsorption isotherm was tested by plotting logC vs θ which resulted in a straight line thereby showing that the adsorption of the inhibitor on the surface of zinc from 0.5N H_2SO_4 obeys Temkin's adsorption isotherm. Figure -3 shows the Temkin adsorption isotherm plot for zinc in 0.5N H_2SO_4 containing different concentrations of the inhibitor.

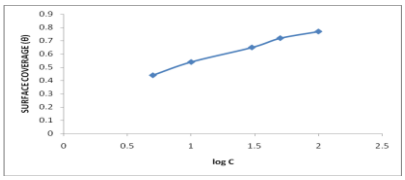

Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N H_2SO_4 containing different concentrations of the inhibitor

V. CONCLUSIONS

Ethyl methyl sulphide used as a corrosion inhibitor for zinc in 0.5N H_2SO_4 performed well and gave high percentage of inhibition efficiency. The inhibition efficiency of the inhibitor increases with the increase in its concentration. The adsorption of the inhibitor molecules on zinc surface obeyed Temkin adsorption isotherm.

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1,4-Diaminobutane as a Corrosion Inhibitor for Mild Steel in Acidic Solutions

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Abstract- The corrosion inhibition activity of 1,4-diaminobutane for mild steel in 1N H_2SO_4 was investigated using weight loss and potentiodynamic polarization studies. Corrosion parameters such as inhibition efficiency, corrosion rates, corrosion potential and corrosion current were evaluated. The inhibition efficiency was found to increase with increase in the inhibitor concentration. The adsorption of the inhibitor on the mild steel surface follows Langmuir adsorption isotherm

Index Terms- 1,4-diaminobutane , acidic solutions, mild steel corrosion, weight loss , potentiodynamic polarization.

I. Introduction

The use of inhibitors is an important method of protecting the metals and alloys against corrosion. Usually organic compounds containing hetero atoms like sulphur, nitrogen and oxygen, multiple bonds and aromatic rings are used as corrosion inhibitors because of their electron richness, an important characteristic to be satisfied by the compounds to be employed as corrosion inhibitors. These compounds inhibit the corrosion of the metals and alloys by adsorption process. Many organic compounds were used as corrosion inhibitors for mild steel in various environments[1-9]. In this work, the influence of 1,4-diaminobutaneas a corrosion inhibitor for mild steel in 1N H_2SO_4acid solution was examined by weight loss and potentiodynamic polarization studies.

II. EXPERIMENTAL

The mild steel specimens of composition: carbon 0.07%, phosphorous 0.008%, manganese 0.34% and the remainder being iron and size of 5cm*2cm* 0.025cm were used for weight loss studies. Mild steel specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. For polarization studies mild steel rod of the same composition, embedded in araldite, with an exposed area of 0.502 cm^2 was used. The inhibitor compound, 1,4-diaminobutanewas obtained from the Alfa- Aesar chemicals of UK.. The corrosion medium was 1N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water.

Weight loss studies were carried out as reported earlier[10].From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of mild steel in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the mild steel was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the mild steel (mg), A is the surface area of the mild steel specimen(cm^2), t is the exposure time (h) and D is the density of the mild steel (g/cm^3).

III. RESULTS AND DISCUSSION

Weight loss studies were carried out at four different concentrations of the inhibitor and the inhibition efficiency(%) and corrosion rate values were calculated and are presented in table-1.

Table 1Values of inhibition efficiency (%) and corrosion rates(mm/y) obtained from the weight loss experiments for the corrosion of mild steel in 1N H_2SO_4in the presence of different concentrations of the inhibitor.

Parameter	1,4-diaminobutane concentration (mM)			
	10	30	50	100
Inhibition efficiency	29.3	55.4	73.3	84.2
Corrosion rates	48.5	33.0	22.6	12.3

The results show that the inhibition efficiency increases and corrosion rates decreases with increase in the inhibitor concentration. The dependence of inhibition efficiency and corrosion rates on the concentration of the inhibitor is shown in figures-1and 2.

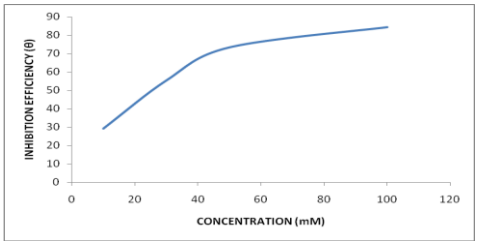

Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

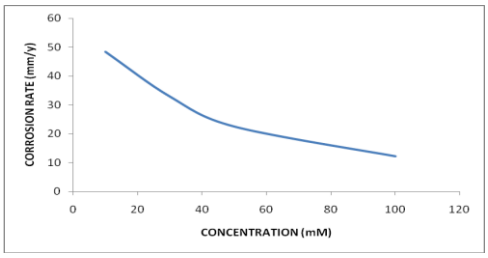

Figure 2 Variation of corrosion rates with concentration of the inhibitor.

Table-2 gives the various corrosion kinetic parmeters such as corrosion potential (E_{corr}), corrosion current(I_{corr}) and anodic and cathodicTafel slopes (b_a and b_c) obtained from the potentiodynamic polarization studies.

Table-2 The corrosion kinetic parameters obtained from polarization studies.

Inhibitor conc. (mM)	E_{corr} mV	Tafel slopes mV dec^{-1}		I_{corr} mA cm^{-1}	I.E (%)
		bc	ba		
Blank	-916	126	78	1.76	-
10	-884	168	81	1.24	29.9
30	-889	172	84	0.78	55.8
50	-897	197	87	0.48	72.7
100	-902	214	90	0.29	83.6

From the table it can be seen that the values of E_{corr} for mild steel becomes less negative with increase in the concentration of the inhibitor compound. This indicates the strong adsorption of the inhibitor molecules on the metal surface which leads to the reduction in the corrosion of the metal. The values of I_{corr} decreases with the increase in the concentration of the inhibitor. This also indicates the reduction in the corrosion of the mild steel in the presence of the inhibitor. The values of both ba and bc increases with increase in the concentration of the inhibitor, but increase in the value of bc is more than that for ba which indicates that the corrosion of mild steel in 1N H_2SO_4 is under mixed control , but predominantly under cathodic control.

IV. ADSORPTION ISOTHERMS

Adsorption of inhibitor molecules on the mild steel surface is characterized by various adsorption isotherms such as Langmuir, Temkin, Freundlisch etc., From the weight loss measurements the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Langmuir's isotherm was tested by plotting C/ θ vs C and a straight line was obtained which indicated that the adsorption of the inhibitor on the surface of the mild steel from 1N H_2SO_4 obey Langmuir's adsorption isotherm. Figure -3 shows the Langmuir's adsorption isotherm plot for mild steel in 1N H_2SO_4containing different concentrations of the inhibitor.

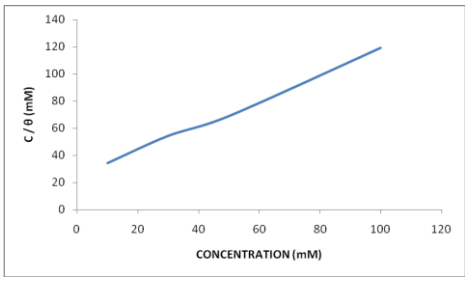

Figure 3 Langmuir's adsorption isotherm plot for mild steel in 1N H_2SO_4 containing different concentrations of the inhibitor

V. CONCLUSIONS

The 1,4-diaminobutane used as a corrosion inhibitor for mild steel in 1N H_2SO_4 performed well and gave high percentage of inhibition efficiency. The inhibition efficiency of the inhibitor increases with the increase in the concentration of the inhibitor. The adsorption of the inhibitor on mild steel surface obeyed Langmuir's adsorption isotherm.

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Chrysoidine Dye as a Novel Corrosion Inhibitor for Mild Steel in Acidic Solutions

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Abstract- Chrysoidine dye was examined as an inhibitor for mild steel in 1N HCl using weight loss, gasometric and thermometric methods. Parameters such as inhibition efficiency and corrosion rates were evaluated. The inhibition efficiency was found to increase with increase in the inhibitor concentration. To study the adsorption of the inhibitor on the mild steel surface, adsorption isotherm was plotted.

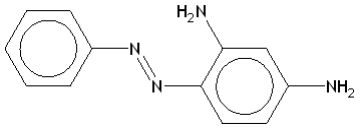
Index Terms- Chrysoidine , acidic solutions, mild steel corrosion, weight loss, gasometry, thermometry.

I. Introduction

Acid solutions are widely used various industries for acid pickling, acid cleaning and oil well cleaning applications.. In these processes the metallic materials usually undergo corrosion. Due to corrosion of metals and alloys many important properties such as malleability, ductility, conductance are lost. The use of inhibitors is an important method of protecting the metals and alloys against corrosion. A review of the literature shows that many organic compounds were used as corrosion inhibitors for mild steel in various environments[1-11]. In this work, the influence of chrysoidine dye as a corrosion inhibitor for mild steel in 1N HCl acid solution was examined by weight loss, gasometry and thermometric methods.

II. EXPERIMENTAL

The mild steel specimens of composition: carbon 0.07%, phosphorous 0.008%, manganese 0.34% and the remainder being iron and size of 5cm*2cm* 0.025cm were used for weight loss gasometry and thermometry studies. Mild steel specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. The inhibitor compound, chrysoidine dye was obtained from the Loba chemicals, India. The corrosion medium was 1N HCl prepared from A.R grade HCl and deionised water. The structure of the inhibitor molecule is given below.



Weight loss, gasometry and thermometric studies were carried out as reported earlier[12-16]. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of mild steel in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the mild steel was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the mild steel (mg), A is the surface area of the mild steel specimen(cm^2), t is the exposure time (h) and D is the density of the mild steel (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\,100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where T_m is the maximum temperature , T_i is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Weight loss, gasometry and thermometric studies were carried out at four different concentrations of the inhibitor and the inhibition efficiency(IE) values were calculated. Values of inhibition efficiency obtained from these experiments for the corrosion of mild steel in 1N HCl in the presence of different concentrations of the inhibitor are presented in the table-1

Table 1 Values of inhibition efficiency(I.E(%)) obtained from the weight loss, gasometry and thermometric experiments for the corrosion of mild steel in 1N HCl in the presence of different concentrations of the inhibitor.

Method employed	Values of I.E(%) for different concentrations (mM) of chrysoidine inhibitor			
	10	30	50	100
Weight loss	33.1	60.2	73.3	84.2
Gasometry	33.7	60.8	72.4	84.7
Thermometry	32.4	59.7	72.9	85.4

It can be observed from the table 1 that there is very good agreement between the values of inhibition efficiency obtained from these three methods. The results also show that the inhibition efficiency increases with increase in the inhibitor concentration. The dependence of inhibition efficiency of the inhibitor on the concentration is shown in figure-1

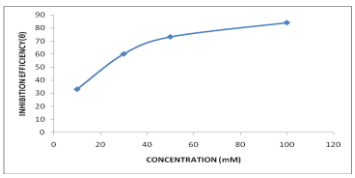


Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

Values of corrosion rates obtained from the weight loss experiments for the inhibitor for the corrosion of mild steel in 1N HCl in the presence of different concentrations of the inhibitor are presented in the table-2

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates for different concentrations (mM) of chrysoidine inhibitor			
10	30	50	100
43.3	25.8	17.3	10.2

From the table-2 it can be seen that the corrosion rates for the corrosion of mild steel in 1N HCl decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure-2.

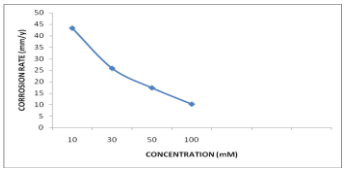


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

The inhibitor molecule contains two primary amino groups, one azo group and two aromatic rings in its molecular structure. All these are potential adsorption centres, through which the inhibitor molecule can get adsorbed on the mild steel surface leading to the formation of a layer on the mild steel surface. This layer acts as a barrier between the mild steel and the corrosive media giving protection to the mild steel. In addition to these, the two primary amino groups present in the molecule can be easily protonated in acid medium to form the cationic form of the inhibitor. The chloride ions present in the acid medium gets adsorbed specifically on the positively charged mild steel surface due to its lesser degree of hydration leading to the creation of excess negative charges on the mild steel surface which favours the adsorption of these cationic form of the inhibitor molecules on the mild steel surface resulting in the enhanced protection of mild steel. Another important factor responsible for the higher inhibition efficiency of the inhibitor is the large surface area of the inhibitor molecules which provides higher surface coverage to the mild steel after getting adsorbed on the mild steel surface.

IV. ADSORPTION ISOTHERMS

Adsorption of inhibitor molecules on the mild steel surface is characterized by various adsorption isotherms such as Langmuir, Temkin, Freundlich etc., From the weight loss measurements the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Temkin's adsorption isotherm was tested by plotting logC vs θ and no straight line was obtained thereby showing that the adsorption of the inhibitor on the surface of mild steel from 1N HCl does not obey Temkin's adsorption isotherm. Langmuir's isotherm was tested by plotting C/ θ vs C and a straight line was obtained which indicated that the adsorption of the inhibitor on the surface of the mild steel from 1N HCl obey Langmuir's adsorption isotherm. Figure -3 shows the Langmuir's adsorption isotherm plot for mild steel in 1N HCl containing different concentrations of the inhibitor.

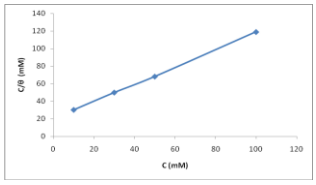


Figure 3 Langmuir's adsorption isotherm plot for mild steel in 1N HCl containing different concentrations of the inhibitor

V. CONCLUSIONS

The chrysoidine dye used as a corrosion inhibitor for mild steel in 1N HCl performed well and gave high percentage of inhibition efficiency. The inhibition efficiency of the inhibitor increases with the increase in the concentration of the inhibitor.The adsorption of the inhibitor on mild steel surface obeyed Langmuir's adsorption isotherm.

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Inhibitive Action of Aegle marmelos Extract on the Corrosion of Zinc in 0.5N H_2SO_4 Medium

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[3]Department of Chemistry, Kongunadu college of Engineering and Technology, Thottiam, Anna University, Tamil Nadu.

Abstract- The inhibitive action of the extract of the roots and fruits of *Aegle marmelos* was investigated as a green corrosion inhibitor for zinc in 0.5N H_2SO_4 employing weight loss, gasometric and thermometric methods. The results obtained revealed that the extract of the plant could be employed as an effective inhibitor for the corrosion of zinc in sulphuric acid medium.. The inhibition efficiency of the extract increased with increase in its concentration. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- *Aegle marmelos*, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry.

I. INTRODUCTION

In the field of corrosion of metals, the inhibitors play a vital role in controlling the corrosion process. Organic compounds are widely used as corrosion inhibitors. The main disadvantage of these inhibitors is their toxic nature. The search for safe, eco friendly, biodegradable alternative sources as corrosion inhibitors lead to the development of natural products of plant origin as corrosion inhibitors[1-15].

In spite of the availability of numerous materials of plant origin, only a few were investigated and employed as corrosion inhibitors. *Aegle marmelos* is a tree found throughout Tamil Nadu, India and belongs to the family rutaceae. The extract of the roots and fruits of *aegle marmelos* is used to cure chronic diarrhoea and dysentry. The fruits exhibit antiviral activity against Ranikhet disease virus. The aim of the present work is to investigate the extract of the roots and fruits of *aegle marmelos* as a green corrosion inhibitor for zinc metal in 0.5N H_2SO_4 employing weight loss, gasometry and thermometry techniques.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 3cm*1.5cm* 0.08cm were used in all the experiments. Zinc metal specimens were polished with a series of emery papers of various grades from 200- 1200, degreased with absolute ethanol and air dried. The corrosion medium employed was 0.5N H_2SO_4 prepared from A.R grade H_2SO_4 and deionised water.

The roots and fruits of the *aegle marmelos* tree were first shade dried and then dried in an oven for 2 hours at 100^0C and ground to get the powder form of the material. 500 ml of alcohol was then added to 10 gram of this powder and left standing for two days with occasional shaking. The solution was then filtered and the alcohol was evaporated to get a light brown sticky mass. 1 gram of this sticky mass was then dissolved in 1L of 0.5N H_2SO_4 to get the stock solution. From this stock solution, concentrations of 200, 400, 600, 800 mg/L of the extract were prepared by dilution. Weight loss, gasometry and thermometric studies were carried out as reported earlier[16-20]. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{Wo - Wi}{Wo} X\,100$$

$$\theta = \frac{Wo - Wi}{WO}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6\,W}{A\,t\,D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{Vo - Vi}{Vo} X\,100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{Tm - Ti}{t}$$

Where T_m is the maximum temperature , T_i is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RNo - RNi}{RNo}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Weight loss, gasometry and thermometric experiments were carried out at five different concentrations of the extract and the inhibition efficiency(IE) values were calculated. Values of inhibition efficiency obtained from these experiments are presented in the table-1

Table 1 Values of inhibition efficiency (I.E(%)) obtained experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the extract.

Method employed	Values of I.E(%) for different concentrations (mg/L) of the extract				
	200	400	600	800	1000
Weight loss	27.4	48.2	64.8	76.6	81.2
Gasometry	27.8	48.9	63.2	76.1	82.4
Thermometry	28.5	47.4	63.9	75.4	81.9

From the table it can be seen that all the techniques gave similar values of inhibition efficiencies. It can also be seen from the table that the inhibition efficiency of the *aegle marmelos* extract increases with increase in the concentration. The dependence of inhibition efficiency of the extract on the concentration is shown in figure-1

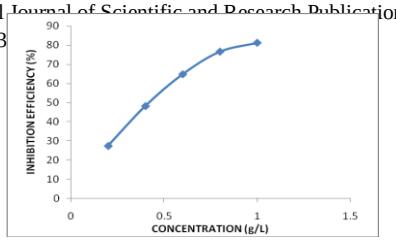


Figure 1 Variation of inhibition efficiency with concentration of the plant extract.

Table-2 presents the values of corrosion rates obtained from the weight loss experiments for the corrosion of zinc in 0.5N H_2SO_4 in the presence of different concentrations of the extract

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates (mm/y) for different concentrations (mg/L) of the extract				
200	400	600	800	1000
74.8	53.4	36.3	24.3	19.4

From the table-2 it can be seen that the corrosion rates for the corrosion of zinc in 0.5N H_2SO_4 decreases with increasing concentration of the plant extract. The effect of extract concentration on the corrosion rates is shown in figure-2.

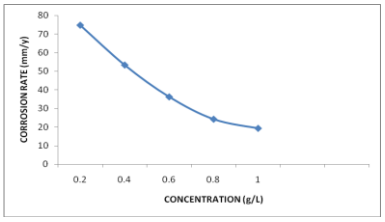
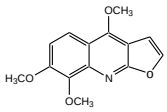
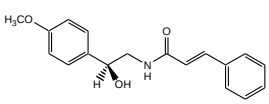


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

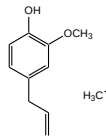
The inhibitive action of *aegle marmelos* extract can be attributed to the presence of various organic compounds . These include skimmianine, scoparone, scopoletin, umbelliferone, marmesin, aegeline, marmelin, beta-sitisterol, citral, eugenol etc. The molecular structure of some of these compounds are shown below.



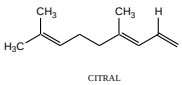
SKIMMIANINE



AEGELINE



EUGENOL



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It can be seen from the structures of these compounds that many hetero atoms, multiple bonds and aromatic rings are present in the molecules. A survey of the literature clearly brings out the fact that organic compounds containing hetero atoms. multiple bonds and aromatic rings with π- electrons function as effective corrosion inhibitors for the corrosion of many metals in various aggressive solutions[21-25]. A*egle marmelos* extract contains many organic compounds with the above mentioned characteristics. No single compound can be credited with the corrosion inhibiting activity of the extract. The inhibitive activity of the extract is attributed to the combined action of all the compounds present in the extract.

IV. ADSORPTION ISOTHERMS

From the weight loss measurements the degree of surface coverage (θ) values were determined and plotted against log C of the extract which results in a straight line. This indicates that the adsorption of the inhibitor on the zinc metal surface follows Temkin adsorption isotherm. Figure 3 shows the Temkin adsorption isotherm.

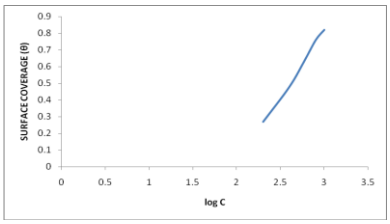

Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N H_2SO_4 containing different concentrations of the extract.

V. CONCLUSIONS

The extract of the roots and fruits of *Aegle marmelos* used in this work exhibited good inhibition efficiency. The inhibition efficiency increases with increase in the concentration of the extract. The adsorption of the components of the extract on to the metal surface in 0.5N H_2SO_4 follows the Temkin adsorption isotherm.

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Discrimination against Girl Child in Family in Urban Slums Hyderabad.

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I. INTRODUCTION

Discrimination against female children has been a topic of debate. It has been a subject of concern and sociological significance. This subject raises the cultural aspects about the role of a female child in society, what her human rights are as a human being and a number of sensitive issues. This issue is important because there is nearly universal consensus on the need for gender equality. Gender based discrimination against female children is pervasive across the world. It is seen in all the strata of society and manifests in various forms. As per the literature, female child has been treated inferior to male child and this is deeply engraved in the mind of the female child. Some argue that due to this inferior treatment the females fail to understand their rights. This is more predominant in India as well as other lesser developed countries. Sex selection of the before birth and neglect of the female child after birth, in childhood and, during the [teenage] years has outnumbered males to females in India and also in countries like Pakistan, Bangladesh and South Korea. There are 1029 women per 1000 men in North and 1076 women per 1000 men in Europe but there are only 927 women per 1000 men in India. These numbers tell us quite a harsh story about neglect and mistreatment of the female child in India. Women have a biological advantage over men for longetivity and survival; however, in spite of this there are more men than women. The figures above support that gender discrimination of female child is a basic facility area. Though the demographic characteristics do not show much or in some cases, anti-female bias, there is always a woman who receives a small piece of the pie.

II. GIRL CHILDREN IN INDIA

Gender injustice starts at home:

India is growing dynamically and shining in every field. The booms in market economy innovative technologies and improved infrastructures have become nation's pride. Similarly it has made measurable progress in recent year with regard to gender equality, but still a basis against female children is widespread in the country. All though, the recent study reveals that today in most cases, girls look after the parents in their old age than boys yet, at the time of pregnancy and delivery, most families desire for a male child. This discloses our culture which continues to glorify the birth of the sons while mourning the daughters.

Education of girls is one of the most effective methods for the development of a nation and the eradication of poverty and that educating girls also protects them from discrimination and violence. Unreasonable work loads in the home, preference for sons, a disregard for the rights of the girls, early marriage, child labour, poverty and the treatment of violence keep many girls from completing their education and trap them and their families in the cycle of poverty.

The universal discrimination of human right says ''All are equal before the law and are entitled without discrimination to equal protection against any discrimination in violation of this

declaration and against incitement to such discrimination ‘’ (Article 7)

The constitution of India has also declared that ‘’The state shall not discriminate against any citizen on grounds only of religion sex, race ,caste, place of birth or any of them ‘’ (Article 15) The constitution of India in article 39 , has declared ‘’The state shall in participate directly its policy towards securing ‘’

That girl child shall not be discriminated against the state. State should protect the girl child against exploitation.

The above declaration is fault issues in the case of girl child because in the society the righties of the girl child are neglected in many ways. united nations statistics, national reports and studies initiated by non government organizations repeatedly show that girls , as a group, have lower literacy rates receive less health care and are more often than boys their conditions, do not improve they become women

Standard of living of girl child is very poor compare to male child. Through the universal declaration of human rights states; everyone has the right to standard of living to adequate food, clothing, housing and medical care . The case of the girl child goes default. Apart form the prevailing poverty other factors also intervene to make lift miserable for the girl child. She is relegated to the background. V is a mist a boy is a boy .taller needs for food- nutrition, clothing happen to ignored and neglected.

Indeed the creator has decorated feminine gender with many qualities that a maze men. In the family the role of the female is very important. She plays role of a daughter sister wife and mother. With out this role of the female the families can not exist. The following are of the feminine gender.

In spite of all these goodness of the female children as well as the women in the society he they face discrimination. They are considering commodity, suppressed by the male gender. The male domination has become part and parcel in the society with the view of traditions and customs. The female of our society are look down. They are not given their rights and opportunities their dignity is not respected. Allover the world this is the reality of the feminized gender. The inhumanity is very much done to the girl children.

III. INHUMAN TREATMEN

Article 5 of universal declaration of Human right lays emphatically Thus “ No one shall be subjected to torture or cruel in human or of degrading treatment or punishment “ Article of constitution of India says, No person shall be deprived of his or her lift or personal liberty except according to procedure established by law”

In spite of all these articles and declaration made universally but still the ill- treatment is done to the girl children very badly. Time and again it is reminded to each individual to protect and to safeguard the lift of girl - children. The government has taken the concrete steps to eradicate the injustice done to the feminine gender. But no one follows the rules and regulations. The male cause discrimination hiding at home.

IV. THE GIRL CHILD IS A GIFT OR A CURSE?

Female homicide and feticide:

In humanity towards the feminine sex is raising its head in the return of female infanticide that is killing of unwanted baby girl by exposing or strangling in some places. Adult women are killed in incidents of bride burning or leading women to commit suicide due to grave harassment. Many of these cases are given out as ‘accidents’: From infanticide to feticide is a short road. A large number of ‘sex determination clinics’ have sprung up, especially in Maharashtra where amniocentesis is used to determine the sex of the fetus with a view to aborting Female Fetuses. The state assembly has enacted a law to curb the evil practice; but it does not seem to have much effect . The repeated abortion in search of the elusive goal of bearing a child takes a heavy tool of life and health of weak women. The imbalance in the sex ratio as a result of search practices is likely to lead to increased incidence of rape and abduction of women. Thrusting all responsibility on her in the midst of an iniquitous social system. Again women are made to bear the physic trauma and physical consequences of the crime.

Out raging modesty of the famine is an offence under section 354 of I.P.C. This includes pulling a woman by her arm with proposal of intercourse, fingering her private parte or touching her body with a corrupt mind, try to remove her clothes, molesting a women whether she is adult, child, mentally handicapped, sleeping or under the effect of an intoxicant

V. LIFE VIEW OF GIRL CHILD

You are to be you when?
O! girl child, you’re addressed
Moon, mother earth, a Goddess, Shakhty…….
Is your freedom enveloped?
Within your walls?
Are you safe to walk on the street?
(If not ramp) at night?
Are you a cheap – commodity
Is capitalistic globalization?
O! Girl-child
You would be wife, and mother…… then?
Who decides your destiny?
What is your name?
You are not be you when?
You are to be you how?
It is now! It is kairos!
Kairos girl child.

Right from birth her life is in the midst of sorrow, at the very tiny stage of her life, she begins to wear the crown of evils existing in the society, such as infanticide, child marriage, child labour, illiteracy, dowry system, malnutrition, girl children are sexually abused, trafficked and forced in prostitution. Through all these social evils they undergo Death in the society, deprived of their humanity, in public big speeches had been delivered that girl is the future of the nation but when we look at the reality it is killing discrimination and violence.

Discrimination has become a tradition to the society where right from the basic needs food, clothing, shelter and education

any work level girl children have become victim to discrimination.

VI. TYPES OF DISCRIMINATION

Forms of discrimination against girl children are numerous depending on the traditions, beliefs, history and culture of a particular society. Therefore to improve the condition of girls, youth, adequate program me international focuses on three threatening practices that impact the lives of millenniums of girl children.

- Female infanticide
- Female genital cutting
- Honor killing

VII. FEMALE INFANTICIDE AND SEX SELECTIVE ABORTION

It is the murder of a girl child often occurring as a deliberate murder of girl infant or young girl child as a result of neglect through selective abortion, it also known as gender selective abortions or female infanticide- is abortion of a fetus because it is female. Today the medical technology has made if possible for parents to discover the sex of a future at early stage of pregnancy, so many women in the society with a prefer for boys and practice sex select abortion.

These practices occur more frequently in the society, where a girl child is viewed as culturally and economically less advantage a boy child. It has been reported in Chaina, North Korea, South Asia, Bangladesh, Nepal, India and Pakistan (i9n the middle east Algeria, Egypt, Jordan, Libia, Morocco, Syria, Tunisia, Turkey) and parts of Africa (Cameroon, Liberia, Madagascar, Senegal and Nigeria).

Economically, girls often have lower hearing potential than boys; they receive higher wages than girls. This is more significant in poor communities where each family member is expected to add to the house-hold income. After marriage a girl turns her wages to the house-hold. In many situations, it is economic burden to raise a girl because the religious, social culture and ceremonies also require expenses.

VIII. FEMALE GENITAL CUTTING

It refers to any practice that involves the removal or the alternation of the female genitalia. It is a centuries- old culture practice found in many countries among people following various religions and belies, but it is most common in Africa. The other terms for female genital cutting include female genital circumcision, female genital operations. According to United Nations population found, it is estimated that over 130 million girl's women have undergone some form of genital cutting and at least two millions girls are at risk, undergoing this practice every year.

There was less support for FGC among women who employed and women who had at least a secondary – level education.

Research on FGC shoes there are a short long- term health effect on girl. Immediate effect includes hemorrhaging pain, and shock, severe bleeding and inability to urinate have caused the death of many girls. They many develop infections such as tetanus. Hepatitis and HIV, chronic bladder and panic infections infertility, the development of excessive scar tissue, cysts at the site of the procedure and problems during or after child birth or among the possible long term complications. In additions sexual intercourse can be very painful or dangers after FGC and many women become unable to experience sexual fulfillments. Scientific evidence for psychology effects of FGC on girls is scarcer however personal accounts reveal that girls who have undergone FGC many suffer from anxiety, terror, humiliations, betrayal and depression. However in some communities milder forms of FGC remain legal and thus legislated.

IX. HONOR KILLING

It is a practice of killing girls and women who are received to have defiled a family's honor by allegedly engaging sexual activity or other improprieties before marriage or outside of marriage "improper" behavior justifies grounds for killing, however has expanded to include transgressions that are not initiated by the girl, including rape sexual abuse or rumor. A girl is killing most often by male kin-father, husband, brother, uncle or cousin to restore honor to her family. Criminal penalties for honor killing or easygoing in countries where this practice is most prevalent. Because many cases go unreported, it is difficult to determine the number of women who are victims of honor killing. The United Nation Population Fund (UNPF) estimates as many as 500 thousands females are being killed each year has a result of honor killing. This practice mostly occurs most frequently in Muslim countries, all though neither Islamic religion nor law sanctions the practice. Other countries were such killing have been reported including Britain, Bangladesh, Brazil, Ecuador, Egypt, India, Israel, Italy, Norway, Jordan, Pakistan, Peru, Morcco, Sweden, Turkey, Uganda and Venezuela.

In December 2001, this article released to allow reduction in penalty only if the murder is committed immediate following the first – hand sighting of the victim of in the act of committing adultery. Significant have been taken in the last decade to stop the practice of honor killing hold men who murder female family members more accountable for their actions. Public awareness of the issue has increased, as mass media, non-governmental organization and international organizations like United Nations are examining the problems and taking action to illuminate the practice.

It is shameful to find honor killing is taking the first place and human life is thrown away without mercy. Everyone who wants to take action to prevent face great challenges in tackling this issue. People take lose into their hands and brutally kill their own young generation,(girl children) in order to maintain their tradition. Through social awareness people should become aware of such to enlighten to live like human beings and start loving girl children.

X. DE-INSTITUSTIONALISES FEMALE CHILD

Since very often female children are over burdened with household tasks at home, they are not able to prefer for school. As a result their education suffers. Though most boys, men and women know that girls are over load with work, little is done to help girl to share their work – load. This due to beliefs about gender and a girl role. Hence we recommitted to terminate men and boys to create gender party. Encourage them to contribute to the work of house hold, chores and to challenge violence and gender roles and traditions that are unjust and harmful.

The pitiable difficulty of girl child in India is so secrete to any of us. She is a victim of social discrimination from womb to tomb millenniums of them are butchered in the womb of their mothers just because they are girls. As a result there an alarming imbalance in the current sex ration of India, where states like Haryana there are villages were the sex radio has dipped as low as 300 females for thousand males. And that in turn escalates crimes like human trafficking, prostitution, child sex abuse, bounded labour, exchanging girls like barter-system for brides. Neither the anti-abortion law nor the all out effort of the pro-life champions and human rights activities seem to arrest the pro-life-ratio of female feticide in India.

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Optimization of the Compressive Strength of Concrete Made With Aggregates from Oji-River Gravel Piths

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Abstract- Sedimentary rock aggregates are commonly used in Nigeria for structural concrete production. Due to its variability in quality, strength and contaminations it is being suspected as one of causes of many structural failures in the country. This paper investigated the quality of 8 – 16mm size gravels from Oji-River piths by optimizing the strength of concrete made from it through Scheffe's simplex method of optimization and produced a mathematical model which gave an optimum compressive strength of 11.78N/mm^2 and mix ratio of 1:1.4:2.5 for a water/cement ratio of 0.53. Because of the small nature of this optimum strength and the general predictions from the model, it was recommended that such aggregate (8 – 16mm from Oji-River) be restricted to oversite concretes, columns and lintels of buildings of load bearing walls and a maximum storey of three; and it should never be used for slabs of suspended floors, retaining walls, bridges and culverts.

I. Introduction

With the increasing rate of development in infra-structures in Nigeria sedimentary rock gravels are increasingly and commonly used for structural concrete production because of its cheapness and availability, when compared with granite. The problem with sedimentary rock aggregates is that they vary in quality over a wide range, especially strength and contaminations. For the fact that aggregates constitute over 70 percent of concrete volume, engineers are becoming more and more suspicious of sedimentary rock aggregates in connection with many structural failures that are experienced all over the country. In view of this, this paper wishes to investigate the quality of 8 – 16mm size gravel aggregates from Oji-River, a popular site for gavel aggregate collection in the South-Eastern part of Nigeria. The reason for the choice of 8 – 16mm size is that they are the worst contaminated with silt and clay due to method of production.

The method of optimization that will be used for the investigation is scheffe's simplex Lattice method for mixtures, where the property studied depends on the component ratios only. Firstly, a simplex is defined as a convex polyhedron with (k+1) vertices produced by k intersecting hyperplanes in k-dimensional space (Akhnazaova, 1982). Any co-ordinate system above 3-dimensions are referred to as hyper planes, such planes are not orthogonal. A 2-dimensional regular simplex is, therefore, an equilateral triangle, while a 3-dimensional regular simplex is a regular tetrahedron.

Scheffe (1958) used a regular (q – 1) – simplex to represent a factor space needed to describe a response surface for mixtures consisting of several components. If the number of components is denoted by q, then for binary system (q = 2) the required simplex is a straight line; for q = 3, the required simplex is an equilateral triangle; and for q = 4, the simplex is a regular tetrahedron. The response surface for such a multicomponent system is normally described by means of a high degree polynomial, of the type of Eq 1.0, having number of coefficients given by C^n_{q+n} , where n is the degree of the polynomial (Akhanzarova et al, 1982).

$$\hat{y} = b_o + \sum_{1\le i\le q} b_i x_i + \sum_{1\le i<j\le q} b_{ij} x_i x_j + \sum_{1\le i<j<k\le q} b_{ijk} x_i x_j x_k + \sum bi_1 i_2 \dots i_n x i_1 x i_2 \dots x i_n \qquad (1.0)$$

Knowing that Eq (2.0) also holds for mixtures

$$\sum_{i=1}^{q} x_i = 1 \qquad - - - \quad (2.0)$$

Where $x_i \geq 0$ represents the component concentrations in the mixture, Scheffe (1958) was able to reduce the number of coefficients in Eq (1.0) to arrive at a new polynomial whose number of coefficients is given by C^n_{q+n-1}, thereby reducing the number of experimental trials required to evaluate the coefficients. Scheffe's reduced polynomial is more preferred and commonly used. To demonstrate this reduction for a four-component mixture, we have:

From Eq (1.0) and Eq (2.0)

$$\hat{y} = b_o + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + +b_{12}x_1x_2 + b_{13}x_1x_3 + b_{14}x_1x_4 + b_{23}x_2x_3 + b_{24}x_2x_4 + b_{34}x_3x_4 + b_{11}x_1^2 + b_{22}x_2^2 + b_{33}x_3^2 + b_{44}x_4^2 \quad - \quad - \quad - \quad - \quad - \quad - \quad (3.0)$$

$$and\ x_1 + x_2 + x_3 + x_4 = 1 \quad - \quad - \quad - \quad - \quad (4.0)$$

Multiplying Eq (4.0) by b_o, x_1, x_2, x_3 and x_4, separately, and rearranging the variables the following equations are obtained;

$$b_o = b_ox_1 + b_ox_2 + b_ox_3 + b_ox_4 \quad - \quad - \quad - \quad (5.0)$$
$$x_1^2 = x_1 - x_1x_2 - x_1x_3 - x_1x_4 \quad - \quad - \quad - \quad - \quad (6.0)$$
$$x_2^2 = x_2 - x_1x_2 - x_2x_3 - x_2x_4 \quad - \quad - \quad - \quad - \quad (7.0)$$
$$x_3^2 = x_3 - x_1x_3 - x_2x_3 - x_3x_4 \quad - \quad - \quad - \quad - \quad (8.0)$$
$$x_4^2 = x_4 - x_1x_4 - x_2x_4 - x_3x_4 \quad - \quad - \quad - \quad - \quad (9.0)$$

Substituting Eqs 5.0, 6.0, 7.0, 8.0 and 9.0 into Eq. 3.0 and rearranging, yields

$$\hat{Y} = \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_{12}x_1x_2 \quad \beta_{13}x_1x_3 + \beta_{14}x_1x_4 + \beta_{23}x_2x_3 + \beta_{24}x_2x_4 \quad +\beta_{34}x_3x_4 \quad - \quad - \quad - \quad - \quad - \quad -(10)$$

Eq(10) is the scheffe's reduced second degree polynomial for 4-component mixtures. It has only 10 coefficients instead of 15, reducing the number of experimental trials by 5.

1.2 Factor Notation on a Simplex Lattice

Each component to be used in a mixture is divided into (n+1) similar level (parts), where n is the degree of the polynomial to be used in the model. The component compositions and their respective concentrations in each mixture are shown by the use of subscripts. For example, a mixture x_{ij} could contain only one component with its full concentration denoted as x_1, x_2, x_3 or x_4 ; another mixture could contain two components of equal concentrations denoted as x_{12}, x_{13}, x_{14}, x_{23}, x_{24} or x_{34}. A mixture having two components of different concentrations is denoted as x_{112}, x_{113}, x_{224}, etc. – the number of times each of the components appears in the subscript relative to the other is a measure of their relative concentration.

These mixtures are arrayed on the simplex to form a lattice, i.e. a uniform scatter that could be joined by crossing straight lines parallel to the edges of the simplex. For tetrahedrons, for instance, starting from the vertex with straight component mixtures x_1, x_2, x_3, etc; followed by the edges with binary component mixtures x_{12}, x_{13}, x_{24}, etc; then the faces with 3-component mixture x_{124}, x_{234} etc; and finally the interior with 4-component mixtures, this sequence is followed until all the required experimental trials are depicted on the simplex. Fig. 1.0 shows the positions of all the factors (mixtures) on a regular tetrahedron for a second degree polynomial to be used for the description of the response space for a 4-component mixture – a (4, 2) – lattice.

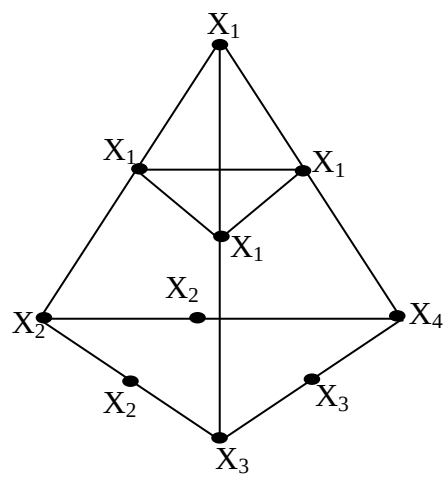


Fig. 1.0: Factor Notations for a (4, 2) – Lattice

A matrix table is normally used to display these factors (see leftside of table 1.0) each row displaying a mixture with its components and concentrations.

Table 1.0: Matrix table for Scheffe's (4, 2) – Lattice Polynomial

Pseudo-Components					Response	Real Components			
S/N	x_1	X_2	X_3	X_4		Z_1	Z_2	Z_3	Z_4
1	1	0	0	0	Y_1	0.6	1.0	1.5	4
2	0	1	0	0	Y_2	0.5	1.0	1.0	1½
3	0	0	1	0	Y_3	0.55	1.0	1½	3.0
4	0	0	0	1	Y_4	0.555	1.0	$2\,{}^{1}/_{2}$	4.0
5	$^{1}/_{2}$	$^{1}/_{2}$	0	0	Y_{12}	0.55	1.0	1.25	2.75
6	$^{1}/_{2}$	0	$^{1}/_{2}$	0	Y_{13}	0.575	1.0	1.5	3.5
7	$^{1}/_{2}$	0	0	$^{1}/_{2}$	Y_{14}	0.578	1.0	2.0	4.0
8	0	$^{1}/_{2}$	$^{1}/_{2}$	0	Y_{23}	0.525	1.0	1.25	2.25
9	0	$^{1}/_{2}$	0	$^{1}/_{2}$	Y_{24}	0.528	1.0	1.75	2.75
10	0	0	$^{1}/_{2}$	$^{1}/_{2}$	Y_{34}	0.553	1.0	2.0	3.5

For the fact that concrete mixtures have its sum of proportions above unity a congruent simplex is necessary such that the mix proportions at the vertices show the range of w/c ratio, cement, fine aggregate and coarse aggregate ratios, respectively, the required polynomial model will cover or predict (see fig. 2.0).

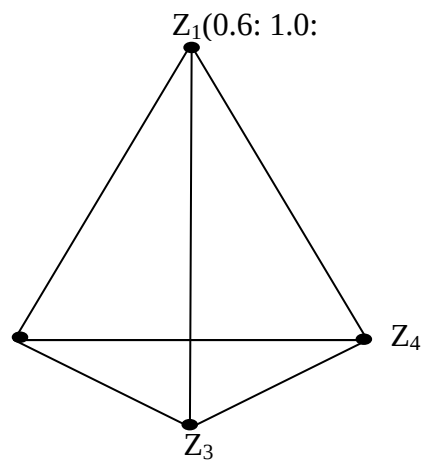


Fig. 2.0: Real Component Simplex (only vertices are shown)

The former simplex, fig. 1.0, is called Pseudo-component simplex and the later, fig. 2.0, real component simplex. From the later (real components) a Z-matrix is formed whose transpose becomes the conversion factor from pseudo to real component; i.e. from fig. 2.0

$$z = \begin{bmatrix} 0.6 & 1.0 & 1.5 & 4.0 \\ 0.5 & 1.0 & 1.0 & 1\frac{1}{2} \\ 0.55 & 1.0 & 1\frac{1}{2} & 3.0 \\ 0.555 & 1.0 & 2\frac{1}{2} & 4.0 \end{bmatrix}$$

$$and\ Z^T = \begin{bmatrix} 0.6 & 0.5 & 0.55 & 0.555 \\ 1.0 & 1.0 & 1.0 & 1.0 \\ 1.5 & 1.0 & 1\frac{1}{2} & 2\frac{1}{2} \\ 4.0 & 1\frac{1}{2} & 3.0 & 4.0 \end{bmatrix} \quad - \quad - \quad - \quad 11$$

To demonstrate the use of Eq (11) in table 1.0, the 5th row in the real component side is obtained by multiplying $[Z]^T$ matrix by the corresponding row in the pseudo-component side of table 1.0, i.e.

$$= \begin{bmatrix} 0.6 & 0.5 & 0.55 & 0.555 \\ 1.0 & 1.0 & 1.0 & 1.0 \\ 1.5 & 1.0 & 1\frac{1}{2} & 2\frac{1}{2} \\ 4.0 & 1\frac{1}{2} & 3.0 & 4.0 \end{bmatrix} \begin{bmatrix} \frac{1}{2} \\ \frac{1}{2} \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 0.55 \\ 1.0 \\ 1.25 \\ 2.75 \end{bmatrix}$$

In this way all the corresponding rows in the real component side are obtained producing a congruent table and simplex suitable for concrete.

II. MATERIAL AND METHOD

(i) Materials

Materials needed for the experiment include sample of unwashed coarse aggregate (gravel) from Oji-River gravel pith. The samples were stored in sacks, indoor, so that moisture variation in the samples would be minimal.

The laboratory equipments needed include, universal crushing machine, 150 x 150mm x 150mm cube moulds, mould oil, weighing balance, trowel and curing tank.

(ii) Method

Using the weighing balance; water, cement fine aggregate and coarse aggregate were weighed out, respectively, in the

proportions shown in table 1.0- right side - in such a way that the materials weighed out served for three cubes. The materials were thoroughly mixed together inside a non-absorbent container before water was added and final mixing was done. Three cubes were cast from each of the mix proportions, making 60 cubes in the whole. The fresh concrete was filled into the moulds in three layers, each layer tamped not less than 25 times. The top was scraped off with the trowel. The concrete was allowed to harden for 24 hours, after which the mould was removed and the cubes were water-cured for 28 days in the curing tank. At the end of 28 days the cubes were crushed in the universal crushing machine. The results and averages from the test points were tabulated in columns 7 to 10 of table 2.0. Extra ten test points were provided for validation of the model. The number of extra test point depends on choice.

Table 2.0: Responses from Experiment and Predictions from Model

S/N	Pseudo-Components				Response Symbols	Replicate Responses (N/mm^2)			Average Response $\bar{Y}N/mm^2$	Predicted values $\hat{Y}N/mm^2$	Real Components (Concrete Mix ratios)			
	X_1	X_2	X_3	X_4		1	2	3						
1	1	0	0	0	Y_1	6.89	6.44	8.22	7.18	7.18	0.6	1	1 ½	4
2	0	1	0	0	Y_2	7.78	7.11	6.89	7.26	7.26	0.5	1	1	1 ½
3	0	0	1	0	Y_3	9.78	8.0	8.0	8.59	8.59	0.55	1	1 ½	3
4	0	0	0	1	Y_4	4.44	5.33	7.33	5.7	5.7	0.555	1	2 ½	4
5	$^1/_2$	$^1/_2$	0	0	Y_{12}	7.55	9.33	8.44	8.44	8.44	0.55	1	1¼	2¾
6	$^1/_2$	0	$^1/_2$	0	Y_{13}	8.44	7.78	10.22	8.81	8.81	0.575	1	1½	3 ½
7	$^1/_2$	0	0	$^1/_2$	Y_{14}	9.55	8.44	10.00	9.33	9.33	0.578	1	2	4
8	0	$^1/_2$	$^1/_2$	0	Y_{23}	13.78	11.11	10.00	11.63	11.63	0.525	1	1 ¼	2¼
9	0	$^1/_2$	0	$^1/_2$	Y_{24}	10.00	10.00	10.00	10.00	10.00	0.528	1	1¾	2¾
10	0	0	$^1/_2$	$^1/_2$	Y_{34}	10.67	8.67	9.33	9.56	9.56	0.533	1	2	3½
	Control Points													
11	$^1/_2$	0	$^1/_4$	$^1/_4$	C_1	10.94	8.67	9.56	9.56	9.82	0.576	1	2 ¾	3 ¾
12	$^1/_4$	0	$^1/_2$	$^1/_4$	C_2	11.11	8.22	10.00	9.78	9.98	0.564	1	1¾	3½
13	$^1/_4$	$^1/_4$	$^1/_4$	$^1/_4$	C_3	11.00	8.11	8.89	9.33	10.92	0.551	1	1.625	3.125
14	$^2/_3$	0	0	$^1/_3$	C_4	8.44	11.11	7.11	8.89	9.52	0.585	1	1.833	4.0
15	$^1/_4$	$^1/_4$	$^1/_2$	0	C_5	9.56	10.44	11.56	10.52	10.53	0.55	1	1.375	2.875
16	$^1/_4$	$^1/_2$	0	$^1/_4$	C_6	7.56	11.56	14.11	10.74	10.02	0.539	1	1 ½	2 ¾
17	$^1/_4$	0	$^1/_4$	$^1/_2$	C_7	5.79	8.89	8.22	7.63	9.82	0.535	1	2	3 ¾
18	$^1/_2$	$^1/_4$	0	$^1/_4$	C_8	6.11	9.56	9.89	8.52	9.91	0.564	1	1.625	3.375
19	$^1/_4$	$^1/_2$	$^1/_8$	$^1/_8$	C_9	10.89	8.67	10.22	9.93	10.29	0.538	1	1.375	2.625
20	$^1/_3$	$^1/_3$	0	$^1/_3$	C_{10}	9.76	10.42	7.67	9.28	10.24	0.552	1	1.667	3.167

2.1Development of the Model

The general form of Scheffe's (4,2) – Lattice Polynomial is given by

$$\hat{Y} = \sum_{1 \le i \le 4} \beta_i x_i + \sum_{1 \le i < j \le 4} \beta_{ij} x_i x_j - \quad - \quad - \quad - \quad 12$$

$$where\ \beta_i = \bar{y}_i\ ,\beta_{ij}\ = 4\bar{y}_{ij} - 2\bar{y}_i - 2\bar{y}_j$$

From table 2.0, Column 10:

$$\beta_1 = 7.18, \beta_2 = 7.26, \beta_3 = 8.59, \beta_4 = 5.7$$

$$\beta_{12} = 4 \times 8.44 - 2 \times 7.18 - 2 \times 7.26 = 4.88$$

$$\beta_{13} = 4 \times 8.81 - 2 \times 7.18 - 2 \times 8.59 = 3.70$$

$$\beta_{14} = 4 \times 9.33 - 2 \times 7.18 - 2 \times 5.7 \ = 12.76$$

$$\beta_{23} = 4 \times 11.63 - 2 \times 7.26 - 2 \times 8.59 = 14.82$$

$$\beta_{24} = 4 \times 10.00 - 2 \times 7.26 - 2 \times 5.7 = 14.08$$
$$\beta_{34} = 4 \times 9.56 - 2 \times 8.59 - 2 \times 5.7 = 9.66$$

The model for compressive strength for Oji-River sample becomes

$$\hat{Y} = 7.18x_1 + 7.26x_2 + 8.59x_3 + 5.7x_4 + 4.88x_1x_2 + 3.70x_1x_3 + 12.76x_1x_4 + 14.82x_2x_3 + 14.08x_2x_4 + 9.66x_3x_4 \quad - - - - 13$$

The predictions from Eq 13 are given in table 2.0 Column 11.

2.2 Validation of the Model (Test for Adequacy)

Adequacy of the model (Eq 13) can be tested through Fisher's variance ratio, whereby the calculated value of Fisher's ratio F is compared with the tabulated value in the Quantile of the F-Distribution.

$$F = \frac{S_g^2}{S_e^2} \quad - - - - - 14$$

$$Where\ Sg^2 = \frac{m}{n-l}\sum_{i=1}^{n}(\bar{y}_i - \hat{y}_i)^2 - - - 15$$

$$and\ S_e^2 = \frac{1}{n(m-1)}\sum_{i=1}^{n}\sum_{u=1}^{n}(y_i - \bar{y}_i)^2 \quad - - - - 16$$

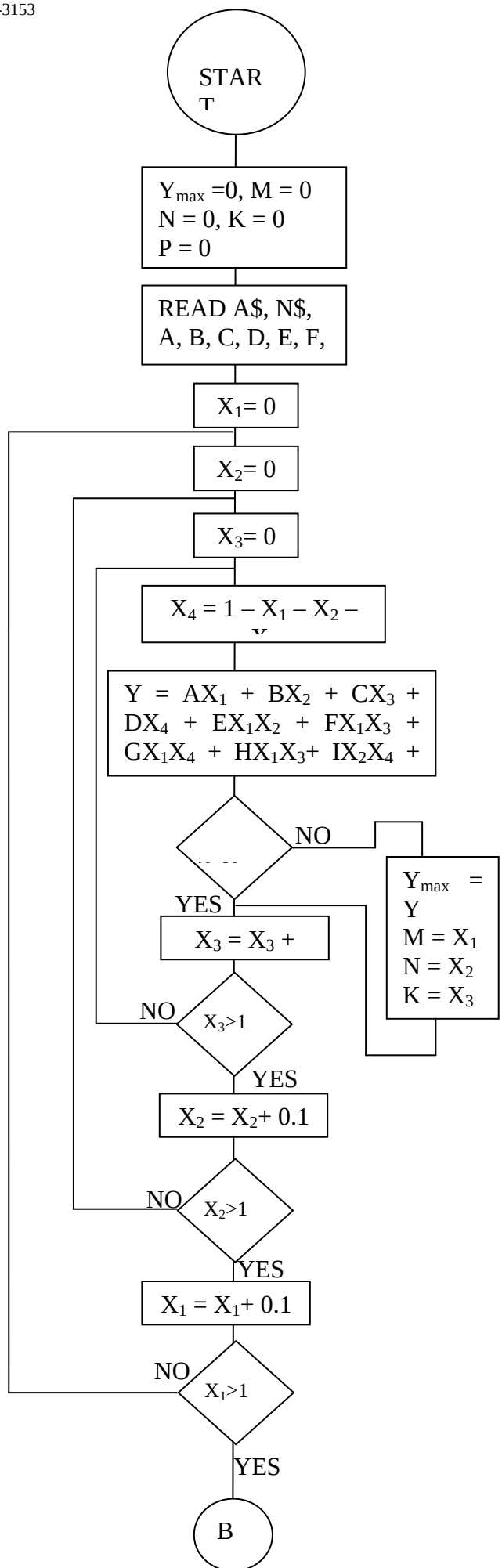
In the above equations n is the number of experimental trials, m is the number of replications for each experimental trial, *l* is the number of coefficients in the model, $\bar{y}_i$ is the average response for i^{th} experimental trial, $\hat{y}_i$ is the predicted value from model for i^{th} trial, y_{iu} is the uth replicate response value for i^{th} trial. If F is less than the tabulated value, then the model is adequate, i.e.

$$S_g^2 = \frac{3}{10} \times 11.3305$$
$$S_e^2 = \frac{1}{40} \times 82.3513$$
$$F = \frac{S_g^2}{S_e^2} = \frac{(^3/_{10}) \times 113305}{(^1/_4) \times 82.3513}$$
$$= 1.65 < 2.1 \quad okay$$

Where the value 2.1 is the limiting value of F obtained from any table of Quantiles of F-Distribution.

2.3 Optimization of the Model

The model (Eq 13) was optimized through a Quick-Basic computer program, whose flowchart is given in Fig. 3.0. The maximum values given by the computer for strength, water, cement, fine aggregate and coarse aggregate ratios are 11.78KN, 0.531, 1, 1.4 and 2.5 respectively.



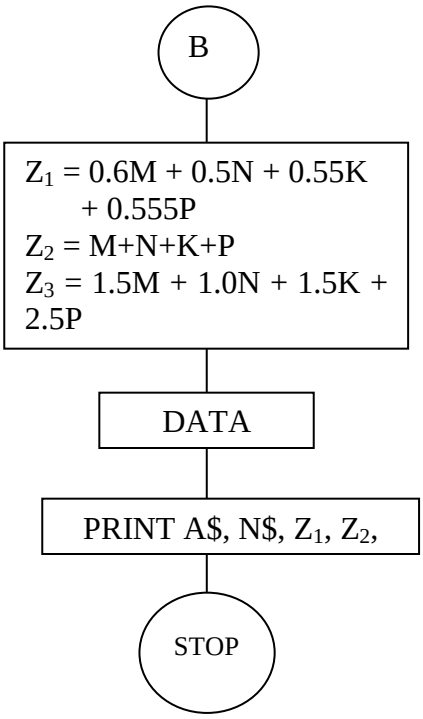
KEY

A$ = Gravel Pith

N$ = Strength Type

A,B,C - - J are the coefficients of the model

Ymax, Z_1, Z_2, Z_3 and Z_4 are the maximum strength, water, cement, fine agg, coarse agg ratios respectively



2.4 Discussion of Results

Looking at the results and predictions from the model in table 2.0 (Columns 7, 8, 9, 10 and 11) it is easy to see that the compressive cube strengths for the various mix proportions are clearly below the expected values by a wide margin. Considering the optimum value given by the computer program, whose proportions are comparable with that of grade 25 concrete, when granite is used instead - it has an average strength of 11.78N/mm^2, which is about half of the expected value - this shows that aggregates of sizes 8 – 16mm from Oji-River are quite inferior.

III. Recommendation and Conclusion

From the above results and discussions it is obvious that concretes from these aggregates cannot be used in areas where there is excessive compressive and tensile forces such as bridges, culverts, thin slabs, foundation, etc. It is therefore recommended for only columns and lintel of load bearing walls, the storey should not be greater than three.

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Computer Programe for the Determination of Optimum Compressive Strength of SDA-Clay Bricks

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Abstract- Often times, admixtures such as sawdust ash (SDA) are added to raw mixes of burnt bricks in order to modify the properties or reduce the cost of the final product. This article present computer programs based on Simplex and Regression Theories, for the determination of the optimum percentage of saw dust ash to be added to clay in order to produce burnt bricks of optimum compressive strength. Bricks of optimum mix would in its finished state, satisfy at minimum cost, the required performance determined by its application. Besides, the compressive strength of SDA-clay bricks obtainable from a specified mix proportions of its constituents and vice verse. Comparison of the results determined by computer programs based in Scheffe's and Regression Theories, showed that there is complete agreement between them. The two computer results, also agreed with the experimental results.

Index Terms- Computer Programs, Optimum Compressive Strength, Clay, Sawdust ash (SDA), Bricks, Simplex Theory and Regression Theory.

I. INTRODUCTION

Clay bricks are masonry units widely used for centuries as building components all over the world. As a matter of fact, bricks are the oldest manufactured building materials, some of which are estimated to be about 6000 years old (Ibstock, 2005). Their properties vary according to the purpose they are intended to serve. The high compressive strength of burnt clay bricks has been exploited for millennium to build structures ranging from high-storey to massive public buildings, big bridges and viaducts (Ignis, 2008).

Sawdust ashes and other pozzolanic materials have been individually or collectively used as admixtures to modify the properties or reduced the cost of bricks and the other building materials. However, it is difficult, time consuming as well as expensive to determine the optimal percentage of Sawdust ash to be added to be added to in order to produce burnt bricks of optimal compressive strength at minimum cost. Computer programs based on Simplex Theory (Scheffe's, 1958) and Regression Theory (Osadebe, 2003), were adopted in this work for the determination of the optimal mixtures of SDA-clay burnt bricks. The programs can be used quickly to determine optimum bricks having a specified mix proportions, and vice versa.

II. THEORITICAL BACKGROUND

Two computer programs were developed using response functions based on the Simplex and Regression theories.

III. SIMPLEX THEORY

Simplex theory (Scheffe, 1958) is the basis of the first response function used in the development of the first computer program for the determination of the optimum compressive strength of the SDA-clay bricks. The theory is applicable only when the response (i.e. property of a mixture) sought, is a function of the mixture components. In this theory, a polynomial function (i.e.Eqn.( )) is used to represent the response of a pseudo-components.

$$F = b_0 + \sum b_i X_i + \sum b_{ij} X_i X_j \text{ ---------- } 1$$

Where: b_i and b_j are constants

X_i and X_j are pseudo components

i and j are subscripts representing points on the simplex lattice and they lie within the region $0 \le i \le j \le 3$

For the SDA-clay bricks with three components, the final response function F, derived from Eqn.(1), is given as follows (Chijoke, 2011):

$$F_{(x)} = 28.32X_1(2X_1 - 1) + 18.03X_2(2X_2 - 1) + 14.35X_3(2X_3 - 1)$$

$$+98.68X_1X_2 + 80.28X_1X_3 + 70.48X_2X_3 \text{ -------- } 2$$

The final response function given by Equ.(2) is the basis of the first computer program for the optimum compressive strength of SDA-clay burnt bricks.

IV. REGRESSION THEORY

The second computer program, is based on the response function derived from Regression theory (Osadebe,2003). Here

the response function $F_{(x)}$, is given as a function of its predictors, Z_i, as follows:

$$F_{(Z)} = F_{(x)}{}^{(0)} + \sum \partial F/\partial Z_i\left(Z_i - Z_i{}^{(0)}\right)$$

$$+\tfrac{1}{2}!/\sum\sum \partial^2 F\left(Z^{(0)}\right)/\partial Z_i \partial Z_j\left(Z^{(0)}\right)\left(Z_i - Z_i^{(0)}\right)\left(Z_j - Z_j^{(0)}\right)$$

$$+\tfrac{1}{2}!/\sum\sum \partial^2 F\left(Z^{(0)}\right)/\partial Z_i{}^2\left(Z^{(0)}\right)\left(Z_i - Z_i^{(0)}\right)^2 + ------ \quad (3)$$

Where $1 \le i \le 3,\ 1 \le i \le 3, 1 \le j \le 3$ and $1 \le i \le 3$ respectively.

The response function, $F_{(x)}$, is assumed to be continuous and differentiable with respect to its predictors, $Z_{(i)}$. By making use of Taylor series and expanding Eqn.(3) in the neighbourhood of a chosen point, $Z = Z_1{}^{(0)}, Z_2{}^{(0)}, Z_3{}^{(0)}, Z_4{}^{(0)}$, and $Z_5{}^{(0)}$, Eqn(4) was obtained:

$$F_{(z)} = 2027767Z_1 + 885121.7Z_2 + 1431628Z_3 + 231203.6Z_1Z_2 - 27119950Z_1Z_3 - 22325282Z_2z_3 ------(4)$$

Where Z_1, Z_2 and Z_3 are the ratio of the actual component portion to the total quantity of SAD-clay mixture.

Eqn(4) is the final regression response function for the development of computer program for the determination of the optimum compressive strength of SDA-clay burnt bricks.

V. REGRESSION MATRIX

The response function, which is dependent on the proportion of mixture components, is given by

$$Y^{(n)} = \sum \alpha_i Z_i{}^{(n)} + \sum \alpha_{ij} Z_i{}^{(n)} Z_j{}^{(n)} ----------(5)$$

Where $1 \le i \le j \le 3$ and $n = 1,2,3$

The above equation can be given in matrix form as follows:

$$\left[Y^{(n)}\right] = \left[Z^{(n)}\right][\alpha] ----------(6)$$

Where $\left[Y^{(n)}\right] =$ matrix of resonse function at the 'nth' point of observation.

$\left[Z^{(n)}\right] =$ matrix of predictors or fractional portion

$[\alpha] =$ matrix of constant coefficient

Expanding Eqn(6) yields:

$$\begin{bmatrix} Y_1 \\ Y_2 \\ Y_3 \\ Y_4 \\ Y_5 \\ Y_6 \end{bmatrix} = \begin{pmatrix} Z_1^1 & Z_2^1 & Z_3^1 \\ Z_1^2 & Z_2^2 & Z_3^2 \\ Z_1^3 & Z_2^3 & Z_3^3 \\ Z_1^4 & Z_2^4 & Z_3^4 \\ Z_1^5 & Z_2^5 & Z_3^5 \\ Z_1^6 & Z_2^6 & Z_3^6 \end{pmatrix} \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_{12} \\ \alpha_{13} \\ \alpha_{23} \end{bmatrix} ----------(7)$$

Where

$$[\alpha]^T = [\alpha_1, \alpha_2, \alpha_3, \alpha_{12}, \alpha_{13}, \alpha_{23}] ----------(8)$$

$$\left[Y^{(n)}\right]^T = [Y^1, Y^2, Y^3, Y^{12}, Y^{13}, Y^{23},] ----------(9)$$

$$\left[Z_i^{(K)}\right] = [Z_1^K, Z_2^K, Z_3^K, Z_4^K, Z_5^K, Z_6^K] ----------(10)$$

Where $1 \le n \le 6$ and $1 \le k \le 3$

The elements of the $Z^{(n)}$ matrix were derived from the matrix of actual portion i.e $\left[s^{(n)}\right]$, while the elements of $Y^{(n)}$ matrix were obtained from laboratory test. Therefore, the elements of the matrix of constant coefficient can be determined from the following equation.

$$[\alpha] = \left[Z^{(n)}\right]^{-1}\left[Y^{(n)}\right] ----------(11)$$

VI. COMPUTER PROGRAM

Interactive computer programs coded in Visual Basic 6.0 language were developed for the execution of the formulated response functions. The first program based on Simplex response function is given in appendix ( ), while the second program based on the Regression response function is given in Appendix ( ). Each of the programs is prepared in two segments. The output of the first segment is a set of mix proportion of bricks components obtainable from an output of a desired compressive strength. And the output of the second part is the compressive strength of

bricks obtainable from a given input of mix proportions of bricks components. Also, optimum compressive strengths are printed out. The results of the executed programs are given in Table 1 and 2 respectively.

Table 1: Mix Proportions from the computer program based on Simplex Theory, corresponding to a desired compressive strength of 26.02KN/m^2.

Compressive Strength (KN/m^2)	Clay (Kg)	SDA (Kg)	Water (Kg)
26.03	0.08	0.29	0.71
26.02	0.05	0.28	0.72
26.02	0.06	0.29	0.72
26.02	0.07	0.29	0.71

Table 2: Mix Proportions from the computer program based on Regression Theory, corresponding to a desired compressive strength of 26.02KN/m^2.

Compressive Strength (KN/m^2)	Clay (Kg)	SDA (Kg)	Water (Kg)
26.03	0.08	0.29	0.71
26.02	0.05	0.28	0.72
26.02	0.06	0.29	0.72
26.02	0.07	0.29	0.71

Compressive strength output corresponding to a given mix proportion:
Output of Simplex Function program
Input the value of clay 0.04
Input the value of SDA 0.28
Input the value of water 0.72
Strength F, of 30KN/m^2, clay 0.04, SDA 0.28 , water 0.72

Output of Regression Function program
Input the value of clay 0.04
Input the value of SDA 0.28
Input the value of water 0.72
Strength F, of 30KN/m^2, clay 0.04, SDA 0.28, water 0.72

VII. DISCUSSION OF RESULTS

The compressive strength results from the two computer programs based on the Simplex and Regression functions are in agreement with the laboratory results as well as with each other. The optimum compressive strength of burnt bricks obtained from simplex function program, is. But, the optimum compressive strength obtainable from the regression function program has no upper bound.

VIII. CONCLUTION

Each of the two programs developed, can be easily and quickly used to determine various combination of bricks components that can yield burnt bricks of a desired compressive strength. Besides, the programs can be used to determine the compressive strength of bricks produce from a given mix proportion of its components. Another value that can be obtained from the program is the optimum compressive strength. The use of the program saves cost.

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Factors impacting profitability of commercial banks in Pakistan for the period of (2009-2012)

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Abstract- Commercial banks play the vital role in the economy of any country. My aim behind this study is to evaluate the profitability of the 23 commercial banks operating in Pakistan for the period of 2009 to 2012.There are internal and external factors that affect the profitability of commercial banks of any country. Internal factors or management factors include the management policies, capital ratios, Risk management etc and external factors include inflation, government policies etc. My study undertakes the only internal factors that impact on the profitability of the commercial banks in Pakistan .This study used the ordinary least square (OLS) method to look into the impact of cost efficiency, liquidity, capital adequacy, deposits and size of the bank on the profitability (ROA) of the commercial banks. I have used the Descriptive statistics that include mean, median, minimum, maximum and standard deviation. Other method includes correlation analysis, regression analysis and natural loghrathim of total assets technique. The empirical findings of my study is that cost efficiency, liquidity and capital adequacy are those variables in the check of management that decide the profitability of commercial banks operating in Pakistan. Other variables like deposits and size of the bank did not demonstrate any impact on profitability.

Index Terms- External factors, internal factors, Natural logarithm technique. OLS, Profitability.

I. Introduction

Banking sector is the backbone of any economy and plays its important role in the economic development of a country. The financial sector in Pakistan includes commercial banks, stock exchanges, insurance companies, or banking finance companies. Mobilization of the national savings to the productive sectors is possible only with the help of commercial banks that increases the economic growth rate of a country. Profitable commercial banks also stabilize the financial system of a country. Commercial banks perform major function of accepting the deposits from the general public and advances loans. In the past a lot of work has been done by the researchers on the profitability determinants of commercial banks. Some researchers have used only bank characteristics or internal factors in their study but some also used the macroeconomic factors or external factors in their study along with internal factors. Saira Javaid et.al (2011) Bank size or total assets does not lead any profitability of commercial banks but equity and deposits have a significant influence on the profitability of commercial banks.

The financial system of the Pakistan has been altered significantly by nationalization of banks in early 1970.It became clear by the end of 1980 that objectives of the commercial banks could not be achieved. The public sector was liable for inefficiency of the domestic banks and non-financial institutions. Share of public sector in total assets of the banking industry was 90 percent and remaining 10 percent relate to the foreign banks by the end of 1990.At that time there is no existence of private shares in banking industry. After 1997 there became significant change in the ownership of the banking sector and concentration in banking sector by privatization the banking industry.(State Bank of Pakistan)

My objective of writing this research paper is to analyze the profitability of 23 commercial banks operating in Pakistan for the period of 2009 to 2012. I have used only banks characteristics or internal factors in my study to check their impact on profitability of commercial banks. My dependant variable is ROA and independent variables are cost efficiency, liquidity, capital adequacy, deposits and size of bank. I have used regression analysis, descriptive analysis, correlation analysis and natural logarithm techniques in my study.

Factors impacting profitability of commercial banks in Pakistan for the period of 2009-2012 contribute to a lot in the literature review. I have worked on 23 commercial banks of Pakistan but the previous studies like Saira Javaid et.al (2011) have worked on the 10 commercial banks of Pakistan, Sehrish Gul, Faiza Irshad and Khalid Zaman (2011) have worked on the 15 commercial banks of Pakistan, Syeda anum bhukhari (2012) has worked on 11 commercial banks in Pakistan and Khizar ali et al (2011) have worked on 22 commercial banks in Pakistan. I have obtained all of my research data from the financial statements of commercial banks.

The remaining sections of the paper discuss the literature review in section 2.Section 3 describes the methodology that has been adopted to achieve the objectives of this paper. And the remaining three sections of this paper section 4 section 5 and section 6 relate to the summary of hypothesis, results and conclusion respectively.

II. LITERATURE REVIEW

This section of the research paper provides the overview of the previous studies related to the determinants of the bank profitability. The dependant variables in these studies have been mostly used like return on assets (ROA), return on equity (ROE) and net interest margin (NIM) and all the internal and external factors have been used as independent variables.

Syafri (2012) checked the profitability of the commercial banks of Indonesia listed in the stock exchange for the period of 2002 to 2011 using pooling data from commercial banks. He

applied the pooling data regression model in which return on assets is dependant variable and internal and external determinants have been used as independent variables. He has said in his research that loan to total assets, total equity to total assets have positive effect on profitability while on the other hand bank size and cost to income ratio have negative effect and economic growth and non interest income to total assets have no effect.

Ani,W.U et.al (2012) investigated the determinants of profitability of commercial banks in Nigeria for the period of ten years from 2001 to 2010 including the observation of 147 banks. Pooled ordinary least square was used to estimate the coefficient. Study finds that bank size does not increase the profit of any commercial banks in Nigeria. Greater capital-asset ratio increases the profitability of banks.

Saira Javaid et.al (2011) examined the profitability of top 10 the commercial banks of Pakistan for the period of 2004-2008.Pooled ordinary least square has been used to check the impact of internal factors includes assets, loan, equity and deposits on the profitability of banks on dependant variable called return on asset (ROA).The study found that internal factors stated above effect the bank's profitability. Bank size or total assets does not lead any profitability of commercial banks but equity and deposits have a significant influence on the profitability of commercial banks.

Abdel karim Almumani (2013) analyzed the internal factors that impact on the profitability of the commercial banks listed in Amman Stock Exchange in Jordan for the duration of 2005-2011.The study constitutes that the cost-income ratio has a significant collide with the profitability of commercial banks in Jordan.

Imad Z.Ramadan et.al (2011) took apart the determinants of profitability of 10 Jordan banks for the period of 2001-2010.They have used return on equity (ROE) and return on assets (ROA) as dependant variables and internal and external factors have been used as an independent variables and the type of data of Jordan banks is penal data. Results designated that profitability of the Jordan banks depend upon the well capitalized banks, high loaning activities, less credit risk and cost management efficiency. Findings also expressed that size does not increase the profitability of Jordan banks.

Fadzlan Sufian et.al (2008) studied the profitability of the banks in Philippines for the period of 1990-2005.The outcome paint a picture that profitability factors have significantly impact on bank profitability. The study also suggests that if the expense related behavior and credit risk increases the profitability of the banks operating in Philippines decreases and the non-interest income and capitalization both have the positive relationship with bank's profitability. During the study undertaken the inflation increases the profit of the banks in Philippines decreases.

Sehrish Gul, Faiza Irshad and Khalid Zaman (2011) tried out the relationship between the bank specific characteristics and the profitability of the banks using the data of top fifteen commercial banks operating in the economy of Pakistan for the period of 2005-2009.This paper applies the Polled Ordinary Least Square method to look into the hit of assets, loans, equity, deposits, economic growth, inflation and market capitalization on major profitability blinkers like return on assets (ROA) ,return on equity (ROE), return on capital employed (ROCE) and net interest margin (NIM) one by one. The study constitute that both the internal and external factors have a solid influence on the banks profitability.

Paolo Saona Hoffmann (2011) tried out the determinants of profitability of the banks operating in US for the period of 1995-2007.The study undertakes the internal and external factors affecting the profitability of banks in US economy. The study found that there is a negative relationship between the capital ratio and profitability which affirms the believe that banks are working most carefully and dismissing potentially profitable trading chances. The cost advantages due to the bank size do not impact on the profitability of the banking industry of US.

Syeda Anum Javed Bukhari (2012) analyzed the internal and external factors that affect on the profitability of 11 commercial banks operating in Pakistan for the period of 2005-2009.The study uses the regression analysis to implicate the result with the hypothesis. The findings from this research paper are that internal factors impact the profitability of the commercial banks whereas external factors do not impact.

Khizar Ali et.al (2011) analyzed the profitability factors impacting on the profit of the 22 commercial banks both public and private working in Pakistan for the period of 2006-2009.The study used the descriptive statistics, correlation and regression analysis. Return on assets (ROA) and return on equity (ROE) have been used as dependant variables and on the other hand internal and external factors have been used as independent variables. The results show that when the economic growth increases the profitability increases. And on the other side when the credit risk increases the profitability decreases.

Deger Alper (2011) probed the internal and external factors of banks profitability of Turkey for the period of 2002-2010.In this study the return on assets (ROA) and return on equity (ROE) both are the dependant variables and the function of internal and external factors. Profitability increases when the non interest income and asset size increases. And real interest rate in the external factors has positive effect on profitability.

Dr. Srinivas Madishetti et.al (2013) analyzed the profitability determinants of Tanzania commercial banks for the period of 2006-2012.Internal determinants use the variables like liquidity risk, credit risk, operating efficiency, business assets and capital adequacy and external determinants use the variables GDP growth rate and inflation rate. All of these variables are independent. The study found that internal variables determine the bank's profitability whereas external factors do not influence the profitability of commercial banks.

Abuzar (2013) studied the determinants of profitability of Islamic banks operating in Sudan. This study found that only the internal factors have the substantial impact on the profitability of the commercial banks. Cost, liquidity and the size of the banks have the positive relationship with the bank profitability. Macroeconomic or external factors have no substantial impact on profitability.

Alkassim (2005) examined the profitability of Islamic and conventional banks in GCC countries for the period of 1997-2004.He analyzed both the internal and external factors impacting on the profitability of Islamic and conventional banks. This study showed that asset quality of the conventional banks is better than others. Interest free lending impact on the profitability

of the Islamic bank and total expenditures impact on the profitability of the conventional banks operating in the GCC countries negatively.

Alpera and Anbar (2011) analyzed the internal and external factors of the commercial banks of Turkey for the period of 2002-2010.The study shows that non interest income and bank size have the positive impact on the bank profitability. And on the side of the macroeconomic or external factors only the real interest rates impact on the profitability of the commercial banks positively.

Vong and chan (2006) analyzed the impact of internal and external factors on the profitability of Macao banking industry for the period of 15 years. This study found that high capitalization leads to the high profitability and size of the bank increases the profitability its mean banks are enjoying the benefit of economies of scale. And on the other hand loan loss provision impact on the profitability of the Macao banking industry unfavorably.

The discussion I have written in the literature review affirms a strong relationship between the bank's profitability and the internal and external factors impacting the profitability of the banks. My research paper covers the gap in the literature by testifying the profitability of the commercial banks operating in Pakistan. In the literature review different independent variables have been used in each study but I have used cost efficiency, liquidity, capital adequacy, deposits and size of the bank as independent variables.

III. METHODOLOGY

My penal data covers the period of 4 years from 2009 to 2012 of 23 commercial banks operating in Pakistan (see appendix).All the data has been extracted from the financial statements of the commercial banks. My study looked into the relationship between the profitability and the internal factors impacting on profitability of the bank. For this aim I have used descriptive analysis (mean, median, minimum, maximum and standard deviation) Pearson correlation analysis and regression analysis to test the hypothesis.

3.1 VARIABLES

Explanation of dependant variable (ROA) and independent variables are as follows:

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \epsilon \quad \text{..... (1)}$$

Whereas:

Y presents Return on Asset

X_1 Presents cost efficiency

X_2 Presents liquidity

X_3 Presents Capital adequacy

X_4 Presents deposits

X_5 Presents size of the bank

ε = Error term.

My research paper does not cover all the profitability internal factors but limited to the followings:

Return on Assets: Return on assets shows the earning of single asset in rupees. For the measurement of the profitability ROA has been used in many studies. Return on assets can be easily calculated by the above formula. Return on assets shows the efficiency of the management to generate income. It is useful for comparing the companies in the same industry.Net profit in the formula of ROA is the profit after tax.

Return on assets = Net profit/Total assets

Cost efficiency: Cost efficiency means the per unit income generated. Cost efficiency measures that how much it is expensive for the bank operating in Pakistan to produce per unit of output. High total cost to total income ratio causes the lower profitability for the banks and low of the ratio shows the increase in the profit. It has been used as an independent variable in my study and can be calculated by the following formula.

Cost efficiency = Total cost/Total income

Liquidity: Liquidity can be used in the measurement of the profitability and can be calculated by the following equation. Liquidity is the amount of short term responsibilities that could be met with the amount of liquid assets.

Liquidity = Liquid assets/Customer deposits + Short term borrowed fund

Capital adequacy: This is another internal factor for the measurement of the profitability and the amount retained by the bank to meet the unexpected loss and danger involved. High of this ratio shows the high profitability and lower ratio causes in the decrease of the profitability. Capital adequacy can be calculated with the help of the following equation.

Capital adequacy = Total equity/Total assets

Deposits to assets: Deposit is another profitability blinker considered as liability. Deposits are the main source of the banks funding and has the important place in the profitability of the commercial banks. High deposits show high profit whereas low deposits show low profitability.

Deposits to assets = Total Deposits/Total Assets

Size of bank: Size shows the natural logarithm of total assets and has been used in many studies as an independent variable. Size of the bank shows the economies and diseconomies of scale. It would be beneficiary to take the natural logarithm of total assets before including in the modal.

Size of bank = Natural logarithm of Total assets

3.2 HYPOTHESIS

This study tries to test the following hypothesis:

H1: Negative relationship exists between cost efficiency and profitability.

H2: Negative relationship exists between liquidity and profitability.

H3: Positive relationship exists between capital adequacy and profitability.

H4: Positive relationship exists between deposits and profitability.

H5: Positive relationship exists between size of the bank and profitability.

IV. RESULTS

This section deals with the results of research paper like descriptive analysis, Pearson correlation analysis and regression analysis.

4.1 DESCRIPTIVE STATISTICS

Table.1 shows the descriptive analysis of the 23 commercial banks operating in Pakistan. Descriptive analysis includes mean, median, minimum, maximum and standard deviation.

Table 1.Descriptive analysis of the dependant variable and all the independent variables.

Rupees in millions

	Y (Return on assets)	X_1 (Cost efficiency)	X_2 (Liquidity)	X_3 (Capital adequacy)	X_4 (Deposits)	X_5 (Size of bank)
Mean	0.008131	0.679291	0.205065	0.138149	0.722864	11.80246
Median	0.008939	0.602791	0.116729	0.105469	0.776188	11.97486
Maximum	0.053020	2.087927	1.762712	0.613910	0.893124	14.29194
Minimum	-0.058989	0.265136	0.051592	0.050931	0.237228	9.020632
Std. Dev.	0.014268	0.331183	0.289851	0.108323	0.147393	1.411804
Observations	92	92	92	92	92	92

The mean and median of Y (ROA) are 0.008131 and 0.008939 respectively for the Pakistanis commercial banks for the study period undertaken. Minimum value is -0.058989 and 0.053020 is the maximum value in the data set. The data set has the standard deviation of 0.014268 which is low and indicates that there is very low variation in the data set and more close to the mean and there is possibility to increase profitability in future.

It is clear cut from the above table that X1 (cost efficiency) have the mean and median 0.679291 and 0.602791 respectively for the study period. Minimum value of the cost efficiency is 0.265136 and 2.087927 is the maximum value of the given data set. The data set has showed the standard deviation equal to 0.331183.The increase in cost efficiency means the increase in operating expenses go through by the commercial banks.

X2 (liquidity) of the commercial banks has showed the mean and median for the given data set 0.205065 and 0.116729 respectively. Liquidity shows the minimum value equal to 0.051592 and 1.762712 is maximum value over the study period and given data set. My data set of liquidity has experienced standard deviation equal to 0.289851 which is minimum and closes to the mean value.

The mean and median of X3 (capital adequacy) are 0.138149 and 0.105469 respectively for the Pakistanis commercial banks for the study period undertaken. Minimum value is 0.050931 and 0.613910 is the maximum value in the data set. The data set has the standard deviation of 0.108323 which is low and also close to mean value. Achieving high level of the capital adequacy ratio is the sign of having more capital to hedge against the risk.

Table 1 shows the mean and median values of X4 (deposits) equal to 0.722864 and 0.776188 respectively. Deposits show the minimum value equal to 0.237228 and 0.893124 is maximum value over the study period and given data set. My data set of deposits has experienced standard deviation equal to 0.147393 which is not closely to mean value in given data set.

X5 (size of bank) has showed the values of mean and median equal to 11.80246 and 11.97486 respectively.14.29194 is the maximum value in the given data set and 9.020632 is the minimum value in the study period undertaken. Standard deviation has registered the value equal to 1.411804 which is far from the value of mean that indicates that our data set is highly dispersed from mean. This is due to the fact that I have taken in my study various size of bank.

4.2 CORRELATION ANALYSIS

Correlation analysis was used in this study to find out the relationship between variables.

Table 2.Correlation Matrix

Rupees in millions

	Y (Return on assets)	X_1 (Cost efficiency)	X_2 (Liquidity)	X_3 (Capital adequacy)	X_4 (Deposits)	X_5 (Size of bank)
Y (Return on assets)	1.000000					
X_1 (Cost efficiency)	-0.786265	1.000000				
X_2 (Liquidity)	0.079586	-0.018396	1.000000			
X_3 (Capital adequacy)	0.068807	0.096491	0.878731	1.000000		
X_4 (Deposits)	-0.052498	-0.056350	-0.675934	-0.842304	1.000000	
X_5 Size of bank)	0.287635	-0.465592	-0.499699	-0.590277	0.439796	1.000000

Cost efficiency (X_1) has the strong negative relationship with return on assets (Y) and liquidity (X_2), capital adequacy (X_3) both have weak positive correlation with return on assets (Y).And on the other hand deposits (X_4) has the weak negative relationship with the return on assets (Y) and size of the bank (X_5) has the weak positive relationship with the bank profitability or return on assets (Y).

4.3 REGRESSION ANALYSIS
Dependant Variable: ROA
Method: Least Squares
Included Observations: 92

Table 3: Regression Analysis

Rupees in millions

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X_1 (Cost efficiency)	-0.036168	0.003219	-11.23529	0.0000
X_2 (Liquidity)	-0.016913	0.006843	-2.471536	0.0154
X_3 (Capital adequacy)	0.078203	0.026112	2.994954	0.0036
X_4 (Deposits)	0.016182	0.011707	1.382240	0.1705
X_5 (Size of bank)	2.04E-05	0.000915	0.022303	0.9823
C	0.013426	0.017453	0.769244	0.4439
R-Squared		**0.67**		

Adjusted R-Squared	0.65
F	34.20
Sig. Prob (F-Statistic)	0.000
Durbin-Watson	1.99

I have selected my model for the bank's profitability on the basis of high value of R-Squared. Above mentioned table 3 represents the result of regression analysis. The value of **R-Squared** is **0.67** in my model which shows that 67% variation in the dependant variable or ROA is described by the independent variables of the commercial banks of Pakistan and 33% variation is not explained by the independent variables or internal factors. The value of **F=34.20** and is significant supporting the model relevant to the study. The value of **Durbin Watson** is **1.99** which shows that there is no autocorrelation in residuals. The other results suggest that cost efficiency has the negative significant relationship with the ROA .This negative relationship shows that when the cost efficiency ratio increases profitability of the commercial banks decreases. Syafri (2012) has showed the same result in case of cost efficiency. Liquidity shows the significant negative relationship with the dependant variable which shows high loan loss or high cost of intermediation. Inconsistent result has been found by the Ritab al Khouri (2012).Equity of the commercial banks establishes the significant positive relationship with dependant variable which means banks with high capitalization shows high profitability. Saira javaid et al (2012) has showed the same result. Total deposits are the part of my study and have been used as independent variable in my research. Deposits depict the positive relationship in my research. The same result has been showed by the Sehrish Gul, Faiza Irshad and Khalid Zaman (2011). Size of the bank shows the natural logarithm of total assets and demonstrates insignificant positive relationship with the profitability of commercial banks which means that the size of the bank does not lead any type of profitability for the commercial banks either bank is small or large. Advantage of the economies of scale is not available for the banks operating in Pakistan. The same result has been found by the Ani,W.U et.al (2012).

V. SUMMARY OF HYPOTHESIS

H1: Negative relationship exists between cost efficiency and profitability. Accepted
H2: Negative relationship exists between liquidity and profitability. Accepted
H3: Positive relationship exists between capital adequacy and profitability. Accepted
H4: Positive relationship exists between deposits and profitability. Rejected
H5: Positive relationship exists between size of the bank and profitability. Rejected

VI. CONCLUSION

In my study I have analyzed the impact of internal or managerial factors on the profitability of the commercial banks operating in Pakistan for the period of 2009 to 2012.My findings in this regards are:

- High cost efficiency (X_1) leads lower profitability. The negative value of the coefficient indicates this that negative relationship exists between cost efficiency and profitability. Its mean when profitability increases cost efficiency decreases.
- Liquidity (X_2) and profitability of the commercial banks develop the negative relationship which is clear from the negative value of the coefficient and this relationship also significant. High liquidity mean that banks have less deposits and short term borrowed fund.
- Capital adequacy (X_3) and deposits (X_4) both formulate the positive relationship with the profitability of commercial banks as clear from the values of coefficient but only capital adequacy develops the significant relationship while on the other hand deposits develop insignificant relationship which means that deposits do not lead any type of profitability for commercial banks.
- Size of the bank (X_5) and profitability (Y) show insignificant positive relationship which means that size does not lead any type of profitability for the commercial banks or banks are not attaining the advantage of economies of scale.
- Overall it is resolved that cost efficiency, liquidity, capital adequacy, deposits and size are the major internal determinants of profitability of commercial banks in Pakistan.

Further research can be done in this field by including more internal factors like loans, credit risk and bank charges and external factors as well.

APPENDIX

S.No	Banks Name
1	Habib Bank Limited
2	National Bank of Pakistan
3	United Bank Limited
4	MCB Bank Limited
5	Allied Bank Limited
6	Bank Alfalah Limited
7	Bank Al-Habib Limited
8	Standard Chartered Bank Limited

9	Askari Bank Limited
10	Bank of Punjab
11	Habib Metropolitan Bank Limited
12	Meezan Bank Limited
13	NIB Bank Limited
14	Soneri Bank Limited
15	JS Bank Limited
16	The Bank of Khyber
17	Bank Islami Pakistan Limited
18	Albaraka Bank Limited
19	Dubai Islamic Bank Limited
20	HSBC Middle East Limited
21	Samba Bank Limited
22	First Women Bank Limited
23	Bank of Tokoyo Mitsubishi

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Length-Weight relationship and condition factor of *Semiplotus semiplotus* (McClelland, 1839) from Dikrong River, Arunachal Pradesh, India

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Abstract- The length -weight relationship and condition factor (K) of *Semiplotus semiplotus* (McClelland, 1839), were studied for an economically important species of food fish from the Dikrong river system of mountainous state of Arunachal Pradesh, India. A total of 120 specimens were randomly collected using cast net and related contraptions from the water bodies and length (mm) and weight (g) of each of the specimen was measured following standard equipments. The result revealed that length- weight of the species followed the cube-law indicating an isometric growth pattern of the species in its natural habitat. The length –weight regression equation for the species in general can be expressed as Log W = -2.7259+3.04269logTLand the length-weight regression equations of males, females and juveniles respectively were Log W = -2.7242+ 3.0926log TL, Log W = -2.7635+ 3.2592 log TL and Log W = -1.2375 + 2.6135 log TL having r value respectively 0.90674 , 0.98107,0.959 for each cases . All these values indicate positive correlation between length and weight in *Semiplotus semiplotus* in regard to their sex as well as growth stages. General wellbeing of the fish is found to be good, as indicated by the values of condition factor, which were nearer to or greater than 1.

Index Terms- *Semiplotus*, Dikrong river, condition factor, isometric growth.

I. Introduction

The generation of information on length-weight relationship of any species of fish has great significant in fish biology and has several applications in the subject. The parameters like general well-being of any fish species either in its natural habitat or cultivable environment, comparison of growth pattern, onset of maturity spawning, fecundity *etc*., can be assessed with the help of length –weight relation and condition factor[21],[38]. *Semiplotus semiplotus* (McClelland, 1839) wild endemic cyprinidae fish species distributed all the river system of Arunachal Pradesh, very scanty biological information is available still. Moreover, this cyprinid fish is most preferred food fish of the people of the state and the population of this fish is rapidly declining in its habitat probably due to over exploitation along with indiscriminate habitat destruction for various developmental activities. An approach towards conservation and management of the population of this particular fish species demands the generation of information for its length-weight relationship and condition factor from its natural habitat. Estimation of the population size of a fish stock for the purpose of its rational exploitation often requires knowledge of these relationships [21], [11]. Length–weight relationships can also be used to know the growth pattern of the fish in the culture system. It is also used to estimate fish biomass from length frequency distributions, infer fish condition, and to compare life history and morphological aspects of fish populations inhabiting different region [31], [38]. Length-weight relationship establishes the mathematical relationship between length and weight of fish [6]. Inter-conversions of these variables are required for setting up of yield equations, hence leads to information about the body forms of different groups of fishes and its growth pattern. Length-weight relationship also provides information on the changes in the well being of the fishes that happens during their life cycle. This can be estimated by comparing the expected weight estimated by using the length-weight relationship with actual weight of fish. Like other morphometric measurements, length-weight relationships may change during the events of life cycle like metamorphosis, growth and onset of maturity [21].Length-weight relationships can be used as character for differentiation of taxonomic units. An already established length-weight relationship will be useful for assessing the data that contains only length frequency measurements. This relationship can be used in setting up of yield equations, estimate the number of fishes landed and for comparing the population over space and time [5].The relative condition factor in preference to condition factor as the latter is influenced by many environmental and biological factors [21]. Condition factor measures the deviation from a hypothetical ideal fish whereas relative condition factor measures the deviation from the average weight or length of fish.
The relationship between the length (L) and weight (W) of a fish is usually expressed by the equation $W=aL^b$. Values of the exponent 'b' provide information on fish growth. When b=3, increase in weight is isometric. When the value of b is other than 3, weight increase is allometric (positive if b>3, negative if b<3.This parameters (a, b) are important in stock assessment studies. Generally, in fishes the growth pattern follows the cube law indicating isomeric growth [7], [19]. In such cases, the exponential value must be exactly 3.However; environmental stressors may affect the actual relationship between length and weight changing the ideal value [21],[23], [28], [14], [35], [30].Length-weight relationship and condition factor of various fishes have been reported earlier[21], [20], [26],[29], [36], [37], [12],[9], [10],[3],[27].

With the above backdrop, a research activities was designed to find out length-weight relationship and condition factor *in-situ* for the *Semiplotus semiplotus* a potential food fishes for mountain aquaculture so that comparison of well being of the fish can be compared with the population under captive condition expressing values in numerical terms *i.e.*, condition of health, relative strength, fatness *etc*., compared to in-*situ* habitat. This article describes the whole study the in detail which seems to be valuable information for the fishery biologists, conservation specialist and aquaculture specialists trying to develop hill aquaculture in eastern Himalayan region of India.

II. Materials and Methods

The sampling of fishes were carried out in the river Dikrong, flowing within the latitude 27°08'19" N and longitude 93°44'51" E having average elevation of 120 meter from the mean sea level in state of Arunachal Pradesh and finally drained into the river Brahmaputra in Assam. The Dikrong River is one of the major tributary of Brahmaputra drainage system in the states having diversified fish species including moderate population of a cyprinid species *Semiplotus semiplotus*. A total of 120 fish samples including male, female and juveniles of *Semiplotus semiplotus* were collected from November 2011 to December 2012. (29 males and 40 females and 51 juveniles), ranging from 80.0mm-285.0 mm cm in total length (TL) and 6.5g to 330g in weight were used for the length-weight analysis. Fishes were caught by gill nets and cast nets. The samples were transported to the laboratory in oxygenated polythene bags. Dead fishes were kept in deep freezer. Prior to weight and length measurements the fishes were taken out from the freezer and allowed to thaw. Length of fish was measured to the nearest 1.0 mm and weight up to 0.1 g. The fishes were then sexed by observing the gonads after dissection. . Total length (cm) of each fish was taken from the tip of the snout to the extended tip of the caudal fin using digital calipers. Body weight (g) of each fish was taken to the nearest to 1.0 g using a electronic balance (Kern)

The relationship between the length (L) and weight (W) of a fish is first proposed by Huxley (1924) the allometric growth formula to describe the relationship between length and in the form $W=aL^b$, Where W stands for weight,L for length ,a is a constant and b the exponent. The equation expressed logarithmically as suggested by Le Cren (1951)- LogW=Loga+blogL, where 'a' is a constant being initial growth and 'b' is the growth coefficient.

The values of constant a and b were estimated from the log transformed values of length and weight to log W = log a + b log L, via least square linear regression. All the statistical analysis was done in Excel 2007

A) Condition factor and Relative condition factor: Individual variation from general length-weight relationships have been studied under the general name condition [21].Such changes in condition factor or "K-factor" or ponderal index, which has been calculated by using Hille (1936)[15] and Backman (1948) [4] proposed the following
Formula to determine the condition factor (K)

$$K=W\times100/L^3$$

Where, K=Condition factor
W=weight of the fish and
L=Length of the fish

The number 100 is a factor to bring the ponderal index (K) to near unity [8].The condition factor of a fish is influenced by the seasonal changes of gonads and also by the feeding intensity.

The relative condition (Kn) of each size group was estimated by the equation Kn=W\w used by Weatherly (1972) [41] and others, where W= observed weight, w= mean weight of each size group calculated from length- weight relationship. All the statistical analysis was done in Excel 2007.

III. Results

The entire sexed length-weight data of *Semiplotus semiplotus* were pooled in to a single equation which was calculated as:
LogW= −2.7259+3.04269logTL (r=0.9421)
Where, W = Total weight; TL = Total length; r = Correlation coefficient

The calculated correlation coefficient (0.9421) showed a positive correlation between length and weight of the fish. The parabolic equation was $W=0.00191023L^{3.042}$ .The value of 3.043 obtained for b clearly indicated that the length-weight relationship follow the cube law showing isometric growth of the species in it natural habitat

Parabolic and logarithmic graph prepared separately for male, female and juvenile from the collected data showed a straight line relationship in each of the cases of males and females and parabolic line showed in the case of juveniles (Fig. 4 and 5).Various descriptive statistical parameters and relevant equations on length-weight relationship of *Semiplotus semiplotus* are presented in Table 1

A) Length-weight relationship in males, females and Juveniles:

The length-weight relationship in males was based on the examination of specimens ranging from 132 to 285 mm and that in females from 212 to273 mm in total length. The regression equation for male *Semiplotus semiplotus* was estimated to be Log W = -2.7242+ 3.0926log TL (r = 0.90674) .The regression equation for females estimated was: Log W = -2.7635+ 3.2592 log TL (r= 0.98107).The length-weight relationship in juveniles of *Semiplotus semiplotus* was based on the examination of specimens ranging from 80 to 116 mm in total length. The regression equation for juvenile was estimated as: Log W = -1.2375 + 2.6135 log TL (r = 0.959).

B) Condition factor and Relative condition factor:

The condition factors (K) and Relative condition factor (Kn) have been calculated for each 10 mm length groups and the results are presented in Table 2.and Figure 6 .The 'K' value showed its peak in length group IX (161-170mm) and lowest value showed in length group II (91-100).The relative condition factor is varies from 0.9-2.0

Discussion

Length-weight relationship establishes the mathematical relationship between length and weight of fish [6]. Inter-conversions of these variables are required for setting up of yield equations, hence leads to information about the body forms of

different groups of fishes and its growth pattern. Length-weight relationship also provides information on the changes in the well being of the fishes that happens during their life cycle. This can be estimated by comparing the expected weight estimated by using the length-weight relationship with actual weight of fish. Like other morphometric measurements, length-weight relationships may change during the events of life cycle like metamorphosis, growth and onset of maturity [21].

The values of length-weight regression coefficient "b" for *Semiplotus semiplotus* males (3.0926), females (3.2592) and sexes combined (3.0426) were indicate the isometric growth pattern of the fish. The 'b' value of juvenile indicate negative allometric (b>3) growth pattern. The value of regression co-efficient (b) usually lies between 2.5 and 4.0 [15]. The value of 'b' might be in between 2.0 and 4.0[40]. However, a variation in 'b' value may occur due to different environmental factors. An intraspecific difference in the power function 'b' of length in relation to body weight in *Rita rita*, *Sardinella albella*, *Sardinella gibbosa* and *Acrossocheilus hexagonolepis*, respectively at different stages of their growth[20], [34], [9]. The 'b' values is greater than 3 in the case of *Labeo rohita* was observed by many biologist [12], [17], [18]. Isometric pattern of growth was also observed by Narejo *et al*. (2002) in *Monopterus cuchia* [27].The value of regression coefficient was reported in *Labeo calbasu* was 3 from Loni River, in Madhya Pradesh, India [29].Similar observations were also reported in *Garra gotyle* from river Bhagirathi, in *Strongylura leiura*, *Ablennes lians*, and in *A. hexagonolepis* and in *Nemipterus japonicas* [10], [33], [9],[32] .Similar results were also reported for b in males and females of *A. hexagonolepis* and in *Monopterus cuchia* ,[9], [27]. The value of regression coefficient in *Labeo calbasu* as 3.0 from Loni reservoir, M. P. India [29]. The value of regression coefficient wass recorded as 3.16 for *Hilsa* males and females from Iraq[1].The values of 'b' was reported as 3.16 for males and 3.20 for females in *Labeo bata* from Bangladesh[3].The value of 'b' was calculated as 3.02 for males and 3.03 for females in *Tenualosa ilisha* from Pakistan[27]. However, a variation in 'b' value may occur due to difference in environmental factors. The value of 'b' remains constant at 3.0 for an ideal fish [2].

The 'b' value of juveniles of *Semiplotus semiplotus* was observed negative allometric growth pattern (b>3) (2.6135) and the values was found to be greater than '3' and equal to '3'(3.2592) in case of females and males(3.0926) due to environmental condition, food competition,trophic potential of the river etc. The seasonal changes, notably the period during and immediately after spawning, affect the length-weight relationship. Weight of the gut contents may also alter fish weights, depending upon the food ingested just before weighting [25].

The correlation coefficient of male, female, juvenile and pooled data (Table: 1) showed a very high degree of correlation between length and weight in *Semiplotus semiplotus.* The similar type of observations was observed in *Labeo rohita* from Ganga basin in India [24].

The condition factor of *Semiplotus semiplotus* showed variation in different length groups, it was noticed that the K was higher when fish entered into the maturation phase (Figure.6). The length group 161-280mm showed highest K value because of maturity stages of the fish ranges in this lengths. K showed slightly lower values in the juvenile length group and after spawning groups. The environmental factors, food supply and parasitism have great influence on the health of the fish [21]. The differences in condition factors seasonally could be attributed to low feeding intensity and degeneration of ovaries during winter and high feeding intensity and full development of gonads during summer months. Comparatively high values of K during winters could be attributed to high deposition of fats as preparation for the coming breeding season. The values of relative condition factor Kn showed fluctuations in all size groups of males and females. The highest Kn values observed in the length group IX (161mm-170mm) (Figure.6).

The members of one population sampled on a single date, there may be considerable variation in condition with length. Fish populations display considerable variations in average condition, reflecting normal seasonal fluctuations in their metabolic balance and in the pattern of maturation and subsequent release of reproductive products (Goswami, 2008). It has been reported that feeding intensity may also influence the 'K'factor (Wheatherley, 1972).

The present studies provide the first hand information about the growth pattern and relative conditions of *Semiplotus semiplotus* from its in-situ habitat. This study will help biologists to know the status of this fish and develop culture technology in natural waters and will be useful for the fishery biologists and conservation biologist, for successful development, management, production and ultimate conservation of the most preferred food fishes of the states.

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Figures:

Figure 1: *Semiplotus semiplotus* (Male)

Figure 2: *Semiplotus semiplotus* (Female)

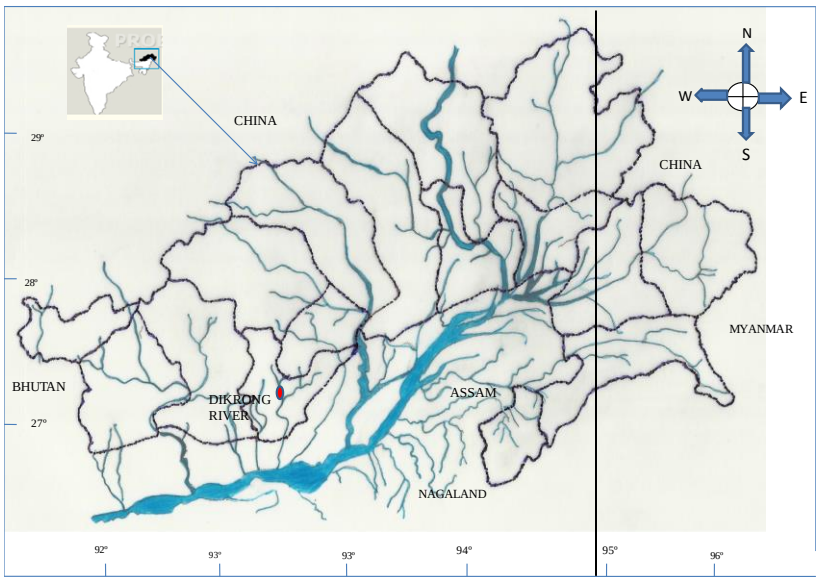

Figure 3: Map showing the sampling sites of *Semiplotus semiplotus.*

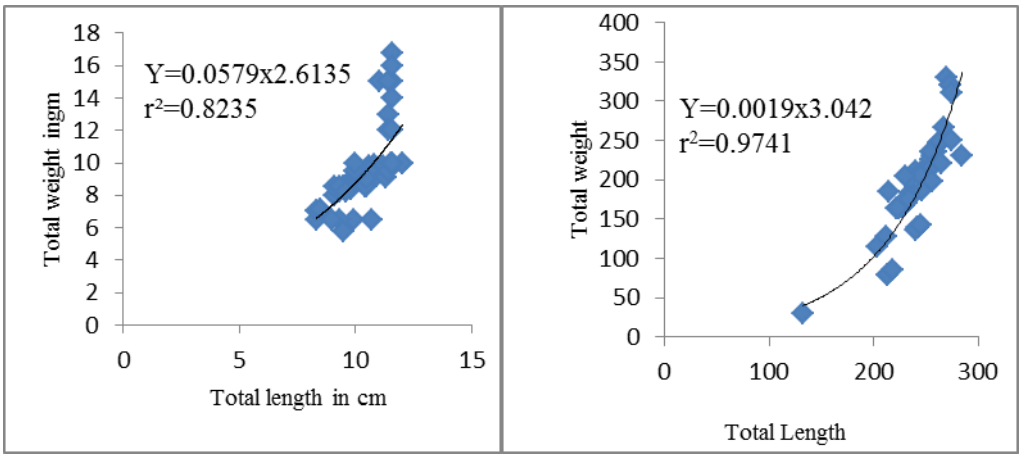

Figure 4: Length-Weight relationship of juveniles and sexed groups.

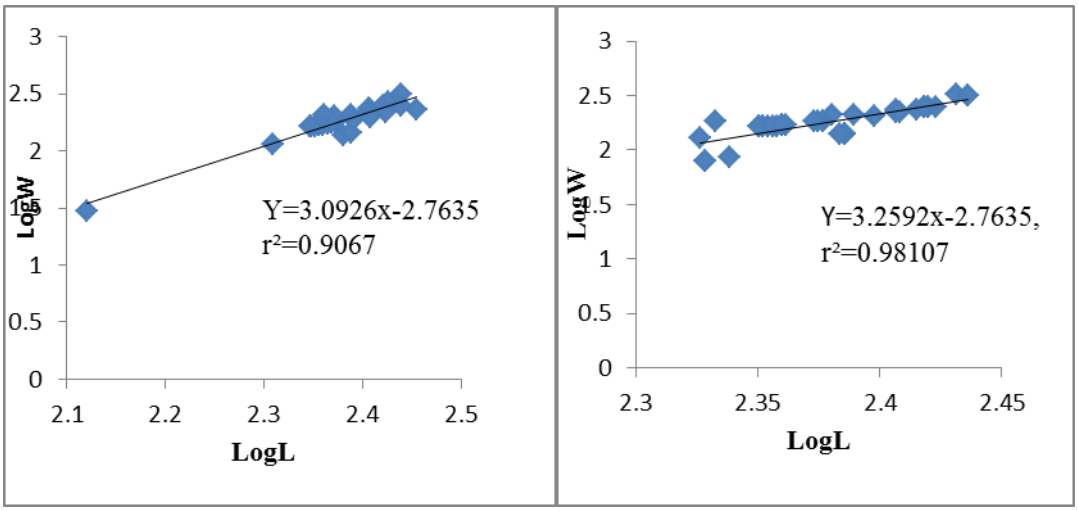

Figure 5: Length-weight relationship of males and females of *Semiplotus semiplotus.*

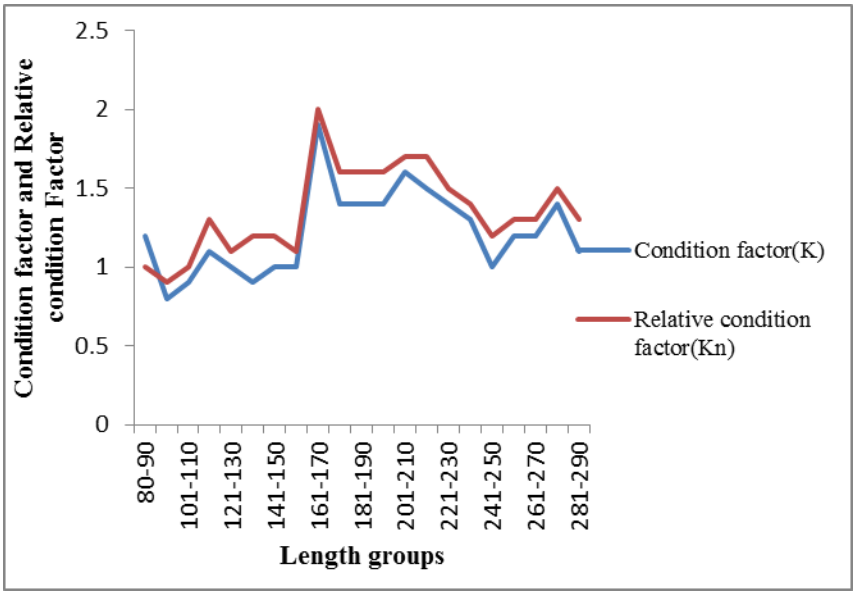

Figure: 6.Condition factor (K) and Relative Condition factor (Kn) of different size groups of *Semiplotus semiplotus.*

Tables:

Table1: Descriptive statistics and estimated parameters of length-weight relationships for *Semiplotus semiplotus* from Dikrong River Arunachal Pradesh, India.

Sample	Sample Size	Length range(mm)	b value	a value	R^2	95% CL of b	Parabolic equation
Female	40	212-273	3.2592	0.0017	0.9810	3.504-2.99	$W=0.0017365L^{3.2592}$
Male	29	132-285	3.0926	0.0019	0.9067	3.344-2.835	$W=0.00190L^{3.0926}$
Pooled (Sexed	69	132-285	3.0426	0.0019	0.9421	3.33-2.8212	$W=0.00191023L^{3.042}$
Juveniles (Unsexed	51	80-116	2.6135	0.057	0.959	2.867-2.358	$W=0.0579L^{2.6135}$

Table 2: Condition factor (K) and Relative Condition factor (Kn) in different length groups of *Semiplotus semiplotus.*

Sample size group(mm)	Condition factor(K) (mean ±SE)	Relative condition factor(Kn)(mean ± SE)
I.80-90	1.2±0.01	1.0±0.01
II.91-100	0.8±0.04	0.9±0.03
III.101-110	0.9±0.04	1.0±0.04
IV.111-120	1.1±0.04	1.3±0.05
V.121-130	1.0±0.01	1.1±0.01
VI.131-140	0.9±0.01	1.2±0.03
VII.141-150	1±0.01	1.2±0.01
VIII.151-	1±0.01	1.1±0.02
160	1.9±0.03	2.0±0.01
IX.161-170	1.4±0.04	1.6±0.03

X.171-180	1.4±0.04	1.6±0.01
XI.181-190	1.4±0.07	1.6±0.01
XII.191-200	1.6±0.09	1.7±0.01
XIII.201-210	1.5±0.01	1.7±0.03
XIV.211-220	1.4±0.1	1.5±0.02
XV.221-230	1.3±0.05	1.4±0.05
XVI.231-240	1±0.08	1.2±0.06
XVII.241-250	1.2±0.03	1.3±0.03
XVIII.251-260	1.2±0.02	1.3±0.01
XIX.261-270	1.4±0.05	1.5±0.05
XX.271-280	1.1±0.07	1.3±0.01
XXI.281-290		

Achieving Mutual Trust and Empowering Dynamic Data in Cloud Storage

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Abstract- The management of vast amount of data is quite expensive due to the requirements of high storage capacity and qualified personnel. Storage-as-a-Service (SaaS) offered by cloud service providers (CSPs) is a paid facility that enables organizations to outsource their data to be stored on remote servers. Thus, SaaS reduces the maintenance cost and mitigates the burden of large local data storage at the organization's end. A data owner pays for a desired level of security and must get some compensation in case of any misbehavior committed by the CSP. On the other hand, the CSP needs a security from any false accusations that may be claimed by the owner to get dishonest compensations. In this paper, a cloud-based storage scheme is proposed that allows the data owner to benefit from the facilities offered by the CSP and enables indirect mutual trust between them. The proposed scheme has four important features: (i) it allows the owner to outsource sensitive data to a CSP, and perform full block-level dynamic operations on the outsourced data, i.e., block modification, insertion, deletion, and append, (ii) it ensures that authorized users (i.e., those who have the right to access the owner's file) receive the latest version of the outsourced data, (iii) it enables indirect mutual trust between the owner and the CSP, and (iv) it allows the owner to grant or revoke access to the outsourced data. We discuss the security issues of the proposed scheme.

Index Terms- Storage-as-a-Service mutual trust, access control, Cloud storage, Data outsourcing

I. Introduction

Cloud computing is based on the fundamental principle of reusability of IT capabilities. It is a large-scale distributed computing paradigm in which a pool of computing resources is available to users (cloud consumers) via the Internet Computing resources, e.g., processing power, storage, software, and network bandwidth, are represented to cloud consumers as the accessible public utility services. Distributed processing, parallel processing and grid computing together emerged as cloud computing. Cloud computing is a distributed computational model over a large pool of shared-virtualized computing resources (e.g., storage, processing power, memory, applications, services, and network bandwidth). Cloud service providers (CSPs) offer different classes of services (Storage-as-a-Service (SaaS), Application-as-a-Service, and Platform-as-a-Service) that allow organizations to concentrate on their core business and leave the IT operations to experts. The users can access the stored data at any time by using Application Programming Interface (API) provided by cloud providers through any terminal equipment connected to the internet. Though cloud computing is targeted to provide better utilization of resources using virtualization techniques and to take up much of the work load from the client, it is fraught with security risks. Cloud computing is the long dreamed vision of different organizations produce a large amount of sensitive data including personal information, electronic health records, and financial data. While there is an observable drop in the cost of storagehardware, the management of storage has become more complex and represents approximately 75% of the total ownership cost SaaS offered by CSPs is an emerging solution to mitigate the burden of large local data storage and reduce the maintenance cost via the concept of outsourcing data storage.

Since the owner physically releases sensitive data to a remote CSP, there are some concerns regarding confidentiality, integrity, and access control of the data. For example, in e-Health applications inside the USA the usage and disclosure of protected health information should meet the policies admitted by Health Insurance Portability and Accountability Act (HIPAA) , and thus keeping the data private on the remote storage servers is not just an option, but a demand. The confidentiality feature can be assured by the owner via encrypting the data before outsourcing to remote servers. The proposed model provides trusted computing environment by addressing important issues related to outsourcing the storage of data, namely confidentiality, integrity, access control and mutual trust between the data owner and the CSP. This means that the remotely stored data should be accessed only by authorized users (i.e., those who have the right to access the owner's file) and should remain confidential. The CSP needs to be safeguarded from any false accusation that may be claimed by a data owner to get illegal compensations.

The access control techniques assume the existence of the data owner and the storageservers in the same trust domain. This assumption, however, no longer holds when the data is outsourced to a remote CSP, which takes the full charge of the outsourced data management, and resides outside the trust domain of the data owner. A feasible solution can be presented to enable the owner to enforce access control of the data stored on a remote untrusted CSP. Through this solution, the data is encrypted under a certain key, which is shared only with the authorized users. The unauthorized users, including the CSP, are not capable to access the data since they do not have the decryption key. This general solution has been widely incorporated into existing schemes], which aim at providing data storage security on untrusted remote servers. Another class of solutions utilizes attribute-based encryption (ABE) to achieve fine-grained access control. ABE is a public key cryptosystem for one-to-many communications that enables fine-grained sharing of encrypted data. The ABE associates the ciphertext with a set of attributes, and the private key with an access

structure (policy). The ciphertext is decrypted if and only if the associated attributes satisfy the access structure of the private key. Different approaches have been investigated that encourage the owner to outsource the data, and offer some sort of guarantee related to the confidentiality, integrity, and access control of the outsourced data. These approaches can prevent and detect (with high probability) malicious actions from the CSP side. On the other hand, the CSP needs to be safeguarded from a dishonest owner, who attempts to get illegal compensations by falsely claiming data corruption over cloud servers. This concern, if not properly handled, can cause the CSP to go out of business.

In this work, we propose a scheme that addresses some important issues related to outsourcing the storage of data, namely data dynamic, newness, mutual trust, and access control. One of the core design principles of data outsourcing is to provide dynamic scalability of data for various applications. This means that the remotely stored data can be not only accessed by authorized users, but also updated and scaled by the owner. After updating, the authorized users should receive the latest version of the data (newness property), i.e., a technique is required to detect whether the received data is stale. This issue is crucial for applications in which critical decisions are taken based on the received data. For example, in e-Health applications a physician may write a prescription based on a patient's medical history received from remote servers. If such medical data is not up-to-date, the given prescription may conflict with the patient's current circumstances causing severe health problems. Mutual trust between the data owner and the CSP is another imperative issue, which is addressed in the proposed scheme. A mechanism is introduced to determine the dishonest party, i.e., misbehavior from any side is detected and the responsible party is identified. Last but not least, the access control is considered, which allowsthe data owner to grant or revoke access rights to the outsourced data.

II. MAIN CONTRIBUTIONS

Our contributions can be summarized in two main points.

1) The design and implementation of a cloud-based storage scheme that has the following features:

- It allows a data owner to outsource the data to a remote CSP, and perform full dynamic operations at the block-level, i.e., it supports operations such as block modification, insertion, deletion, and append
- It ensures the newness property, i.e., the authorized users receive the most recent version of the data
- It establishes indirect mutual trust between the data owner and the CSP since each party resides in a different trust domain
- It enforces the access control for the outsourced data

2) We discuss the security features of the proposed scheme. Besides, we justify its performance through theoretical analysis and experimental evaluation of storage, communication, and computation overheads.

2. LITERATURE REVIEW

Existing research close to our work can be found in the areas of reliability verification of outsourced data, access control of outsourced data, and cryptographic file systems in distributed networks.

In 1999, sales- force.com was established by Parker Harris, Marc Benioff. They applied many technologies of consumer web sites like Google and Yahoo! to business applications. They also provided the concept's like ''On demand'' and ''SaaS'' with their real business and successful customers. Cloud data storage (Storage as a Service) is an important service of cloud computing referred as Infrastructure as a Service (IaaS). Amazon's Elastic Compute Cloud (EC2) and Amazon Simple Storage Service(S3) are well known examples of cloud data storage. Cloud users are mostly worried about the security and reliability of their data in the cloud. Amazon's S3 is such a good example.

Kallahalla et al designed a cryptography-based file system called Plutus for secure sharing of data on untrusted servers. Some authorized users of the data have the privilege to read and write, while others can only read the data. In Plutus, a file-group represents a set of files with similar attributes, and each file-group is associated with a symmetric key called file-lockbox key. A data file is fragmented into blocks, where each block is encrypted with a unique symmetric key called a file-block key. The file-block key is further encrypted with the file-lockbox key of the file-group to which the data file belongs. If the data owner wants to share a file-group with a set of users, the file-lockbox key is just distributed to them. Plutus supports two operations on the file blocks: read and write/modify. Delete operation can be supported by overwriting an existing block with null.

Goh et al. have presented SiRiUS, which is designed to be layered over existing file systems such as NFS (network file system) to provide end-to-end security. To enforce access control in SiRiUS, each data file (d-file) is attached with a metadata file (md-file) that contains an encrypted key block for each authorized user with some access rights (read or write). More specifically, the md-file represents the d-file's access control list (ACL). The d-file is encrypted using a file encryption key (FEK), and each entry in the ACL contains an encrypted version of the FEK under the public key of one authorized user. For large-scale sharing, the authors in presented SiRiUS-NNL that uses NNL (Naor-Naor-Lotspiech) broadcast encryption algorithm to encrypt the FEK of each file instead of encrypting using each authorized user's public key. SiRiUS supports two operations on the file blocks: read and write/modify.

Based on proxy re-encryption Ateniese et al. have introduced a secure distributed storageprotocol. In their protocol, a data owner encrypts the blocks with symmetric data keys, which are encrypted using a master public key. The data owner keeps a master private key to decrypt the symmetric data keys. Using the master private key and the authorized user's public key, the owner generates proxy re-encryption keys. A semi-trusted server then uses the proxy re-encryption keys to translate a ciphertext into a form that can be decrypted by a specific granted user, and thus enforces access control for the data.

Vimercati et al. have constructed a scheme for securing data on semi-trusted storage servers based on key derivation methods of In their scheme, a secret key is assigned to each authorized user, and data blocks are grouped based on users that can access these blocks. One key is used to encrypt all blocks in the same group. Moreover, the data owner generates public tokens to be used along with the user's secret key to derive decryption keys of

specific blocks. The blocks and the tokens are sent to remote servers, which are not able to drive the decryption key of any block using just the public tokens. The approach in allows the servers to conduct a second level of encryption (over-encryption) to enforce access control of the data. Repeated access grant and revocation may lead to a complicated hierarchy structure for key management.

Wang et al. designed an over-encryption to enforce access control has also been used by In their scheme, the owner encrypts the data block-by-block, and constructs a binary tree of the block keys. The binary tree enables the owner to reduce the number of keys given to each user, where different keys in the tree can be generated from one common parent node. The remote storage server performs over-encryption to prevent revoked users from getting access to updated data blocks.

Popa et al. have introduced a cryptographic cloud storage system called CloudProof that provides read and write data sharing. CloudProof has been designed to offer security guarantees in the service level agreements of cloud storage systems. It divides the security properties in four categories: confidentiality, integrity, read freshness, and write-serializability. CloudProof can provide these security properties using attestations (signed messages) and chain hash. Besides, it can detect and prove to a third party that any of these properties have been violated. Read freshness and write-serializability in CloudProof are guaranteed by periodic auditing in a centralized manner. The time is divided into epochs, which are time periods at the end of each the data owner performs the auditing process. The authorized users send the attestations – they receive from the CSP during the epoch – to the owner for auditing. Like Plutus and SiRiUS, CloudProof supports two operations on the file blocks: read and write/modify.

Discussion. Some aspects related to outsourcing data storage are beyond the setting of both PDP and POR, e.g., enforcing access control, and ensuring the newness of data delivered to authorized users. Even in the case of dynamic PDP, a verifier can validate the correctness of data, but the server is still able to cheat and return stale data to authorized users after the auditing process is done. The schemes have focused on access control and secure sharing of data on untrusted servers. The issues of full block-level dynamic operations (modify, insert, delete, and append), andachieving mutual trust between the data owners and the remote servers are outside their scope. Although have presented an efficient access control technique and handled full data dynamic over remote servers, data integrity, newness property, and mutual trust are not addressed. Authorized users in CloudProofare not performing immediate checking for freshness of received data; the attestations are sent at the end of each epoch to the owner for completing the auditing task. Instantaneous validation of data freshness is crucial before taking any decisions based on the received data from the cloud. CloudProof guarantees write-serializability, which is outside the scope of our current work as we are focusing on owner-write-users-read applications.

III. CURRENT DATA STORAGE CHALLENGES IN CLOUD

A cloud storage service provider should base its pricing on how much storage capacity a business has used, how much bandwidth was used to access its data, and the value-added services performed in the cloud such as security. Unfortunately, all the CSPS are not functioning in equal manners‟. Data storage paradigm in "Cloud" brings about many challenging design issues because of which the overall performance of the system get affected. Most of the biggest concerns with cloud data storage are:

3.1 Data integrity verification at un-trusted servers

For example, the storage service provider, which experiences Byzantine failures occasionally, may decide to hide the data errors from the clients for the benefit of their own. What is more serious is that for saving money and storage space the service provider might neglect to keep or deliberately delete rarely accessed data files which belong to an ordinary client. Consider the large size of the outsourced electronic data and the client's constrained resource capability, the core of the problem can be generalized as how can the client find an efficient way to perform periodical integrity verifications without the local copy of data files.

3.2 Data accessed by unauthorized users

The confidentiality feature can be guaranteed by the owner via encrypting the data before outsourcing to remote servers. For verifying data integrity over cloud servers, researchers have proposed provable data possession technique to validate the intactness of data stored on remote sites.

3.3 Location Independent Services

The very characteristics of the cloud computing services are the ability to provide services to their clients irrespective of the location of the provider. Services cannot be restricted to a particular location but may be requested from any dynamic location as per the choices of the customer.

3.4 Infrastructure and security

The infrastructure that is used for these services should be secured appropriately to avoid any potential security threats and should cover the life time of component.

3.5 Data recovery /Backup

For data recovery in cloud the user must concern the security as well as the bandwidth issue in consideration.

IV. SYSTEM AND ASSUMPTIONS

4.1 System Components and Relations

The cloud computing storage model considered in this work consists of four main components as illustrated in Fig. 1: (i) a data owner that can be an organization generating sensitive data to be stored in the cloud and made available for controlled external use; (ii) a CSP who manages cloud servers and provides paid storage space on its infrastructure to store the owner's files and make them available for authorized users; (iii) authorized users – a set of owner's clients who have the right to access the remote data; and (iv) a trusted third party (TTP), an entity who is trusted by all other system components, and has capabilities to detect/specify dishonest parties.

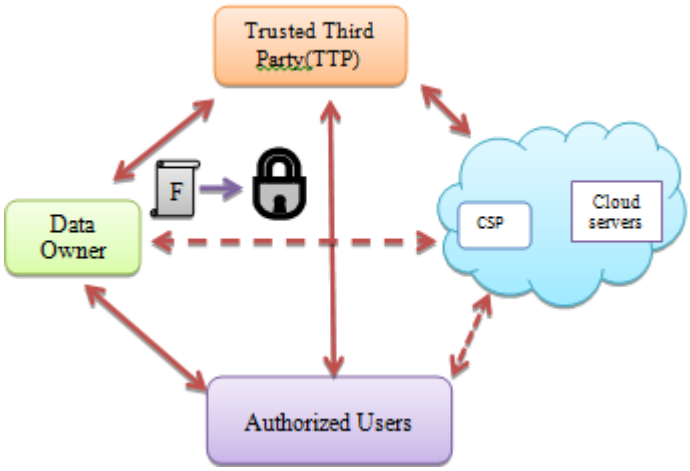

Fig. 1, Cloud data storage system model

In Fig. 1, the relations between different system components are represented by double-sided arrows, where solid and dashed arrows represent trust and distrust relations, respectively. For example, the data owner, the authorized users, and the CSP trust the TTP. On the other hand, the data owner and the authorized users have mutual distrust relations with the CSP. Thus, the TTP is used to enable indirect mutual trust between these three components. There is a direct trust relation between the data owner and the authorized users.

Statement 1: The idea of using a third party auditor has been used before in outsourcing data storage systems, especially for customers with constrained computing resources and capabilities .The main focus of a third party auditor is to verify the data stored on remote servers, and give incentives to providers for improving their services. The proposed scheme in this work uses the TTP in a slightly different fashion. The auditing process of the data received from the CSP is done by the authorized users, and we resort to the TTP only to resolve disputes that may arise regarding data integrity or newness. Reducing the storage overhead on the CSP side is economically a key feature to lower the fees paid by the customers. Moreover, decreasing the overall computation cost in the system is another crucial aspect. To achieve these goals, a small part of the owner's work is delegated to the TTP.

4.2 Block-Level operations

The data owner has a file F consisting of m blocks to be outsourced to a CSP, where storage fees are pre-specified according to the used storage space. For confidentiality, the owner encrypts the data before sending to cloud servers. After data outsourcing, the owner can interact with the CSP to perform block-level operations on the file. These operations includes modify, insert, append, and delete specific blocks. In addition, the owner enforces access control by granting or revoking access rights to the outsourced data. An authorized user sends a data-access request to the CSP, and receives the data file in an encrypted form that can be decrypted using a secret key generated by the authorized user.

The TTP is an independent entity, and thus has no incentive to collude with any party in the system. However, any possible leakage of data towards the TTP must be prevented to keep the outsourced data private. The TTP and the CSP are always online, while the owner is intermittently online. The authorized users are able to access the data file from the CSP even when the owner is offline.

4.3 Risk model

The CSP is untrusted, and thus the confidentiality and integrity of data in the cloud may be at risk. For economic reasons and maintaining a reputation, the CSP may hide data loss (due to hardware failure, management errors, various attacks), or reclaim storage by discarding data that has not been or is rarely accessed. To save the computational resources, the CSP may totally ignore the data update requests issued by the owner, or execute just a few of them. Hence, the CSP may return damaged or stale data for any access request from the authorized users. Furthermore, the CSP may not honor the access rights created by the owner, and permit unauthorized access for misuse of confidential data.

On the other hand, a data owner and authorized users may collude and falsely allege the CSP to get a certain amount of reimbursement. They may dishonestly claim that data integrity over cloud servers has been violated, or the CSP has returned a stale file that does not match the most recent modifications issued by the owner.

4.4 Requirements for Secure Storage

4.4.1 Confidentiality:

Outsourced data must be protected from the TTP, the CSP, and users that are not granted access.

4.4.2 Integrity:

Outsourced data is required to remain intact on cloud servers. The data owner and authorized users must be enabled to recognize data corruption over the CSP side.

4.4.3 Newness:

Receiving the most recent version of the outsourced data file is an imperative requirement of cloud-based storage systems. There must be a detection mechanism if the CSP ignores any data-update requests issued by the owner.

4.4.4 Access control:

Only authorized users are allowed to access the outsourced data. Revoked users can read unmodified data, however, they must not be able to read updated/new blocks.

4.4.5 CSP's defense:

The CSP must be safeguarded against false accusations that may be claimed by dishonest owner/users, and such a malicious behavior is required to be revealed.

Combining the confidentiality, integrity, newness, access control, and CSP's defense properties in the proposed scheme enables the mutual trust between the data owner and the CSP. Thus, the owner can benefit from the wide range of facilities offered by the CSP, and at the same time, the CSP can mitigate the concern of cheating customers.

4.5 System Preliminaries

4.5.1 Lazy Revocation

The data owner can revoke the rights of some authorized users for accessing the outsourced data, the user can access the unmodified data block he cannot access the updated or new block.

4.5.2 Key Rotation

Key rotation is the technique user can generate a sequence of key by using initial key and a master secret key it has to property (i) the owner of the master secret key can generate next key in sequence (ii) Authorized users knowing the sequence of key can generate the previous keys.

4.5.3 Broadcast Encryption (bENC)

bENC is to enforce the access control over the outsourced data. This allows the broadcaster to encrypt the data for a set of arbitrary user, the set of user only can decrypt the message.

V. PROPOSED STORAGE SCHEMA

5.1 Existing scheme

Once the data has been outsourced to a remote CSP, which may not be trustworthy, the owner loses the direct control over the sensitive data. This lack of control raises the data owner's concerns about the integrity of data stored in the cloud. Conversely, a dishonest owner may falsely claim that the data stored in the cloud is corrupted to get some compensation. This mutual distrust between the data owner and the CSP, if not properly handled, may hinder the successful deployment of cloud architecture.

A straightforward solution to detect cheating from any side(data owner or CSP) is through using authentication tags (digital signatures). For a file F = $\{b_j\}_{1\leq j\leq m}$, the owner attaches a tag $OWN\sigma j$ with each block before outsourcing. The tags are generated per block not per file to enable dynamic operations at the block level without retrieving the whole outsourced file. The owner sends $\{bj, OWN\sigma j\}1\leq j\leq m$ to the CSP, where the tags $\{OWN\sigma j\}1\leq j\leq m$ are first verified. In case of failed verification, the CSP rejects to store the data blocks and asks the owner to re-send the correct tags. If the tags are valid, both the blocks and the tags are stored on the cloud servers. The tags $\{OWN\sigma j\}1\leq j\leq m$ achieve non-repudiation from the owner side. When an authorized user (or the owner) requests to retrieve the data file, the CSP sends $\{b_j, OWN\sigma_j, CSP\sigma_j\}_{1\leq j\leq m}$, where $CSP\sigma_j$ is the CSP's signature/tag on $b_j||OWN\sigma_j$. The authorized user first verifies the tags $\{CSP\sigma_j\}_{1\leq j\leq m}$. In case of failed verification, the user asks the CSP to re-perform the transmission process. If $\{CSP\sigma_j\}_{1\leq j\leq m}$ are valid tags, the user then verifies the owner's tag $OWN\sigma_j$ on the block $bj\forall j$. If any tag $OWN\sigma_j$ is not verified, this indicates the corruption of data over the cloud servers. The CSP cannot repudiate such corruption for the owner's tags $\{OWN\sigma j\}1\leq j\leq m$ are previously verified and stored by the CSP along with the data blocks. Since the CSP's signatures $\{CSP\sigma_j\}_{1\leq j\leq m}$ are attached with the received data, a dishonest owner cannot falsely accuse the CSP regarding data integrity. Although the previous straightforward solution can detect cheating from either side, it cannot guarantee the newness property of the outsourced data; the CSP can replace the new blocks and tags with old versions without being detected (*replay attack*). The above solution increases the storage overhead – especially for large files in order of gigabytes – on the cloud servers as each outsourced block is attached with a tag. Moreover, there is an increased computation overhead on different system components; the data owner generates a signature for each block, the CSP performs a signature verification for each outsourced block, and the authorized user (or the owner) verifies two signatures for each received block from the cloud servers. Thus, for a file F containing *m* blocks, the straightforward solution requires *2m* signature generations and *3m*signature verifications, which may be computationally a challenging task for large data files. For example, if the outsourced file is of size 1GB with 4KB block size, the straightforward solution requires 2^{19} signature generations and 3×2^{18} signature verifications. If the CSP receives the data blocks from a trusted entity (other than the owner), the block tags and the signature operations are not needed since the trusted entity has no incentive for repudiation or collusion. Therefore, delegating a small part of the owner's work to the TTP reduces both the storage and computation overheads. However, the outsourced data must be kept private and any possible leakage of data towards the TTP must be prevented.

5.2 Overview Logic

The proposed scheme in this work addresses important issues related to outsourcing data storage: *data dynamic, newness, mutual trust,* and *access control.* The owner is allowed to update and scale the outsourced data file. Validating such dynamic data and its newness property requires the knowledge of some metadata that reflects the most recent modifications issued by the owner. Moreover, it requires the awareness of block indices to guarantee that the CSP has inserted, added, or deleted the blocks at the requested positions. To this end, the proposed scheme is based on using combined hash values and a small data structure, which we call block status table (BST). The TTP establishes the mutual trust among different system components in an indirect way. For enforcing access control of the outsourced data, the proposed scheme utilizes and combines three cryptographic techniques: *bENC, lazy revocation,* and *key rotation*. The bENC enables a data owner to encrypt some secret information to only authorized users allowing them to access the outsourced data file. Through lazy revocation, revoked users can read unmodified data blocks, while updated/new blocks are encrypted under new keys generated from the secret information broadcast to the authorized users. Using key rotation, the authorized users are able to access both updated/new blocks and unmodified ones that are encrypted under older versions of the current key.

5.3 Representations

- **F** is a data file to be outsourced composed of a sequence of m blocks, i.e., $F = \{b_1, b_2, \ldots, b_m\}$
- **h** is a cryptographic hash function
- **DEK** is a data encryption key
- $\mathbf{E_{DEK}}$is a symmetric encryption algorithm under DEK, e.g., AES (advanced encryption standard)
- $\mathbf{E^{-1}_{DEK}}$ is a symmetric decryption algorithm under DEK
- $\mathbf{F^{-1}}$ is an encrypted version of the file blocks
- $\mathbf{FH_{TTP}}$is a combined hash value for F-1, and is computed and stored by the TTP

- **TH_{TTP}** is a combined hash value for the BST, and is computed and stored by the TTP
- **ctr** is a counter kept by the data owner to indicate the version of the most recent key
- **Rot=<ctr,bENC(K_{ctr})>**is a rotator, where bENC(K_{ctr}) is a broadcast encryption of the key K.
- $\oplus$ is anXOR Operator

5.4 Block Status table (BST)

To reduce the computational task in the owner and CSP side, the trusted third party (TTP) is introduced to reduce generation of block tags and signature verification. Now validation of outsourced dynamic data and newness property are addressed in proposed schema, this is based on combined hash value and a small data structure called block status table (BST). The TTP established mutual trust among different system component. To enforce access control of outsourced data, this schema use cryptographic techniques: bENC, Key rotation and Lazy revocation. Block status table (BST) is a small dynamic data structure used to reconstruct and access the file blocks outsourced to the CSP. This table consist of the columns *Serial Number(SN*) is an index to the file blocks. It shows the physical locations of each blocks in the data file. *Block Number(BN)* is a counter to make logical numbering to each file blocks. *Key Version(KV)* is to indicate the version of the key used to encrypt the blocks in the data file. The BST is implemented as a linked list to simplify the insertion and deletion of table entity. *SN* is a simple index to the table so it is not needed. Where *BN* and *KV* is an integer of *8m* bytes, where *m* is the number of blocks in the file. When a data file is created initially counter (ctr) and *KV*is set to 1. When a block level modifications is performed then ctr is increased by 1 and *KV* of the modified/new block is set to ctr.

Fig 2 shows some examples on changes made in BST due to different dynamic operation on file $F = \{b_j\}_{1\le j\le 8}$. (Fig2.a) ctr is set to 1, $SN_j = BN_j = j$, and$KV_j = 1$: $1 \le j \le 8$.(Fig 2.b) shows no change for updating the block at position 5 since no revocation is performed. (Fig 2.c) inserting new block after position 3 for a file F with new entry (4, 9, 1) here 4 is the physical position of newly created block and 9 is the logical number and the version number of key used to encrypt the file block is 1. The first revocation in the system increment the ctr by 1, now ctr =2, (Fig 2.d) now modify the block at the position five, new key is used for encryption of block number 4 now the table entity in the position five is (5, 4, 2). (Fig 2.e) shows new block is inserted in position 7 and the second revocation is done, which increments ctr by 1 and the table entity is (7, 10, 3) (Fig 2.f) shows the deleting the block at position 2 from the data file all the sub sequent entity are pop up by 1 step upward.

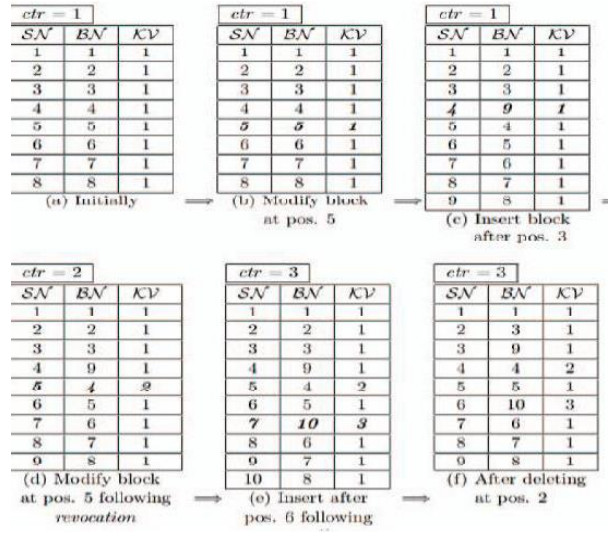

Fig.2,Changes in the BST due to different dynamic operations on a file $F = \{b_j\}_{1\le j\le 8}$.

5.5 System Setup and File Preparation

The setup is done only once during the life time of the data storage system, which may be for tens of years. The system setup has two parts: one is done on the owner side, and the other is done on the TTP side.

5.5.1 Owner Role

The data owner initializes ctr to 1, and generates an initial secret key K_{ctr}/K_1. K_{ctr} can be rotated forward following user revocations, and rotated backward to enable authorizedusers to access blocks that are encrypted under older versions of K_{ctr}.

For a file$F = \{b_j\}_{1\le j\le m}$, the owner generates a BST with $SN_j = BN_j = j$, and KV_j = ctr. To achieve privacy-preserving, the owner creates an encrypted file version $\tilde{F} = \{\tilde{b}_j\}_{1\le j\le m}$Moreover, the owner creates a rotator *Rot=<ctr,bENC(K_{ctr})>*, where bENC enables only authorized users to decrypt K_{ctr} and access the outsourced file. The owner sends { $\tilde{F}$, BST,Rot} to the TTP, and deletes the data file from itslocal storage.

Embedding *BN j* with the block b_j during the encryption process helps in reconstructing the file blocks in the correct order. If the encrypted blocks are not corrupted over cloud servers, but randomly delivered to an authorized user, the latter can utilize the embedded *BNj*and the BST to orderly reconstruct the data file F.

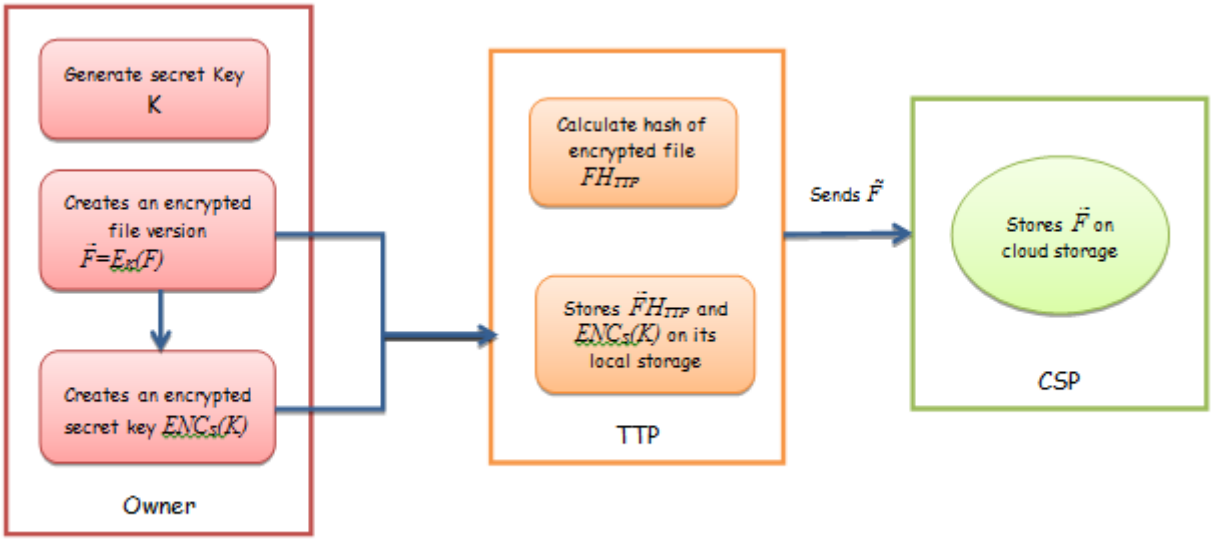

Fig.2, Setup and file preparation for data outsourcing

5.5.2 TTP Role

A small part of the owner's work is delegated to the TTP toreduce the storage overhead and lower the overall system computation. For the TTP to resolvedisputes that may arise regarding data integrity/newness, it computes and locally stores combinedhash values for the encrypted file $\tilde{F}$ and the BST. The TTP computes $FHTTP = \oplus^{m}_{j=1} h(\tilde{b}_j)$ and $TH_{TTP} = \oplus^{m}_{j=1} h(BN_j \| KV_j)$,then sends $\{\tilde{F}$, BST$\}$ to the CSP. The TTP keeps only $FH_{TTP}$and TH_{TTP} on its local storage.

Statement 2: The BST is used by the authorized users to reconstruct and access the outsourced data file. The proposed scheme in this work assumes that the data owner is intermittently online and the authorized users are enabled to access the data file even when the owner is offline. To this end, the CSP stores a copy of the BST along with the outsourced data file. When an authorized user requests to access the data, the CSP responds by sending both the BST and the encrypted file e F. Moreover, the BST is used during each dynamic operation on the outsourced data file, where one table entry is modified/inserted/deleted with each dynamic change on the block level. If the BST is stored only on the CSP side, it needs to be retrieved and validated each time the data owner wants to issue a dynamic request on the outsourced file. To avoid such communication and computation overheads, the owner keeps a local copy of the

BST, and thus there are two copies of the BST: one is stored on the owner side referred to as BST_O, and the other is stored on the CSP side referred to as BST_C. Recall that the BST is a small dynamic data structure with a table entry size = 8 bytes. For 1GB file with 4KB block size, the BST size is only 2MB (0.2% of the file size). Table 1 summarizes the data stored by each component in the proposed scheme.

Owner	TTP	CSP
ctr, *Kctr*, BST_O	*Rot*, *FHTTP* , *THTTP*	*F*, BST_C

TABLE 1: Data stored by each component in the system.

5.6 Dynamic Tasks on the Outsourced Data

The dynamic operations in the proposed scheme are performed at the block level via a request in the general form (BlockOp,$TEntry_{BlockOp}$, j ,KV_j , h($\tilde{b}_j$), RevFlag , $\tilde{b}^*$) where BlockOp corresponds to block modification (denoted by BM), block insertion(denoted by BI), or block deletion (denoted by BD). $TEntry_{BlockOp}$ indicates an entry in BST_O correspondingto the issued dynamic request. The parameter j indicates the block index on which thedynamic operation is to be performed, *KVj* is the value of the key version at index j of BST_Obefore running a modification operation, and h($\tilde{b}$j) is the hash value of the block at index j beforemodification/deletion. *RevFlag* is a 1-bit flag (true/false and is initialized to false) to indicatewhether a revocation has been performed, and $b^*$is the new block value.

5.6.1 Modification

Data modification is one of the most frequently used dynamic operations in theoutsourced data. For a file$F = \{b1, b2, . . . ,bm\}$, suppose the owner wants to modify a block *bj*with a block b'j .The owner uses the technique of one-sender-multiple-receiver(OSMR) transmission to send the modify request to both the CSP and the TTP.The TTP updates the combined hash value $FH_{TTP}$for $\tilde{F}$ through the step $FH_{TTP} = FH_{TTP} \oplus h(\tilde{b}_j) \oplus h(\tilde{b}'j)$, which simultaneously replaces the hash of the old block h($\tilde{b}$j) with the new one h($\tilde{b}$'j). This is possible due to the basic properties of the $\oplus$operator. The same idea is used whenRevFlag = true to update the combined hash value TH_{TTP} on the TTP side by replacing thehash of the old table entry at index j with the hash of the new value.

5.6.2 Insertion

In a block insertion operation, the owner wants to insert a new block $\bar{b}$ after indexj in a file$F = \{b1, b2, . . . , bm\}$ i.e., the newly constructed file F' = $\{b1, b2, . . . b_j,\bar{b},\ldots\ldots,bm+1\}$,where $b_{j+1} = \bar{b}$. The block insertion operation changes the logical structure of the file, whileblock modification does not.

5.6.3 Append

Block append operation means adding a new block at the end of the outsourced data.It can simply be implemented via insert operation after the last block of the data file.

5.6.4 Deletion

Block deletion operation is the opposite of the insertion operation. When one block isdeleted all subsequent blocks are moved one step forward. The step $FH_{TTP} = FH_{TTP} \oplus h(\tilde{b}_j)$ is used to delete the hash value of the $\tilde{b}_j$ from the combined hash FH_{TTP}(properties of $\oplus$operator). The same idea is used with the TH_{TTP} value.

5.7 Data Access and Cheating Detection

An authorized user sends a data-access request to both the CSP and the TTP to access the outsourced file. The user receives $\{\tilde{F}, BST_C\ \sigma_F, \sigma_T\}$ from the CSP, and $\{FH_{TTP}, TH_{TTP}, Rot\}$ from the TTP. For achieving non-repudiation, the CSP generates two signatures σ_F and σ_T for $\tilde{F}$ and BST_C,respectively.

5.7.1 Verification of encrypted data file

The authorized user verifies the signatures, and proceeds with the data access procedure only if both signatures are valid. The authorized user verifies the contents of BST_C entries by computing $TH_U = \oplus^m_{j=1} h(BN_j||KV_j)$, and comparing it with the authentic value TH_{TTP} received from the TTP. If the user claims that $TH_U \neq TH_{TTP}$, a report is issued to the owner and the TTP is invoked to determine the dishonest party. In case of $TH_U = TH_{TTP}$, the user continues to verify the contents of the file $\tilde{F}$ by computing $FH_U = \oplus^m_{j=1} h(\tilde{b}_j)$ and comparing with FH_{TTP} . If there is a dispute that $FH_U \neq FH_{TTP}$, the owner is informed and we resort to the TTP to resolve such a conflict.

For the authorized user to access the encrypted file $\tilde{F} = \{\tilde{b}_j\}_{1\leq j\leq m}$, BST_C and *Rot* are used to generate the key *DEK* that decrypts the block $\tilde{b}j$. The component $bENC(K_{ctr})$ of *Rot* is decrypted to get the most recent key K_{ctr}. Using the key rotation technique, the user rotates K_{ctr} backward with each block until it reaches the version that is used to decrypt the block $\tilde{b}_j$. Both *ctr*and the key version KV_j can determine how many rotation steps for $K_{ctr}$with each block $\tilde{b}_j$. Decrypting the block $\tilde{b}_j$ returns $(BN_j||b_j)$. Both BN_j and BST_C are utilized to get the physical block position SN_j into which the block b_j is inserted, and thus the file F is reconstructed in plain form.

Optimization The backward key rotation done can be highly optimized by computing a set of keys $Q = \{K_i\}$ from K_{ctr}. Each $K_i$in Q is the result of rotating K_{ctr} backward $ctr-I$ times. For example, if ctr= 20, a set $Q = \{K_1,K_5,K_{10},K_{15}\}$can be computed from K_{ctr}. To decrypt a block $\tilde{b}_j$, the authorized user chooses one key K_i from Q, which has the minimum positive *distance* $i- KV_j$. Then, K_i is rotated backward to get the actual key that is used to decrypt the block $\tilde{b}_j$. A relatively large portion of the outsourced data is kept unchanged on the CSP, and thus K_1 from Q can be used to decrypt many blocks without any further key rotation. The size of Q is negligible compared with the size of the received data file.

5.7.2 Cheating Detection Procedure

Fig. 4 shows how the TTP determines the dishonest party in the system. The TTP verifies the signatures σ_T and σ_F, which are previously verified and accepted by theauthorized user. If any signature is invalid, this indicates that the owner/user is dishonest for corrupting either the data or the signatures. In case of valid signatures, the TTP computes temporary combined hash values $TH_{temp} = \oplus^m_{j=1} h(BN_j||KV_j)$ and $FH_{temp} = \oplus^m_{j=1} h(\tilde{b}_j)$. If $TH_{temp} \neq TH_{TTP}$ or $FH_{temp} \neq FH_{TTP}$, this indicates that the CSP is dishonest for sending corrupted data, otherwise the owner/user is dishonest for falsely claiming integrity violation of received data.

VI. PERFORMANCE ANALYSIS

6.1 Settings and Overheads

The data file F used in our performance analysis is of size 1GB with 4KB block size. Without loss of generality, we assume that the desired security level is 128-bit. Thus, we utilize a cryptographic hash *h* of size 256 bits (e.g., SHA-256), an elliptic curve defined over Galois field *GF(p)* with |p| = 256 bits (used for bENC), and BLS (Boneh-Lynn-Shacham) signature of size 256 bits (used to compute $\sigma_F$andσ_T). Here we evaluate the performance of the proposed scheme by analyzing the storage, communication, and computation overheads. We investigate overheads that the proposed scheme brings to a cloud storage system for static data with only confidentiality requirement. This investigation demonstrates whether the features of our scheme come at a reasonable cost. The computation overhead is estimated in terms of the used cryptographic functions, which are notated . Let m and n denote the number of file blocks and the total number of system users, respectively. It presents a theoretical analysis for the storage, communication, and computation overheads of the proposed scheme. It summarizes the storage and communication overheads for our data file F (1GB with 4KB block size) and 100,000 authorized users.

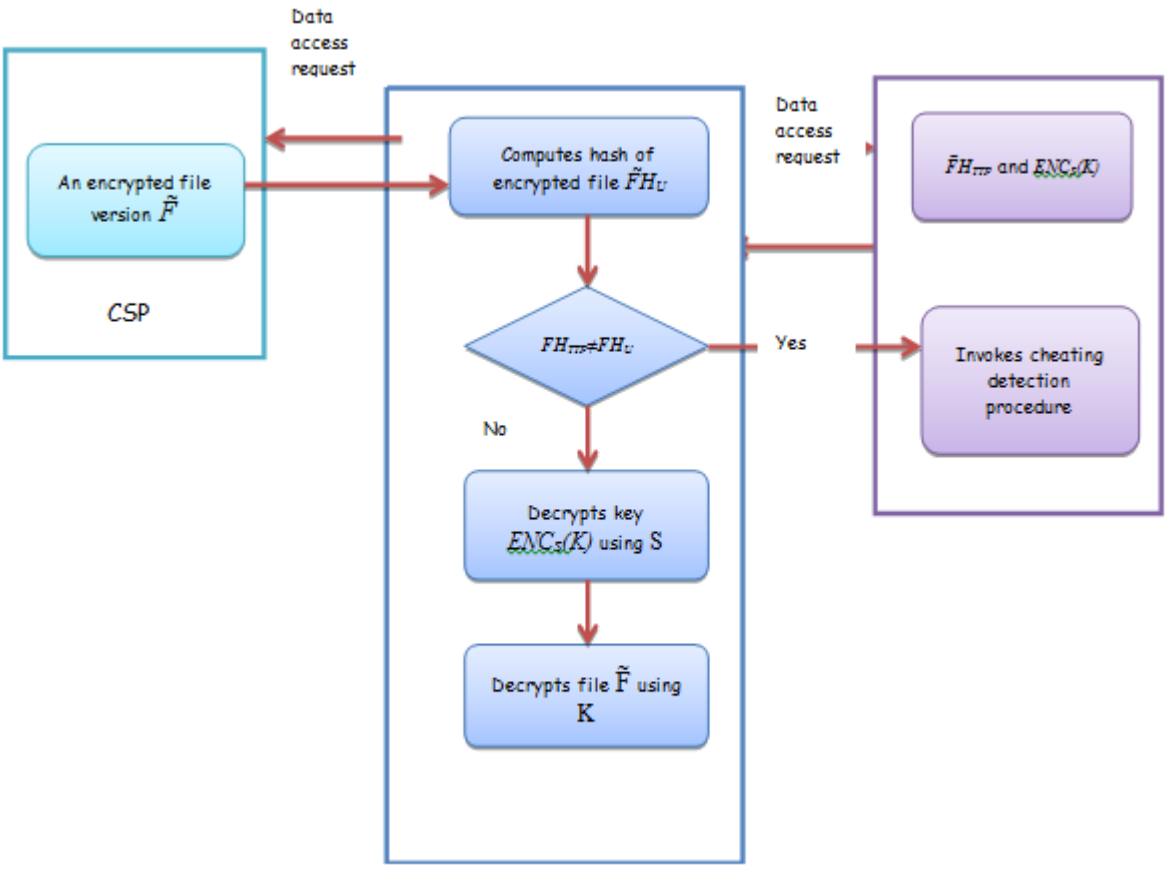

Fig.3, Data access and Verification of encrypted data file

Observations

Storage overhead It is the additional storage space used to store necessary information other than the outsourced file $\tilde{F}$. The overhead on the owner side is due to storing BST_O. An entry of $BST_O$is of size 8 bytes (two integers), and the total number of entries equals the number of file blocks *m*.

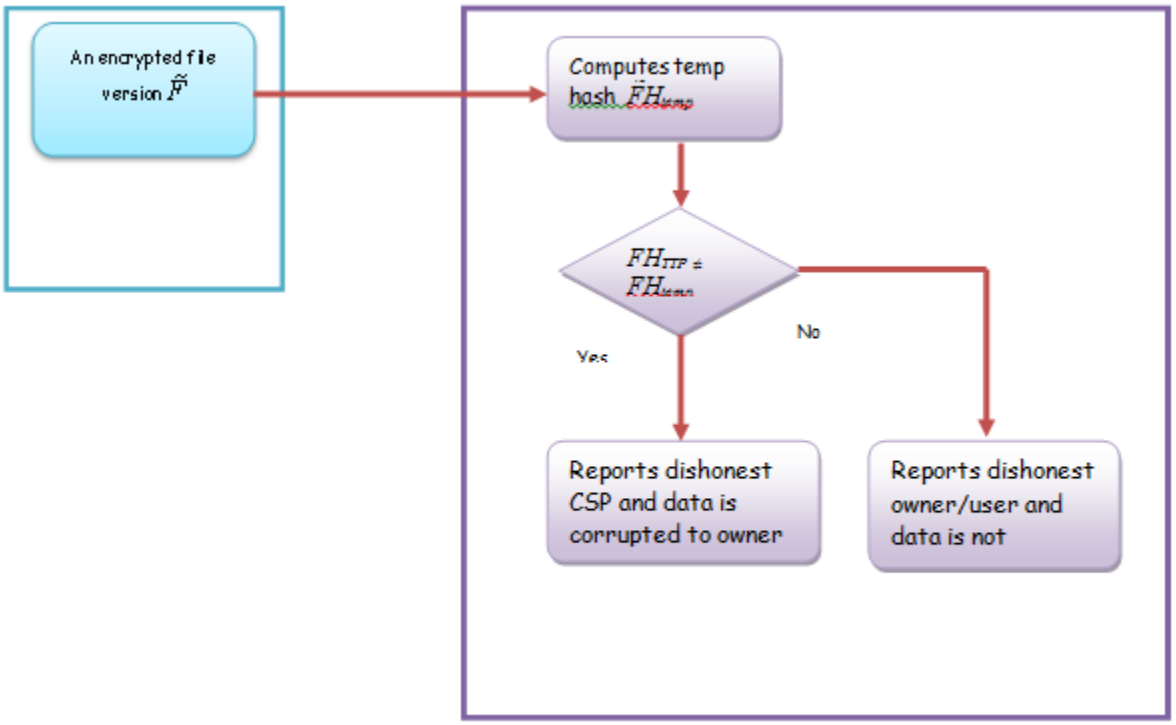

Fig.4, Cheating detection procedure

During implementation *SN* is not needed to be stored in BST_O; *SN* is considered to be the entry/table index ($BST_O$is implemented as a linkedlist). The size of $BST_O$for the file F is only2MB (0.2% of F). BST_O size can be further reducedif the file *F* is divided into larger blocks (e.g., 16KB). Like the owner, the storage overhead on the CSP side comes from the storage of BST_C. To resolve disputes that may arise regarding data integrity or newness property, the TTP stores FH_{TTP} and TH_{TTP} , each of size 256 bits. Besides, the TTP stores *Rot* =<*ctr*, *bENC*(K_{ctr})>that enables the data owner to enforce access control for the outsourced data. The *ctr* is 4 bytes, and bENC has storage complexity O(√n), which is practical for an organization (data owner) with n = 100,000 users. A point on the elliptic curve used to implement bENC can be represented by 257 bits (≈ 32 bytes) using compressed representation .Therefore, the storage overhead on the TTP side is close to 10KB, which is independent of the outsourced file size. Overall, the storage overhead for the file F is less than 4.01MB (≈ 0.4% of F).

Communication overhead It is the additional information sent along with the outsourced data blocks. Duringdynamic operations, the communication overhead on the owner side comes from the transmission of a block operation *BlockOP* (can be represented by 1 byte), a table entry $TEntry_{BlockOP}$ (8 bytes), and a block index j (4bytes). If a block is to be modified following a revocation process, KV_j(4 bytes) is sent to the TTP. Moreover, incase of a block modification/deletion, the owner sendsa hash (32 bytes) of the block to be modified/deleted to the TTP for updating FH_{TTP} . Recall that the owner also sends *Rot (4 + 32 √n bytes)* to the TTP if block modifications/ insertions are to be performed following user revocations. Therefore, in the worst case scenario (i.e., block modifications following revocations), the owner's overhead is less than 10KB. The Rot represents the major factor in the communication overhead, and thus the overhead is only 45 bytes if block modification/deletion operations are to be performed without revocations (only 13 bytes for insertion operations). In practical applications, the frequency of dynamic requests to the outsourced data is higher than that of user revocations. Hence, the communication overhead due to dynamic changes on the data is about 1% of the block size (the block is 4KB in our analysis). As a response to access the outsourced data, the CSP sends the file along with σ_F(32 bytes), σ_T(32 bytes), and BST_C (8m bytes). Moreover, the TTP sends FH_{TTP}(32 bytes), TH_{TTP} (32 bytes), and *Rot*. Thus, the communication overhead due to data access is 64 + 8m bytes on the CSP side, and 68 + 32 √n bytes on the TTP side. Overall, to access the file F, the proposed scheme has communication overhead close to 2.01MB (≈ 0.2% of F).

Computation overhead: A cloud storage system for static data with only confidentiality requirement has computation cost for encrypting the data before outsourcing and decrypting the data after being received from the cloud servers. For the proposed scheme, the computation overhead on the owner side due to dynamic operations (modification/insertion) comes from computing DEK = h(Kctr) and encrypting the updated/inserted block, i.e., the overhead is one hash and one encryption operations. If a block modification/insertion operation is to be performed following a revocation of one or more users, the owner performs *FR* to roll K_{ctr} forward, and bENC to generate the Rot. Hence, the computation overhead on the owner side for the dynamic operations is $h + E_{DEK} + FR + bEnc$(worst case scenario). Updating BST_O and BST_C is done without usage of cryptographic operations (add, remove, or modify a table entry).

To reflect the most recent version of the outsourced data, the TTP updates the values FH_{TTP} and TH_{TTP} .If no revocation has been performed before sending a modify request, only FH_{TTP} is updated on the TTP side. Therefore, the maximum computation overhead on the TTP side for updating both FH_{TTP} and TH_{TTP} is *4h*. Before accessing the data received from the CSP, theauthorized user verifies two signatures (generated by the CSP), BSTC entries, and the data file. These verifications cost $2V_\sigma + 2mh$. Moreover, the authorized user decrypts $bENC(K_{ctr})$ part in the *Rot* to get K_{ctr}. For each received block, $K_{ctr}$is rotated backward to obtain the actual key that is used to decrypt the data block. The optimized way of key rotation (using the set Q) highly affects the performance of data access; many blocks need a few or no rotations. Moreover, one hash operation is performed per block to compute DEK. Overall, the computation overhead due to data access is $2\ V_\sigma + 3mh + bENC^{-1} + [BR]$ on the owner side, and $2S_\sigma$on the CSP side. For determining a dishonest party, the TTP verifies $\sigma_T$andσ_F. In case of valid signatures, the TTP proceeds to compute TH_{temp} and FH_{temp}. The values TH_{temp} and $FH_{temp}$are compared with TH_{TTP} and FH_{TTP} ,respectively. Hence, the maximum computation overhead on the TTP side due to cheating detection is $2V_\sigma + 2mh$.

VII. ENACTMENT AND EXPERIMENTAL VALUATION

7.1 Enactment

We have implemented the proposed scheme on top of Amazon Elastic Compute Cloud (Amazon EC2) andAmazon Simple Storage Service (Amazon S3) cloud platforms. Our implementation of the proposed scheme consists of four modules: *OModule*(owner module), *CModule* (CSP module), *UModule*(user module), and *TModule* (TTP module). *OModule*, which runs on the owner side, is a library to be used by the owner to perform the owner role in the setup and file preparation phase. Moreover, this library is used by the owner during the dynamic operations on the outsourced data. *CModule* is a library that runs on Amazon EC2 and is used by the CSP to store, update, and retrieve data from Amazon S3. *UModule*is a library to be run at the authorized users' side, and include functionalities that allow users to interact with the TTP and the CSP to retrieve and access the outsourced data. *TModule*is a library used by the TTP to perform the TTP role in the setup and file preparation phase. Moreover, the TTPuses this library during the dynamic operations and todetermine the cheating party in the system.

7.2 Implementation settings

In our implementation we use a "large" Amazon EC2 instance to run *CModule.*

This instance type provides total memory of size 7.5GB and 4 EC2 Compute Units (2 virtual cores with 2 EC2 Compute Units each). One EC2 Compute Unit provides the equivalent CPU capacity of a 1.0 - 1.2GHz 2007 Opteron or 2007 Xeon processor. A separate server in the lab is used to run *TModule*. This server has Intel(R) Xeon(TM) 3.6GHz processor, 2.75GB RAM, and Windows XP operating system. The *OModule* is executed on a desktop computer with Intel(R) Xeon(R) 2GHz processor and 3GB RAM running Windows XP. A laptop with Intel(R) Core(TM) 2.2GHz processor and 4GB RAM running Windows 7 is used to execute the *UModule*. We outsource a data file of size 1GB to Amazon S3. Algorithms (hashing, broadcast encryption, digital signatures, etc.) are implemented using MIRACL library version 5.5.4. For a 128-bit security level, bENCuses an elliptic curve with a 256-bit group order. In the experiments, we utilize SHA-256, 256-bit BLS signature, and Barreto- Naehrig (BN) curve defined over prime field GF(p) with |p| = 256 bits and embedding degree = 12.

7.3 Experimental Valuation

Here we describe the experimental evaluation of the computation overhead the proposed scheme brings to a cloud storage system that has been dealing with static data with only confidentiality requirement.

Owner computation overhead To experimentally evaluate the computation overhead on the owner side due to the dynamic operations, we have performed 100 different block operations (modify, insert, append, and delete) with number of authorized users ranging from 20,000 to 100,000. We have run our experiment three times, each time with a different revocation percentage. In the first time, 5% of 100 dynamic operations are executed following revocations. We increased the revocation percentage to 10% for the second time and 20% for the third time. Fig. 8 shows the owner's average computation overhead per operation. For a large organization (data owner) with 100,000 users, performing dynamic operations and enforcing access control with 5% revocations add about 63milliseconds of overhead. With 10% and 20% revocation percentages, which are high percentages than an average value in practical applications, the owner overhead is 0.12 and 0.25 seconds, respectively. Scalability (i.e., how the system performs when more users are added) is an important feature of cloud storage systems. The access control of the proposed scheme depends on the square root of the total number of system users. Fig. 8 shows that for a large organization with 105 users, performing dynamic operations and enforcing access control for outsourced data remains practical.

TTP computation overhead In the worst case, the TTP executes only 4 hashes per dynamic request to reflect the change on the outsourced data. Thus, the maximum computation overhead on the TTP side is about 0.04 milliseconds, i.e., the proposed scheme brings light overhead on the TTP during the normal system operations. To identify the dishonest party in the system in case of disputes, the TTP verifies two signatures (σ_F and σ_T), computes combined hashes for the data (file and table), and compare the computes hashes with the authentic values (TH_{TTP} and FH_{TTP}). Thus, the computation overhead on the TTP side is about 3.59 seconds. Through our experiments, we use only one server to simulate the TTP and accomplish its work. The TTP may choose to split the work among a few devices or use a single devicewith a multi-core processor which is becoming prevalent these days, and thus the computation time on the TTP side is significantly reduced in many applications.

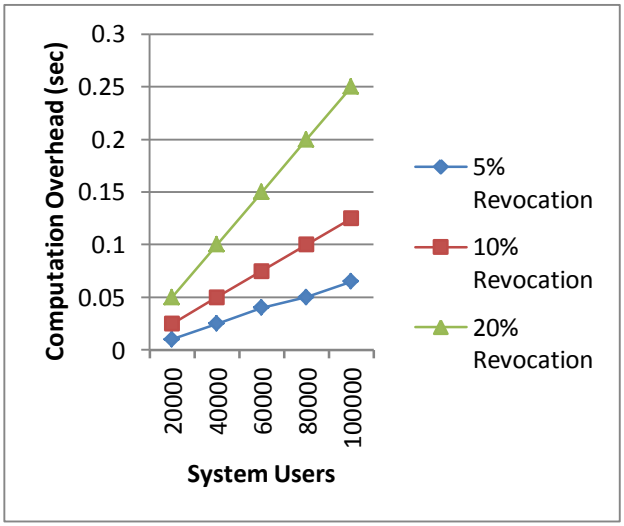

Fig.5, Owner's average computation overhead due to dynamic operations

TABLE 2: Experimental results of the computation overheads

Component	TTP	Users	CSP
Computation Overhead	0.04 ms / 3.59s	0.55 s	6.04 s

User computation overhead The computation overhead on the user side due to data access comes from five aspects divided into two groups. The first group involves signatures verification and hash operations to verify the received data (file and table). The second group involves broadcast decryption, backward key rotations, and hash operations to compute the DEK. The first group costs about 5.87 seconds, which can be easily hidden in the receiving time of the data (1GB file and 2MB table). To investigate the time of the second group, we access the file after running 100 different block operations (with 5% and 10% revocation percentages). Moreover, we implement the backward key rotations in the optimized way. The second group costs about 0.55 seconds, which can be considered as the user's computation overhead due to data access.

CSP computation overhead. As a response to the data access request, the CSP computes two signatures: $\sigma_F$andσ_T. Thus, the computation overhead on the CSP side due to data access is about 6.04 seconds and can be easily hidden in the transmission time of the data (1GB file and 2MB table).

VIII. CONCLUSION

The proposed schema for cloud based storage which supports outsourcing of dynamic data, updating and scaling of outsourced data in remote server is ensuring the authorized user receiving most recently updated versions of data. TTP can determine the dishonest party. We have investigated the overheads added by our scheme when incorporated into a cloud storage model for static data with only confidentiality requirement. The storage overhead is ≈ 0.4% of the outsourced data size, the communication overhead due to block-level dynamic changes on the data is ≈ 1% of the block size, and the communication overhead due to retrieving the data is ≈ 0.2% of the outsourced data size.

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Geotechnical Subsoil Investigation for the Design of Water Tank Foundation

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Abstract- Subsoil investigation was conducted at Unyeada in Andoni Local Government Area, in the Niger Delta for the purpose of designing a suitable foundation for a water tank structure. Field and Laboratory investigations show that the topsoil is underlain by a Loose clayey sandy Layer (about 6m thick) with Phi < 28^0, overlying a soft clay with c_u of about $12KN/m^2$. Underneath the soft clay is medium dense sandy layer with Phi between 30^0 and 32^0. The allowable bearing capacity profile of the sub-surface shows a minimum bearing Capacity of $79.8KN/m^2$. Settlement predictions based on a loading of $300KN/m^2$ indicated a settlement of 26mm. The bearing capacity analysis for the underlying soils is limited to the near surface sandy clay. In general, the sandy clay is partially saturated and when tested in unconsolidated and undrained conditions, exhibits both cohesion of 0.00kPa and angle of internal friction of $28^0$for its shear strength characteristics. However, the frictional component of shear strength is neglected for the clay encountered within normal founding depths for shallow foundations when estimating ultimate bearing pressures for the clay. The placement of a Raft foundation on a compacted granular material is suggested for the water tank stand.

Index Terms- Cone Penetrometer Test (CPT), Standard Penetration Test (SPT), Compressibility, Bearing Capacity, Shallow Foundation, Settlement

I. INTRODUCTION

The bearing capacity of shallow foundations on granular material has been studied for years by many different investigators. Although many approaches and additional considerations to the governing criteria of bearing capacity have been presented, the calculation of the ultimate bearing capacity of a footing has changed very little since Terzaghi (1943) presented his general equation for ultimate bearing capacity (qult). However, current design of shallow foundations on granular soils does not account for the absolute size of the footing, or the scale effect between the soil and the foundation. This may result in an overly conservative design, which in turn results in excessive costs of foundations. Unlike the values of Nq and Nc, the bearing capacity factor, Nγ, is not a unique value, but depends on both the unit weight, γ, and the friction angle, φ of the soil. In addition to these elements, there appears to be considerable evidence that for granular materials, the bearing capacity factor (Nγ) is also dependent on the absolute width of the foundation, B; that is, there appears to be a scale effect such that the value of Nγ decreases as the footing width increases, all other variables being constant. Some researchers have suggested that this phenomenon may be related to grain-size characteristics of the soil.

However, since Nγ appears to have a scale effect, and is theoretically related only to the unit weight and friction angle of the soil, it is possible that the actual scale effect may be, at least in part, related to the method of determining the friction angle. That is, it is possible that the scale effect observed between Nγ and the footing size is directly related to the confining stress felt underneath a footing, i.e., the larger the footing, the higher the confining stress and the lower the friction angle. This can be related to the curvature of the Mohr Coulomb failure envelope.

Bearing capacity failure occurs as the soil supporting the foundation fails in shear, which may involve either a general, local or punching shear failure mechanism (Bowles, 1988). For these different failure mechanisms, different methods of analyses are used. Estimation and prediction of the ultimate bearing capacity of a foundation is one of the most significant and complicated problems in geotechnical engineering (Coduto, 2001). A list of the principal contributors to the study of bearing capacity failure mechanism may include Terzaghi (1943), Hansen (1970), Vesic (1973), Chen and McCarron (1991), Lutenegger and Adams (2003) and Erickson and Drescher (2002). The focus of this work is on the estimation of soil and depth of foundation on the ultimate bearing capacity of the footing of a water tank.

II. MATERIALS AND METHODS

Two methods, Cone Penetration Test and the conventional shell and auger boring were applied for this soil investigation.

Cone Penetration Test (CPT)

Hydraulically operated GMF type of static penetrometer, 100KN capacity was used in the cone resistance soundings. Mechanical mantle cone with friction jacket and discontinuous sounding procedure was adopted in the test. The cone in its retracted position is first forced into the ground a distance of 10cm by the application of force to the outer sounding tubes. The cone is then pushed out a distance of about 4cm by the application of force to the inner rods only and the magnitude of the force required to achieve this is measured on the pressure gauges (cone resistance) and recorded. With this, two CPT probes were made each to a depth of 20m as shown in figures 1a &1b.

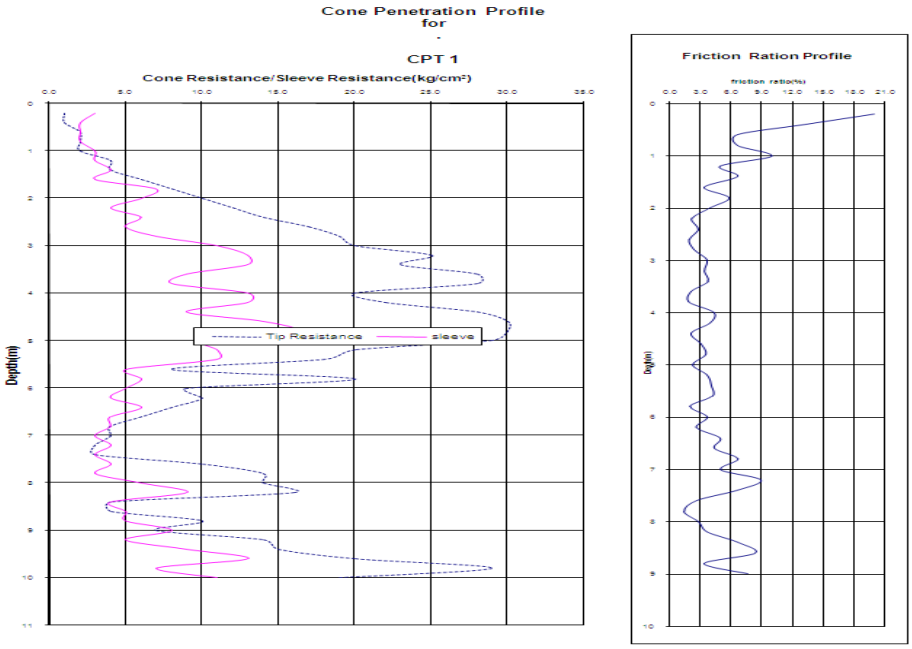

Figure 1a: CPT Probe through the soil at the site

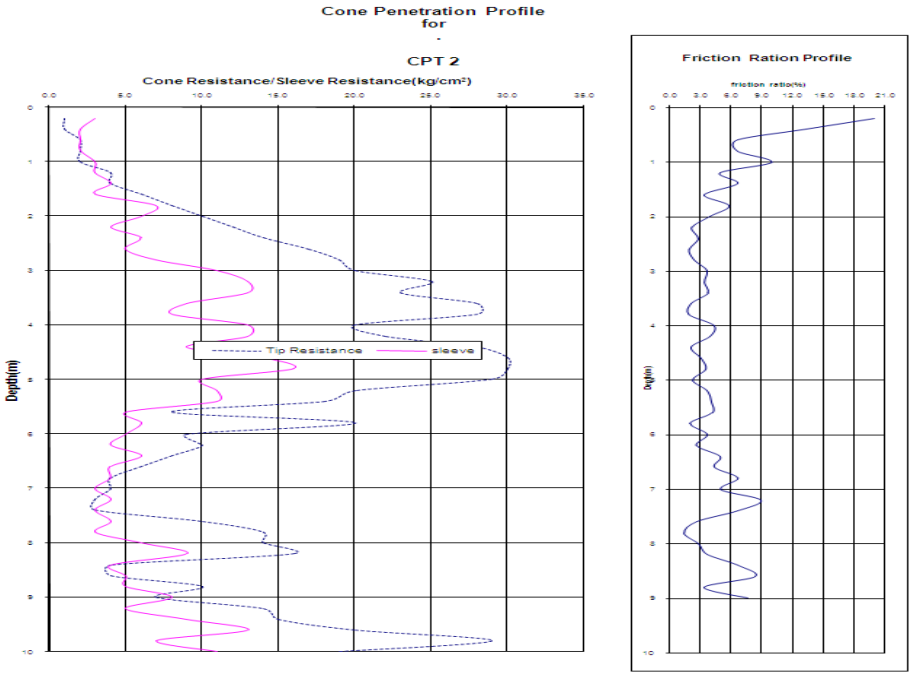

Figure 1b: CPT Probe through the soil at the site

Soil Borings

Conventional boring method which consists of the use of the light shell and auger hand rig was used in the boring operations. During the boring operations, disturbed samples were regularly collected at depths of 0.75m intervals and also when change of soil type is noticed. Undisturbed cohesive soil samples were retrieved from the boreholes with conventional open-tube sampler, 100mm in diameter and 450mm in length. The open-tube sampler consists essentially of a lower end and upper end screwed into a drive head which is attached to the rods of the rig. The head has an overdrive space and incorporates a non-return valve to permit the escape of air or water as the samples enters the tube. The sampler is driven into the soil by dynamic means using a drop hammer. On withdrawal of the sampler, the non-return valve assists in retaining the sample in the tube. All samples recovered from the boreholes were examined, identified and roughly classified in the field.

Standard Penetration Tests (SPT) is performed at every 1.5m advance through cohesionless soils. The main objective of this test is to assess the relative densities of the cohesionless soils

penetrated. In this test, a 50mm diameter split spoon sampler is driven 450mm into the soil with a 63.5kg hammer falling freely at a distance of 760mm. The sampler is driven into the soil in three stages. The initial 150mm penetration of the sampler is regarded as the seating drive, while the first 300mm and the last 300mm penetration are the test drives. The number of blows required to effect the last 300mm penetration below the seating drive provides an indication of the relative density of the cohesionless soil stratum being tested. This is also referred to as the N-value. The penetration resistances in blow counts with depth are indicated on the borehole logs in figure 2.

The SPT blow count is correlated to the friction angle based on Schmertmann (1975) and Hatanaka and Uchida (1996). These methods are based on actual data and taken into account the effect of the overburden stress.

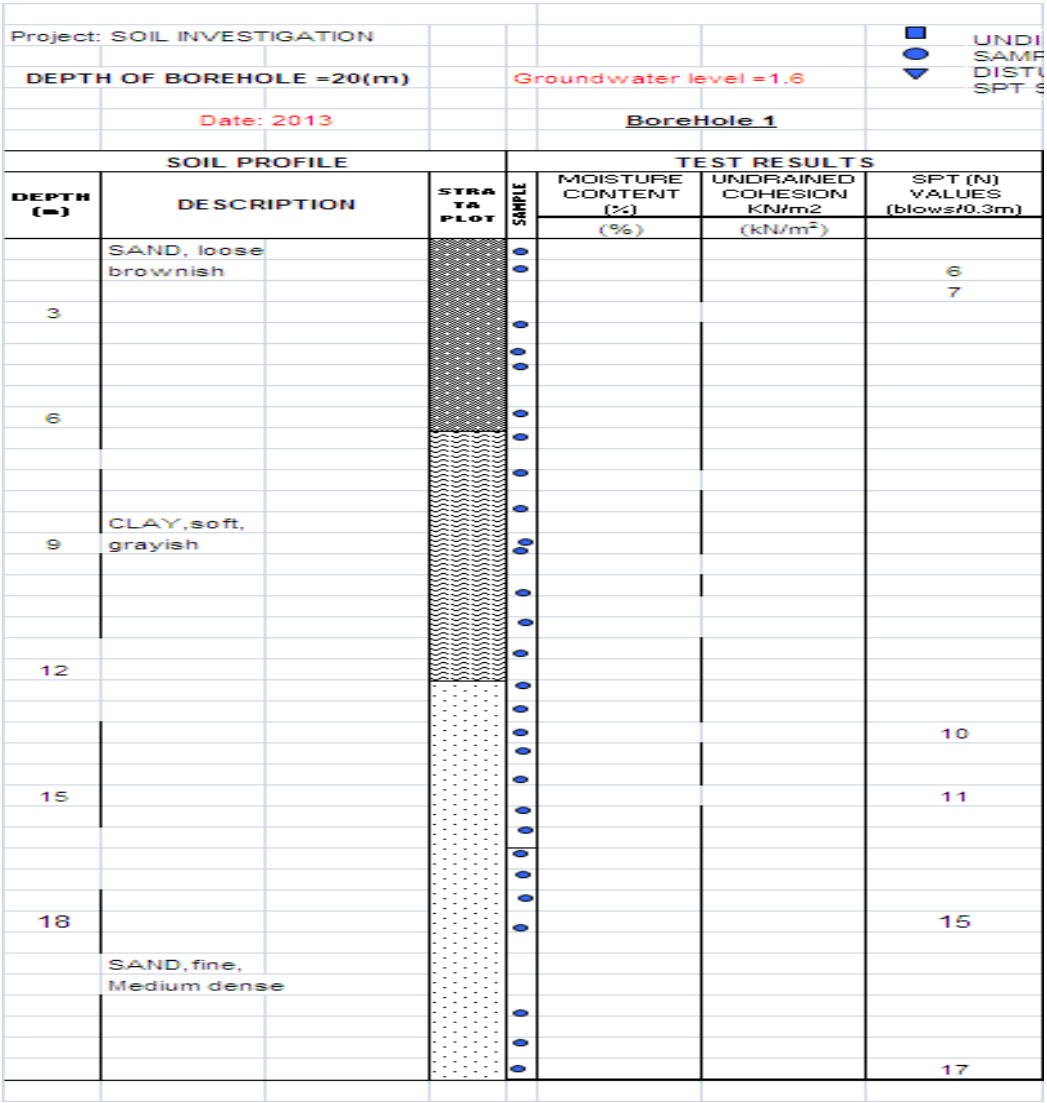

Figure 2: Borehole Logs and SPT blow counts

III. RESULTS AND DISCUSSION

Stratigraphy and Engineering Properties of the Soil

Data from the soil sampling, standard penetration tests, cone resistance soundings and laboratory tests were carefully evaluated for the determination of the stratification of the underlying soils. The evaluation uncovered three primary soil profiles characterizing the site as follows:

(i) clayey Sandy Layer encountered from surface to 6.0m depth
(ii) Soft grayish clay encountered from 6.0m to 12.0m depth
(iii) Medium dense sandy layer encountered from 12.0m to 20.0m depth where the investigation ended.

The stratigraphy beneath the site showed significant uniformity in both the two borings and the two cone penetrometer tests with water table at 1.6m below ground level. The ranges of thicknesses of the different strata are shown in the strata logs in figure 2.

Classification, strength and compressibility characteristics of the soils were determined from the laboratory and in-situ tests. The relevant index and engineering parameters of the soils are

summarized below. Details of these are presented in tables 1, 2, 3, 4, 5 and figures 3, 4 and 5 of this report.

Clayey Sandy Layer

The loose clayey sandy layer is found to have low compressibilty and brownish in colour with average CPT value of 8.0kg/cm^2. The ranges of variations in the relevant index and engineering parameters of the sandy layer are summarized below:-

Average effective particle size, d_{10} (mm) is 0.13; Mean particle size, d_{50} (mm) is 0.21; Coefficient of uniformity, $Cu=d_{60}/D_{60}$ is 1.8; Coefficient of curvature, $Cc= d^2_{30}/ D_{10}\text{-}d_{60}$ is 1.0.

Soft Clayey Layer

The clay has a property of high compressibility with M_v values >0.4m^2/MN and grayish in colour. The ranges of variations in the relevant index and engineering parameters of the clay are summarized in tables 3a and 3b.

Medium Dense Sandy Layer

Underlying the lower soft clay is a layer of predominantly well sorted, medium dense sand. The ranges of variations in the relevant engineering parameters of this layer are given as follows: Effective particle size, d_{10} (mm) is 0.17; Mean particle size, d_{50} (mm) is 0.41; Coefficient of uniformity, $Cu=d_{60}/D_{60}$ is 2.9; Coefficient of curvature, $Cc= d^2_{30}/ D_{10}\text{-}d_{60}$ is1.0.

Table 1: Allowable Bearing Capacities for shallow foundations (Water depth < foundation Depth)

Foundation Depth (m)	Width (m)	Undrained Shear Strength (KN/m^2)	Ultimate Bearing Pressure (KN/m^2)			Allowable Bearing Pressure (KN/m^2)		
			L/B=1	L/B=1.5	L/B=5	L/B=1	L/B=1.5	L/B=5
1.5	1	0	239.4	243.6	249.48	79.80	81.20	83.16
1.5	1.5	0	264.6	270.9	279.72	88.20	90.30	93.24
1.5	2	0	289.8	298.2	309.96	96.60	99.40	103.32
1.5	2.5	0	315	325.5	340.2	105.00	108.50	113.40
1.5	5	0	441	462	491.4	147.00	154.00	163.80
1.5	10	0	693	735	793.8	231.00	245.00	264.60
2	1	0	302.4	306.6	312.48	100.80	102.20	104.16
2	1.5	0	327.6	333.9	342.72	109.20	111.30	114.24
2	2	0	352.8	361.2	372.96	117.60	120.40	124.32
2	2.5	0	378	388.5	403.2	126.00	129.50	134.40
2	5	0	504	525	554.4	168.00	175.00	184.80
2	10	0	756	798	856.8	252.00	266.00	285.60

Bearing Capacity

The conventional method of foundation design is based on the concept of bearing capacity or allowable bearing pressure of the soil. The bearing capacity is defined as the load or pressure developed under the foundation without introducing damaging movements in the foundation and in the superstructure overlying the foundation.

Damaging movements may result from foundation failure or excessive settlement. The two criteria used in the design of foundation are therefore:

(a) Determination of bearing capacity of soil and the selection of adequate factor of safety, usually not less than 2.5

(b) Estimating the settlement under the expected load and comparison with the permissible settlement

Choice of Parameters:

In clays, the ultimate bearing capacity of spread foundation is calculated using total stress parameters. This gives the end-of-construction case, which is the worst condition, and allows the design to be based on undrained shear strength tests.

The bearing capacity analysis for the underlying soils is limited to the near surface sandy clay. In general, the sandy clay is partially saturated and when tested in unconsolidated and undrained conditions, exhibits both cohesion and angle of internal friction for its shear strength characteristics (tables 3a and 4). However, the frictional component of shear strength is neglected for the clay encountered within normal founding depths for shallow foundations when estimating ultimate bearing pressures for the clay. Undrained cohesion of 0.00kPa and angle of internal friction of 28^0 are adopted for the bearing capacity analysis. Therefore, the placement of a Raft foundation on a compacted granular material is suggested for the water tank stand.

Settlement of Shallow Foundation

The Burland and Burbdige (1984) method for settlement criteria was considered in which the average N value over the depth of influence below the footing, approximately, 1.5 times the width of the foundation was used. Considerations were taken to accommodate corrections made in the SPT blow counts according to the recommendations of Youd et al (2001) and Mayne (2001), for the type of sampler, the rod length, the

borehole diameter, the energy transmitted to the sampler and the overburden stress.

Settlement of shallow foundation for net foundation load of $\Delta\sigma$ **=100**kPa was then calculated.

Table 2a: Settlements Parameter

Clay	**6.0m (normally consolidated)**
e_o	**1.183**
Preconsolidation Pressure	**28KPa**
Cc	**0.17**
Soil Compressibility based on Cc and e_o	**0.077**

Table 2b: Computed Rate of Settlements

Rate of Settlements	**Years**
T_{50}	**0.3**
T_{90}	**1.4**

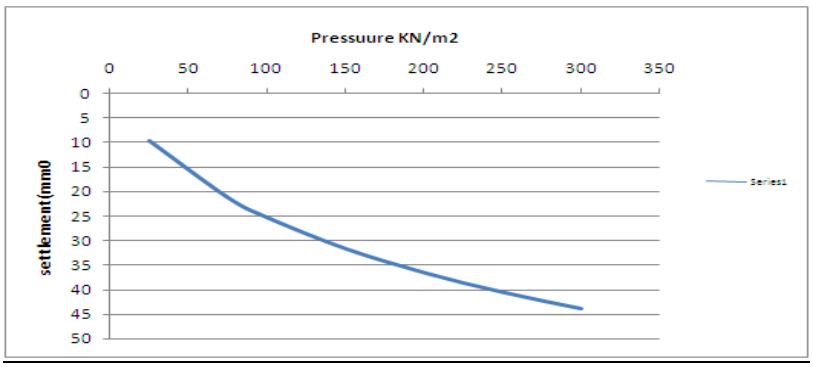

Figure 3a: Load Settlement Curve for Clay from 6.0m depth

Table 2c: Settlements Parameter

Clay	**10.0m (normally consolidated)**
e_o	**1.89**
Preconsolidation Pressure	**60KPa**
Cc	**0.5**
Soil Compressibility based on Cc and e_o	**0.173**

Table 2d: Computed Rate of Settlements

Rate of Settlements	**Years**
T_{50}	**0.173**
T_{90}	**1.0**

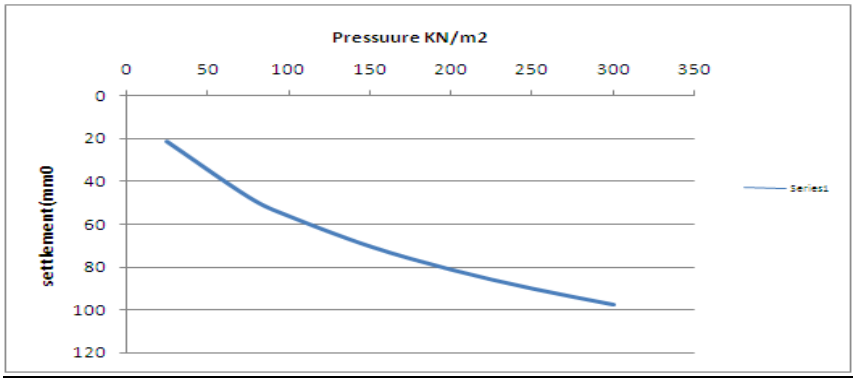

Figure 3b: Load Settlement Curve for Clay from 10.0m depth

Table 2e: Showing Variation of Settlement with foundation Pressure

Sand	**1.5m**
Load(KN/m^2)	**300**
Elastic Modulus	**12000KPa**
Influence factor	**0.5**
Cone Value (Kg/cm^2)	**6**
P_i (elastic)	**26**

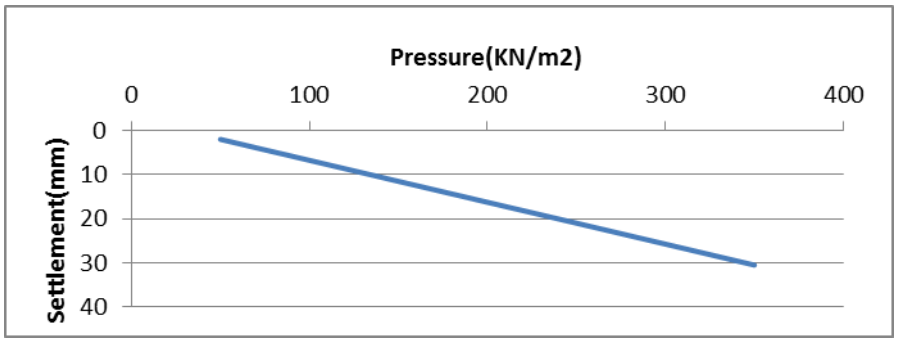

Figure 3c: Load Settlement Curve for Sand from 1.5m depth

TABLE 3a: CLASSIFICATION TEST (ATTERBERG LIMITS)

Borehole No.	**Depth sampled (m)**	**Liquid Limit (%)**	**Plastic Limit (%)**	**Plasticity Index**	**Sat. Unit Weight\ γ (KN/m^3)**
1	6	63	33	30	14
1	6	47	17	30	14

TABLE 3b: CONSOLIDATION (ONE–DIMENSIONAL) COMPRESSIBILITY TEST

Bore-Hole Nos	**Depth (m)**	**Pressure Range (Kpa)**	**Coefficient of Consolidation Cv(m^2/yr)**	**Coefficient of Volume Compressibility Mv 10^{-4}**	**Coefficient of Permeabilty K 10^{-8}cm/s**
1	6m	0-25	1.4892	3.100000	1.43E-8
		25-50	1.4892	5.321240	2.46E-8
		50-100	1.4892	5.985394	2.77E-8
		100-200	1.441161	4.974993	2.23E-8

		200-400	1.441161	0.180055	8.06E10
		400-800		0.556019	2.49E-9

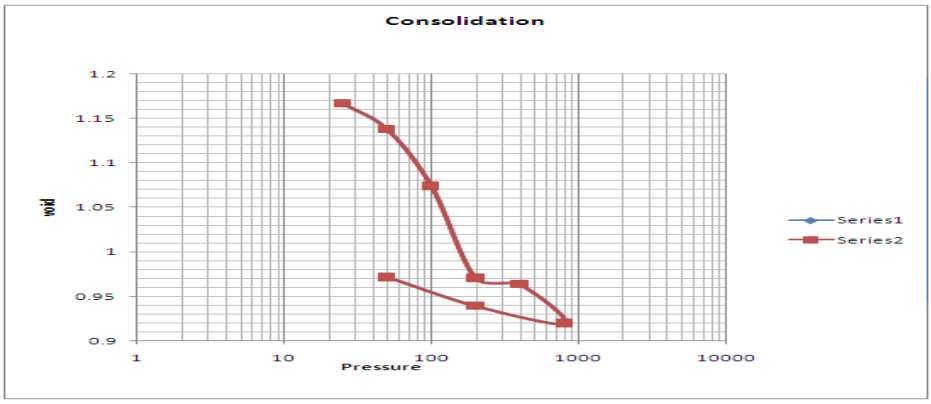

Figure 4a: Plot of Consolidation Test

TABLE 3c: CONSOLIDATION (ONE–DIMENSIONAL) COMPRESSIBILITY TEST

Bore-Hole Nos	Depth (m)	Pressure Range (Kpa)	Coefficient of Consolidation C_v (m^2/yr)	Coefficient of Volume Compressibility, M_v 10^{-4}	Coefficient of Permeabilty, K 10^{-8}cm/s
1	10m	0-25	2.127428	3.400000	2.25E-08
		25-50	2.127428	3.630862	2.4E-08
		50-100	2.127428	5.210178	3.44E-08
		100-200	1.942434	4.321746	2.61E-08
		200-400	1.942434	2.785211	1.68E-08
		400-800	1.942434	1.859349	1.12E-08

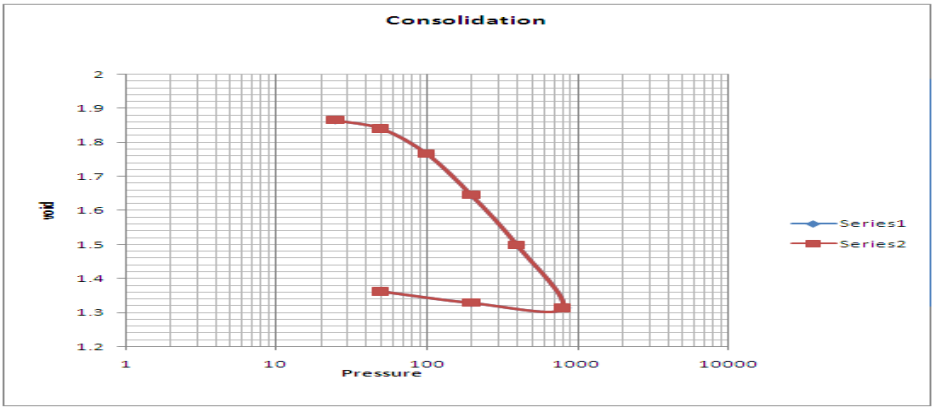

Figure 4b: Plot of Consolidation Test

TABLE 4: UNDRAINED TRIAXIAL COMPRESSION TESTS

Bore-Hole No	Depth Sampled (m)	Natural Moisture Content (%)	Undrained Cohesion (KN/m^2)	Friction angle ϕ(Degree)	USCS
1	6	53	28	2	CH
1	10	47	12	2	CH

Table 5a: Triaxial Test (BH 1, 6.0m)

Minor Principal Stress	100KN/m^2	300KN/m^2
Deviator Stress	64KN/m^2	78KN/m^2
Major Principal Stress	164KN/m^2	378KN/m^2

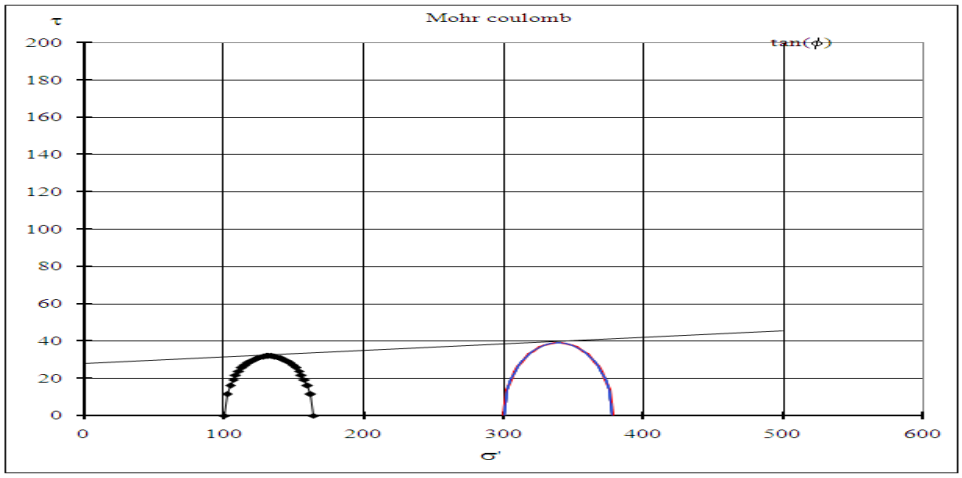

Figure 5a: Mohr –Coulomb Failure Envelop for Sample from 6m

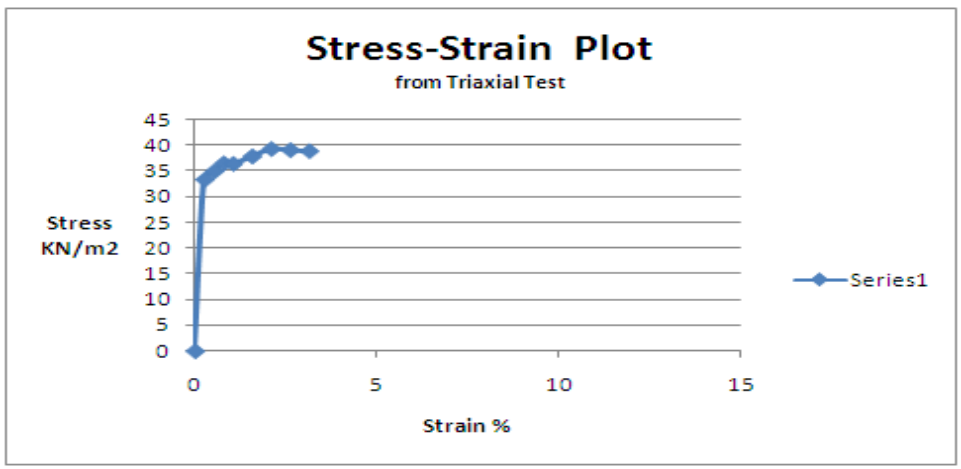

Figure 5b: Direct Shear Test Displacement Curve for Sample from 6m

Table 5b: Triaxial Test (BH 1, 10.0m)

Minor Principal Stress	100KN/m^2	300KN/m^2
Deviator Stress	31KN/m^2	47KN/m^2
Major Principal Stress	131KN/m^2	347KN/m^2

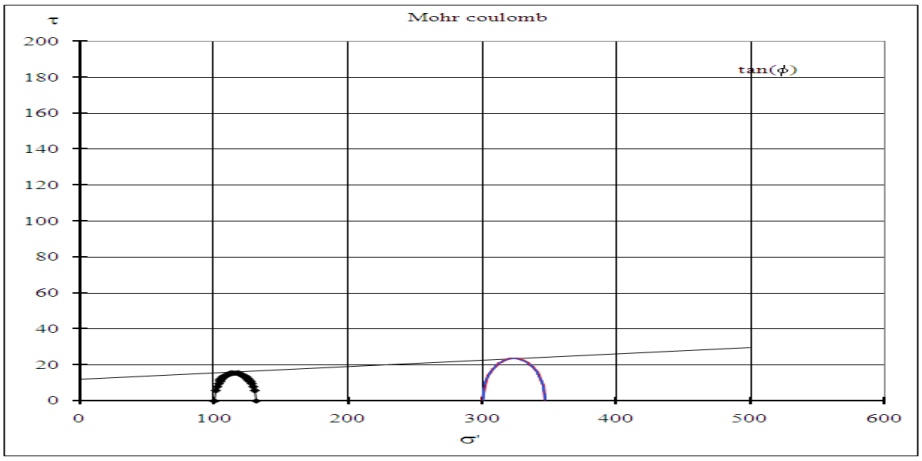

Figure 5c: Mohr –Coulomb Failure Envelop for Sample from 10m

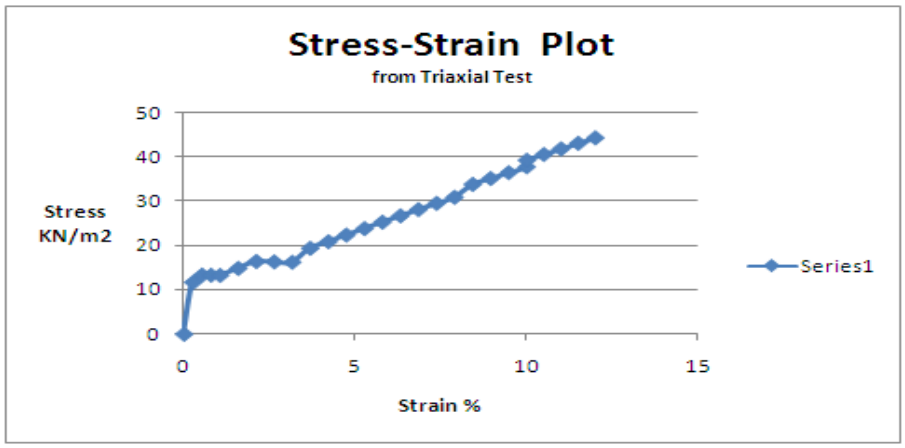

Figure 5d: Direct Shear Test Displacement Curve for Sample from 10m

IV. CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations reached in this report are based on the data obtained from the soil borings, in-situ and laboratory tests performed. It is not envisaged that soil conditions will vary significantly from those described. However, some variations are possible. The extent of the variations in the stratigraphy across the site may not be evidenced until construction commences. Should the stratigraphy vary, it will be necessary to evaluate the engineering significance of such variations that could result in further investigation and supplementary recommendations.

Field and Laboratory investigations show that the topsoil is underlain by a Loose clayey sandy Layer (about 6m thick) with Phi < 28^0, overlying a soft clay with c_u of about 12KN/m^2. Underneath this layer is Medium Dense Sandy Layer with Phi between 30^0 and 32^0. The allowable bearing capacity profile of the sub-surface shows a minimum bearing Capacity of 79.8KN/m^2. Settlement predictions based on a loading of 300KN/m^2 indicated a settlement of 26mm (figure 3c).

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Composition of Some Traditional Malaria Remedies and their Antiplasmodial Effects on (*Plasmodium berghei*)

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Abstract: This study is aimed to establish the pharmacological basis for the acclaimed antimalarial activities of the bark extracts of the three herbs. Aqueous extract of the herbs was obtained by cold maceration (72 hrs) while methanol herb extract was by soxhlet extraction. Phytochemical tests were carried out on the three herbs, the antiplasmodal activity of the aqueous extract of the herbs were screened by in-vivo model in mice infected with *Plasmodium berghei* using 4 days suppression test. The herb extracts were significant ($p>0.05$) but with varying levels of antiplasmodal activity, as *Trema orientalis* has the highest (85%) suppression activity followed by *Morinda lucida* (83%) and *Alstonia soonei* (80%). The phytochemical screening of the herb extracts revealed the presence of alkaloids, glycosides, proteins, flavonoids, steroids, terpenoids, saponins and tannin. The results suggest that the bark extracts of *A. soonei, M. lucida* and *T.orientalis* possess significant antimalarial activity.

Key words: Herbs extract, Phytochemical, *Plasmodium berghei,* antimalarial, suppression

1. Introduction

Malaria is a very old disease since *Anopheles* mosquito that transmits the disease is as old as mankind. The writings of the Samarians, Egyptians, Ancient Chinese, Homer, Aristotle, Plato and Shakespeare some dating 3,500 to 4,000 years ago, described intermittent fevers and splenomegaly, characteristic of malaria [1]. Malaria is believed to have originated from West Africa (*P. falciparum*), West and Central Africa (*P. vivax)* (on the basis of the presence of homozygous alleles for hemoglobin C and RBC duffy negativity that confer protection against *P. falciparum* and *P. vivax* respectively) and transported to other parts of the world through trans-pacific voyages, slave trade and man's migration [2]. He reported that man and malaria seemed to have evolved together, and that the ancestors of malaria parasite probably existed at least half a billion years ago. At present, about 100 countries or territories in the world are considered malarious almost half of which are in Africa, south of the Sahara. Although this number is considerably less than it was in the mid 1950s (140 countries or territories) more than 2400 million of the world's populations are still at risk [3]. The manifestation of the disease in different populations varies across the continent. In many parts of Africa, young children and pregnant women are most affected while in Asia adults as well as children are equally affected [4]. In Nigeria, there is an element of uniform distribution and prevalence of the disease in both rural and urban areas. This may be due to the vectors, *Anopheles gambiae* , *Anopheles arabiensis* and *Anopheles funestus* breeding in fairly clean sun lit water pools e.g. water storage tanks and wells which are found in both rural and urban areas [1]. Malaria in Nigeria is holoendemic i.e. there is an intense all-year round transmission with greater intensity in the wet season than dry season. The use of anti – malaria drugs and other means have not been fruitful over the years, however, the use of herbal medicine in combating malaria has been reported by many researchers as a good alternative, but little has been done in examine the chemical composition of these herbs. This study is therefore designed to examine the phytochemical composition of the three herbs used in order to establish its acclaimed antiplasmodial activity on the experimental animals (mice) infected with P. berghei.

2. Literature

Before the advent of orthodox medicine in the treatment of ailments which include malaria, the traditional African society had devised various means of combating such ailments. One of the major ailments that are of concern in the world today is malaria. Malaria is the single most important cause of ill health, death and poverty in the Sub-Saharan Africa. About 200 to 300 million new cases of malaria occur worldwide each year, and about one to three million deaths occur of which 2 / 5 occur in Africa [3]. The disease is believed to be a major obstruction to social and economic development in Africa, causing enormous misery and suffering through the pain of fevers and the anguish of bereavement. Ninety percent of the deaths caused by malaria occur in children aged less than five year old [5]. However, the problems militating against the effective management of malaria have been enumerated. The most important problem is that Plasmodial parasites are resistant to most widely available, affordable and safest first line treatments such as Chloroquine and Fansidar [6] or secondly , the overall control of mosquitoes which transmits malaria is made difficult by their

resistance to a wide range of insecticides. The third which is a new and rapid developing problem is the wide production of fake antimalarial drugs. In Southeast Asia 32% and 53% of artesunate blister packs sampled contained no active ingredients [7]. Lastly, most countries in Africa lack the necessary infrastructure and resources to manage and control malaria [5].

A number of traditional herbs have been tested and used in the prevention and also treatment of malaria including Artemisia annua, old leaves of Carica papaya, roots and leaves of *Guinensis*, unripe fruit of *Capsicum frutescence* and *Azadirachta indica* popularly called Dongoyaro in Nigeria [8]. Recent studies indicate that lemon grass can be successfully used to treat drug resistant malarial and typhoid fever [9]. It has been discovered that several drugs most of which are used for the treatment of malaria can be taken for prevention.

3. Previous work

A number of traditional herbs have been tested and used in the prevention and also treatment of malaria including Artemisia annua [8], old leaves of Carica papaya, roots and leaves of *Guinensis*, unripe fruit of *Capsicum frutescence* and *Azadirachta indica* popularly called Dangoyaro in Nigeria. Recent studies indicate that lemon grass can be successfully used to treat drug resistant malarial and typhoid fever [9]. It has been discovered that several drugs most of which are used for the treatment of malaria can be taken for prevention. In what is best described as an attestation to the efficacy of herbs in the prevention of malaria in the country, experts have found the water extracts of pawpaw and mango leaves showed potencies against malaria parasites and that they compare favourably with an established long acting orthodox anti-malarial drug, sulphadoxine/pyrimethamine. One of the common drugs in this group is Fanisidar (SP). *Carica papaya* or pawpaw has also been studied for its many medicinal uses. Its fruit rind is reportedly used in India by traditional healers for the treatment of 'recurrent fever'. On the other hand, the medicinal uses of the fruits, stem, bark, leaf and root of *Magnifera indica* (mango) have been recognized for ages.

4. Methods / Approach

4.1 Materials

4.1.1 Collection, Authentication and Preparation of plant material

Fresh leaves and bark of *A. soonei* ***(Afefe),*** *M. lucida* ***(Oruwo) and*** *T. orientalis* ***(Ahun)*** were collected from forest zone of the Federal University of Technology, Akure, Ondo State Nigeria**.** The plant leaves and bark were taken to the Department of Crop Soil and Pest Management (CSP) of the University for Clear Identification and they were carefully identified and labeled by curators. The samples were air dried and later pulverized to coarse powder using a laboratory milling machine (Model **4** Arthur Thomas, USA).

4.1.2 Malaria Parasite: *Plasmodium berghei* obtained from the Department of Parasitology. Institute of Medical Research and Training (IMRAT), University College Hospital (UCH) Ibadan, Nigeria was used.

4.2 Extraction and Fractionation of Plant Material: The plant materials were divided into three parts. One part was extracted with metllano1 using a Soxhlet extractor till the solvent became clear. Another part was soaked in water for 72hrs while the remaining parts were successively extracted with n-hexane using a soxhlet extractor. The extract and fractions were evaporated to a dry residue using a rotary evaporator (Rotavapour).

4.3. Sample Animal and weight determination Swiss albino mice used in this research were collected from the Institute of Medical Research and Training (IMRAT) University College Hospital UCH Ibadan, Nigeria, and then transferred to the laboratory in the animal section of the Department of Biology, Federal University of Technology, Akure, Ondo State, Nigeria. A total number of fourteen (14) mice were used for this research at equal number of male and female weighing between 17g and 28g and were fed on standard diets manufactured by Pfizer Livestock Feeds LTD, Nigeria. They were kept in separate cage (3.5cm x 6.5cm), same environmental conditions of 12 hours light and 12 hours darkness, normal room temperature of 27^0C were maintained for all the animals throughout the period of investigation and were not denied access to water.

4.4. Inoculation of the mice: Each of the Swiss albino mice was intraperitonally administered with a standard inoculums of P *berghei*. Stored parasitized blood in liquid Nitrogen was allowed to thaw. The content was injected into three donor mice and left for five days so as to allow for the development of parasitemia. The parasitized blood was collected from each donor mouse and diluted appropriately with Phosphate buffer saline to make 1×10^7 parasitized red blood cells, as described by [10]. 0.2ml of the diluted inoculums was then injected into each of the sample mouse after which they were left for three days. The aim was to achieve a high level of parasitaemia. However, thick blood smear were prepared from their tail veins and viewed under the × 40 microscope after five days. The parasitaemia count was carried out by the use of a tally counter and the average percentage parasitaemia calculated using the approach of [11] as thus:

Average % Parasitaemia = No of parasitaemia / No of WBC × 100

4.5. Collection of peritoneal macrophage: All the cytological preparations were done under sterilized conditions. Peritoneal macrophages were collected from the sacrificed mice and washed in chilled PBS, pH 7.2 supplemented with 0.01M EDTA and 1% glucose by centrifugation. The macrophages were resuspended to 10^6 cells/ml in DMEM supplemented with 10% fetal calf serum, 100 U/ml penicillin and 100 mg /ml streptomycin.

4.6. Antiplasmodial Studies: Preliminary evaluation of the antimalarial activity of aqueous methanol extracts of the three herbs was conducted. Antiplasmodial activity of aqueous methanol extracts was screened by in-vivo model in mice infected with *plasmodium berghei* using 4-day suppression. A donor mouse heavily infected with parasites was anaesthetized using chloroform and the blood was collected through cardiac puncture. The presence of parasitemia was established by microscopic examination of a thin blood film. 1ml of the blood was diluted with normal saline to 20ml in which 0.2ml was injected intraperitoneally to healthy mice used for this research. The infected mice were later grouped into three separate groups of four animals each since three herb extracts was prepared. The animals were treated with extracts shortly after inoculation on day zero to avoid death. They were left for 4 days after which the thin film of tail veins blood of each mouse was made on a microscopic slide and viewed under the × 40 microscope. The film (smear) were stained with Leishman stain and examined under microscope. Parasitemia level was determined by counting average number of parasites in 10 fields of at least 1000 erythrocytes by the use of a tally counter and the average percentage parasitaemia calculated using the approach of [11] as thus:

Average % Parasitaemia ═ No of parasitaemia / No of WBC × 100.

Average % Suppression ═ Av. % Parasitaemia in control ─ Av. % Parasitaemia in treated /
Av. % Parasitaemia in Control × 100

The parasitized red cells were recorded as the percentage of total RBC's as against the control.

4.7 Phytochemical Screening

Basic phytochemical screening consists of performing simple chemical tests was used to detect the presence of alkaloids, tannins saponins, anthraquinones, phylobatannins and cardiac glycosides on plant extracts [12].

(i) Test for alkaloids:

About 0.1g of each extracts was stirred in 5ml of 1% aqueous hydrochloric acid in a steam bath, 1ml of the filtrate was treated with a few drops of dragendooffs reagent. Turbidity or precipitation was taken as the primary evidence for the presence of alkaloids in the extracts being evaluated [13].

(ii) Test for saponins

The ability of saponin to produce frothing in aqueous solution and to haemolyse red blood cell was used as screening test for these compounds. For the frothing test, the method described by [14]. About 1ml each of the extract was shaken with water in a test tube. Frothing which persist on warming was taken as preliminary for the presence of saponin.

(iii) Test for tannins

About 5.0g of each portion of plant extract was stirred with 10ml of distilled water, filtered and ferric chloride reagent was added to the filtrate. A blue – black green or blue – green precipitate was taken as evidence for the presence of tannins [13].

(iv) Test for cardiac glycosides

a. **Legal test** The extract was dissolved in pyridine and a few drops of 2% Sodium Nitroprusside together with a few drops of 20% NaOH were added. A deep red color, which faded to brownish yellow, indicated the presence of cardenolides.

b. Liberman's Test

About 0.5g of the extract was dissolved in 2.0ml of acetic anhydride and cooled well in ice. Sulphuric acid was carefully added. A color change from violet to blue to green indicated the presence of steroidal nucleus [14].

c. Salkowski Test About 0.5g of the extract was dissolved in 2.0ml chloroform. Sulphuric acid ($H_2SO_4$was added carefully added to form a lower layer. A reddish – brown color at the interface indicated the presence of steroidal ring and terpenoid.

d. Killer – Kiliani Test

About 0.5g of extract was dissolved in 2.0ml glacial acetic acid containing one drop of ferric chloride solution. This was underplayed with 1.0ml concentrated Sulphuric acid. A brown ring obtained at the interface indicated the presence of deoxy sugar – a characteristic of cardenolides. [14].

(v) Test for carbohydrate

i. Molisch test for carbohydrates

20mg of plant extract was further extracted by warming with 5ml of H_20 in a water bath for 2min. To the cold aqueous extract (filtrate) was added a few drops of 2% w/v aqueous solution of a - naphthol. After mixing thoroughly, Iml of conc. H_2SO_4 was gently poured down the side of the test tube into the mixture. A positive result is indicated by the appearance of a brown ring at the interface.

(vi) **Fats and oils**

A small quantity of the extracts was pressed on paper; translucency indicates the presence of fats and oils.

(vii) **Test for Resins**

a. Precipitation test: About 30g of the extracts were further extracted with 5ml 96% ethanol. The resultant alcoholic extract was then poured into 20ml of distilled water in a beaker. A precipitate shows the presence of resins.

b. Co1nu1- Test: About 5mg of the extracts was further extracted with chloroform and the resultant extracts concentrated and evaporated to dryness. The residue was redissolved in 3m1 acetone and 3ml conc. HCI was added. The mixture was heated in a water bath for 30 minutes. A pink colour which changed to magenta red indicates the presence of resins.

(viii) Test for Protein

a. Millions Test: To a little portion of the filtrate in a test tube, two drops of Million's reagent were added. A white precipitate indicates the presence of proteins.

b. Xanthoproteic reaction test: About 5ml of the filtrate was heated with a few drops of concentrated nitric acid. A yellow colour which changes to orange with addition of an alkali indicates the presence of protein

c. Picric acid test: To a little portion of the filtrate was added a few drops of picric acid. A yellow precipitate indicates the presence of proteins.

5.0 Results and Discussion

5.1 Phytochemical Studies

The result of phytochemical screen carried out on the three herbs extracts is as presented in (table 1).

Table 1: Phytochemical Constituents of the Herb Extracts

Constituents	*A. Soonei (Afefe)*	*M. lucida (Oruwo)*	*T. orientalis (Ahun)*
Carbohydrate	++	+	++
Reducing sugar	+	-	-
Proteins	++	+	+
Glycosides	+++	+	++
Flavonoids	++	+++	+++
Steroids	+	+	+++
Terpenoids	+	+	++
Saponins	+	++	++
Tannins	++	++	++
Alkaloids	+++	++	+++
Fat and Oil	-	+	-
Resins	-	-	+

+++ = Abundantly present ++ = moderately present + = present - = absent

Alkaloids and glycosides were abundantly present in *A. Soonei*, while tannin, flavonoids, protein and carbohydrates are moderately present and the rest were present in minute except resins and oil. Only flavonoids was found to be abundant in *M. lucida* while alkaloids, tannins and saponins were moderately present and the rest were present in minute except resins and reducing sugar. However, *T. orientalis* was found to be more abundant in alkaloids, steroids and flavonoids, while tannins, saponins, terpenoids, glycosides and carbohydrate were moderately present and the resins and protein were present in minute (trace) except oil and reducing sugar that are not detected. This implies that the three herb extracts were tested positive to almost all phytochemicals that are capable of protecting the body against foreign materials. These plant constituents have been associated with the anti-plasmodia1 effects observed in some plants [15]. Alkaloids are plant-derived compounds that are physiologically active, they contain one nitrogen in a heterocyclic ring, basic and have a complex structure and have been associated with anti-plasmodia1 activities [16]. One of the oldest antimalarial drugs, quinine is an alkaloid derived from the bark of cinchona plant. It is the principal anti-malarial compound found in cinchona bark [17]; [23]. Another alkaloid with anti-parasitic activity against *P. berghei* is naphthylisoquinoline [18]. Flavonoids have been shown to be the active constituents responsible for the anti-malarial effect of plants such as Zingiberaceae [15]. Qucrcetin is a flavonoid claimed to be responsible for the anti-malarial properties of *Azadracta indica* (Neem tree) popularly used as an anti-malarial agent in Nigeria [20]. It is also suspected to be present in *A. soonei and T. orientalis* and responsible for its anti-malarial properties [21].

Table 2: Percentage Parasitemia Count in Mice infected with *P. berghei*

Days / Mice	4	8	12	16	20	24	28
1	5	7	10	15	19	25	31
2	4	6	9	15	20	24	28
3	6	9	12	17	24	28	D
4	ND	5	8	12	16	21	29
5	4	7	11	16	21	25	32
6	5	8	13	18	23	26	32
7	3	6	9	13	19	24	31
8	7	10	14	20	26	D	D
9	5	7	9	15	19	24	30
10	ND	4	7	13	18	24	32
11	3	5	9	14	19	23	29
12	6	9	12	17	21	28	32
13	2	6	8	15	19	24	31
14	ND	ND	ND	ND	ND	ND	ND
Mean	4.54	6.84	10.07	15.38	20.30	24.67	30.63

ND = Not Detected D = Dead 13 = Infected control mice
14 = Non-infected control mice

5.2 Paracetemia

Table 2 presented the percentage infection cell in mice as determined at 4 days interval. It revealed that parasite development was not detected in two male mice at day 4 of infection together with non infected mouse (control), while the mean value of parasitemia in infected mice was 4.54% at day 4. It was observed that all infected has showed increased in parasitemia from the blood collected in day 8 of infection as indicated by average parasitemia of 6.84% but was not detected in non infected control. A significant increase (P>0.05) in parasitemia was obtained from day 12 to day 28 with average parasitemia of 10.07, 15.38, 20.30, 24.67 and 30.63% respectively, however, parasitemia was not detected throughout in non-infected control mouse but mortality was experienced at day 24 and 28 as one each mouse was found dead given a percentage mortality of 14.28% that 2 dead out of 14 experimental mice. Since the two dead mice were female, this implies that male mice were more tolerable than female when infected as they were more prolefirate.

Table 3: Suppressive Effects of *A.soonei* Extract on *P. berghei* Infected Mice

Days / *Mice*	4	8	12	16	20	Before treatment	Difference in parasitemia count	Parasitemia reduction (%)
1	29	23	18	12	D	31	D	D
2	24	20	16	10	6	28	22	78
3	D	-	-	-	-	-	-	-
4	24	19	14	9	5	29	24	82
Mean	25.7	20.7	14	10.3	5.5	28.5	23	-
Control	40.0	40.0	40.0	40.0	40.0	-	-	-
% Against Control	64.25	51.75	40.0	25.75	13.75	-	-	80

D = Dead C = Control = 40 (% infection)

Table 4: Suppressive Effects of *M. lucida* Extract on *P. berghei* Infected Mice

Days / Mice	4	8	12	16	20	Before treatment	Difference in parasitemia count	Parasitemia reduction (%)
5	30	24	20	12	D	32	D	D
6	31	D	D	D	D	32	D	D
7	27	21	17	10	5	31	26	83
8	D	-	-	-	-	-	-	-

Mean	29.3	22.5	18.5	11	5	31.5	26	-
Control	40.0	40.0	40.0	40.0	40.0	-	-	-
%Against Control	73.25	56.25	46.25	27.5	12.5	-	-	83

D = Dead C = Control = 40 (% infection)

Table 5: Suppressive Effects of *T. orientalis* Extract on *P. berghei* Infected Mice

Days / **Mice**	**4**	**8**	**12**	**16**	**20**	**Before treatment**	**Difference in parasitemia count**	**Parasitemia reduction (%)**
9	28	22	19	10	5	30	25	83
10	28	21	D	D	D	32	D	D
11	28	21	D	D	D	29	D	D
12	29	22	17	9	4	32	28	87
Mean	28.5	22	18	9.5	4.5	31	26.5	-
Control	40.0	40.0	40.0	40.0	40.0	-	-	-
%Against Control	71.25	55.0	45.0	23.75	11.25	-	-	85

D = Dead C = Control = 40 (% infection)

5.3 Suppressive Effect of the herbs

The percentage suppressive effects of the three herbs were presented in tables 3, 4 and 5 respectively. The average parasitemia suppression was recorded at 4 days interval after treatment of group of infected mice with herb extract. It shows that *Alstonias* had lower 25.7% parasitemia suppression than those treated with *M. Incida* 29.3% and *T. Orientalis* 28.5% as against 40% obtained for untreated control at day 4 of treatment. There was no significant difference in reduction level of parasitemia in the mice treated with *M. Incida* 22.5% and *T.orientalis* 22% which was higher than that of A. Soonei 20.7% at day 8 of herb administration and day 12 follows the same trend. However, the reverse was the case for day 16 and 20 where T. orientalis showed higher suppression (9.5 to 4.5) than M. Incida and A .Soonei with average parasitemia of (11 to 5%) and 10.3 to 5.5% respectively. The average percentage of parasitemia suppression for herb 3 in treated mice from day 4 to day 20 as against untreated control is given as: *A. Soonei* 64.25%, 51.75%, 40%, 25.75% and 13.75%; *M. Iucida*: 73.25%, 56.25%, 46.25% , 27.5% and 12.5% while *T. orientalis* gave 71.25%, 55%, 45%, 23.75% and 11.25% respectively. Generally, the overall percentage suppression of *T. orientalis* was (85%) higher than that of *M. Incida* (83%) and *A. soonei* (80%). Furthermore, the mortality rate in each group was also recorded during experimental period which showed that high mortality was recorded in group 2 (*M. Incida*) as 3 mice out of 4 were dead before the last day of experiment while 2 were found dead in each group of *A. soonei and T.orientalis* also, the control mouse dead before day 20 given a total of 7 and percentage mortality of 61.53% indicating that less than half of the infected experimental animal survived both infection and treatment to the end of the experiment. The result implies that the 3 herbs used for treatment of infected mice in this study has potency of reducing malaria parasite but *T. orientalis* known as (ahun) has the highest (85%) potency followed by *M. Incida* (83%) (Oruwo) and *A. soonei* (80%) (Afefe). The results obtained in this study were within the range of the results obtained by [22] as the mean % parasitaemia obtained in Group 1- 3 mice administered with methanolic, ethanolic and aqueous extracts of lemon grass were 43.01%, 50.21% and 48.08% while in Gp 4 - 6, 59.54%, 61.50% and 13.4% for the methanol, ethanol and aqueous extracts of neem respectively .The parasitaemia development in group 7 treated with standard drug (Malariech) was significantly minimal with 2.47s and 88.23% as% mean parasitaemia average suppression was recorded as against the highest (85%) that was obtained for *T.orientalis* in this study. Aqueous Neem extract exhibited the highest suppressive effect 76.21% followed by Lemon grass in respect of the methanolic (43.67%) and aqueous (38.07%) extracts as compared with methanolic (25.47%) and ethanolic (23.32%) extracts of Neem.

6. Conclusion

The study has revealed that the results of phytochemical test for the three herbs extracts (*A. soonei, M. lucida and T. orientalis*) showed positive to alkaloids, glycosides, proteins, flavonoids, steroids, terpenoids, saponins, and tannins indicating their presence in various proportions. All the herb extracts used for this research showed significant (p>0.05), but varying levels of antiplasmodal activity as *Trema orientalis* has the highest (85%) suppression activity followed by *Morinda Iucida* (83%) and *Alstonia soonei* (80%), This suggest that the bark extracts of the (*A. soonei, M. Iucida and T.orientalis*) possesses significant antimalarial activity. Since the three herbs extracts showed potency of reducing plasmodium, the study therefore suggest that the combination of three herbs should be adopted in treatment of malaria.

7. Future Scope

Further research work on the pharmacological study on average body requirement of herb extracts used in the treatment of malaria should be investigated and established.

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24 hours GPS Tracking in Android Operating System

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Abstract- In this paper, I present a Smartphone-based autonomous management of Location. When developing a location-aware application for Android, one can utilize GPS and Android's Network Location Provider to acquire the user location. Android's Network Location Provider determines user location using cell tower and Wi-Fi signals, providing location information in a way that works indoors and outdoors, responds faster, and uses less battery power. To obtain the user location in your application, one can use both GPS and the Network Location Provider, or just one. Here one could track the positions of the Android Device constantly for 2/4hrs and save them on a well secured webpage. So that if a device is found to be in a prohibited area it can be easily traced out. Hence it is very useful for the military purposes. No unauthorized devices can enter or leave the area without notification to the server. It can also help to create a daily log of device i.e each and every location visited by the device in a day.

Index Terms- Android Devices, Wi-Fi, Smartphone, GPS (Global Positioning System)

I. INTRODUCTION

Mobile has become a vital communication tool which everyone prefers to possess and carry along. This technology has laid a foundation to overcome the traditional desktop based approach of obtaining information. Mark Weiser the father of Pervasive Computing in his paper entitled, 'The Computers of 21st Century, 'envisioned that, "*The technology would weave into the fabric of everyday life until they are indistinguishable from it,* "this is the his vision and has come true in this current 21stcentury. Following the vision of Mark Weiser, researchers at Carnegie Mellon University in a project *Aura* demonstrated that, human distractions could be minimized by Ubiquitous systems which will have to be proactive in anticipating the demands, thus self-tunable so as to give a better response to the future hassles. The ability to sense and process a context forms as a fundamental requirement for a system to be proactive. Hence, designing a context -aware application would pave way to satisfy the future growing requirements of user.

Most promising type of contextual information is the proximity selection known as Location Based Service (LBS). Tracking location of a mobile device accurately has been a challenging research topic for decades. Global Positioning Systems (GPS) is a top priority technology used for locating a device position accurately. Methodology for tracking can be done using a GPS receiver which is an additional hardware integrated in most of mobile equipment. We have used GPS as the approach idea for location tracking. The platform used for development is Android Operating System, as described [6] is been proven as the best operating system for a context-aware location based services. Customer friendly user interface letting user to enter the task and store it for future retrieval is done using the exclusive SQLite inbuilt database available in Android mobile. User can align task associated with any location and retrieving details as alert before reaching a desired location of interest. User entering into this application is given an option for connecting to the database so as to verify the location updates. Information is then delivered at the right time in the right place to the right person. The mobile user will also be able to receive retail offers and discount information in the surrounding by this intelligent observer module.

This paper is organized as follows: Section II discusses on various literatures reviewed. Section III provides an overview of the proposed solution and design model. Section IV describes about implementation and Section V focuses on the outcome Section VI concludes the paper. Future enhancement of this project is also discussed at the end.

II. LITERATURE REVIEW

Literatures on the prior research work done by accredited scholars in the Ubiquitous Computing domain are reviewed. Challenges and solutions proposed are in specific to context aware location based service are presented here.

Zohaib et al[6] has put forth the major challenges faced in designing a ubiquitous application. Android operating system is suggested as a best tool for designing context aware applications. Towards the end, author had featured an analysis report on performance of various mobile devices for a location aware computing.

Xianhua et al in their manuscript [8] have described on the anatomy of Android architecture. Components of Android platform such as Activity, Services, Content Providers and Broadcast Receivers were introduced thus providing a better insight of application development.

Sandeep et al[5] have outlined the significance of location based services. Technological development in an exponential manner have paved a way to access hardware directly by customized application interface such as GPS, web service, programming cameras were elucidated.

Ubiquitous Computing is an emerging technology and has lot of challenges in design, modelling and user interaction which are identified and implemented in this organizer application .

III. PROPOSED SOLUTION

Providing continuous and uninterrupted service is essential for tracking mobile location without affecting the regular routines of any user. This organizer application would ease user

to track current location, compare it with the task and displays discount information, thus acting as an intelligent observer of the surrounding.

A. Architecture

Task is entered and stored in the SQLite database. Location tracking is performed using the GPS service. Changes in location can be emulated with the help of (Key Hole Markup language) KML file in Android. The location change is compared with the database entries to see if there are tasks associated to the current location. Corresponding task information is displayed on the mobile screen. Web server is invoked whenever change in location is sensed and is used for displaying retail discount information. Fig 1 shows the architecture of location module designed for tracking and retrieving the information based on location to the user.

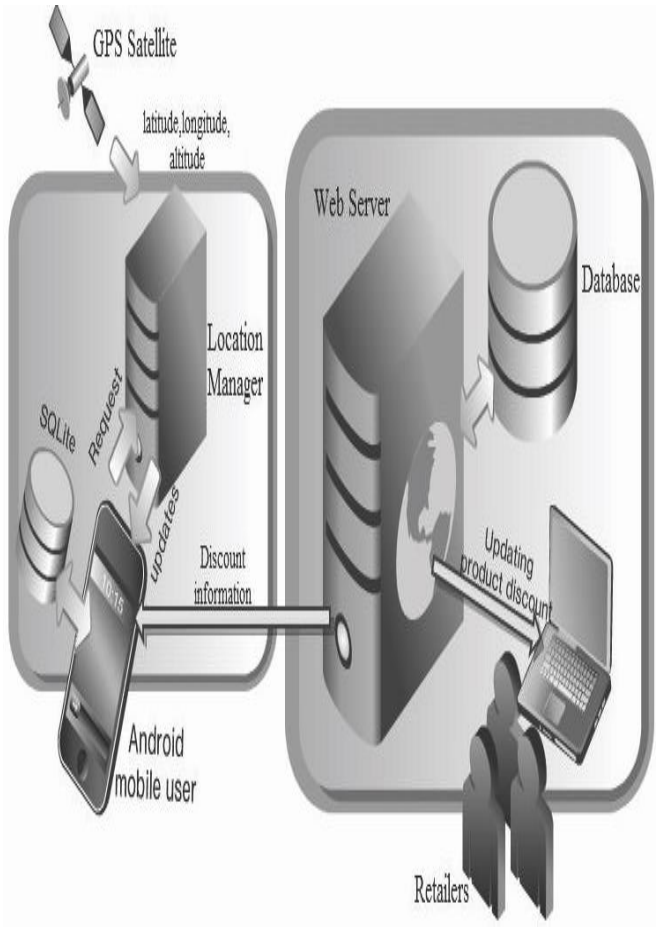

Figure 1.Architecture Diagram

B. Design

Designer model is developed to describe the overall layout of the project. Fig 2 illustrates in detail the basic model used as reference during the project implementation.

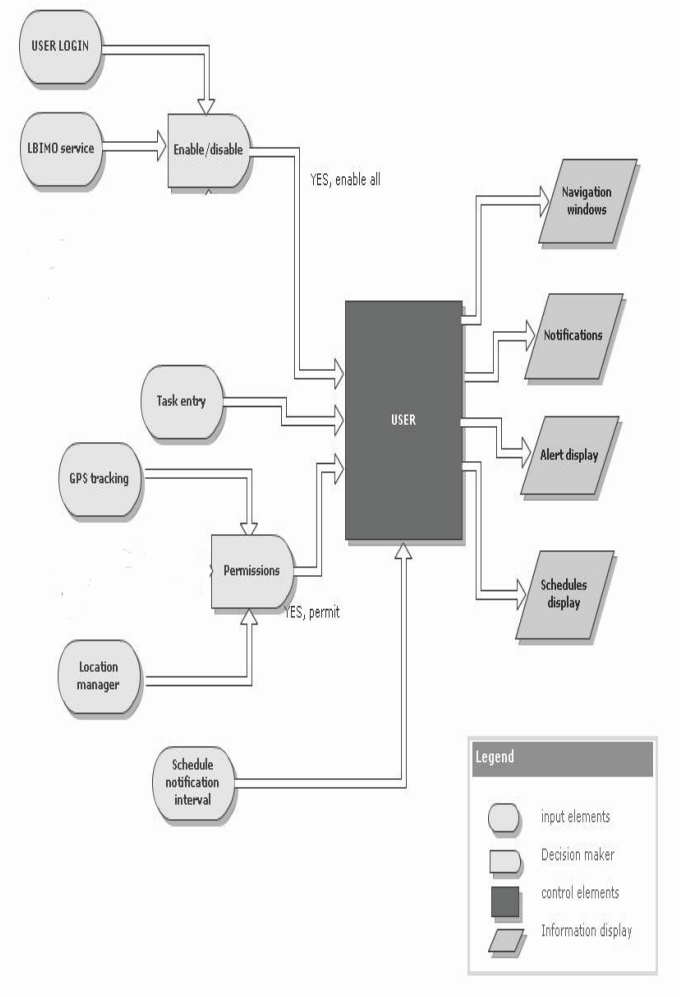

Figure 2. Application flow

Service will invoke the application automatically on booted. Location server constantly delivers the location information to mobile every 3 seconds. Based on this communication with the backend server for displaying corresponding task is established.

IV. IMPLEMENTATION

Location application will get the task input from user and will listen for location changes. The new co-ordinates are passed to service routine written for handling task. Following are the benefits of task application

•Adding and editing task
•Storing task in SQLite database
•Tracking and displaying location
•Viewing retail discount information
•Retrieving information on mobile device
•Task around few Km displayed as alert

A. Service Invocation

Service running in background will track the user location continuously. Android Software Development Kit (SDK) does not provide a special intent that will listen for changes in location. Broadcast Receiver listens for BOOT_COMPLETED event. Therefore once the device is booted on, the location

service is invoked automatically using our service routine. Permission has to be set in the Android Manifest file as shown in the Fig 3.

```
<uses-permission android:
name="android.permission.RECEIVE_BOOT_COMPLETED
"></uses-permission>
```

Figure 3. Permission for Boot

B. Location Services

Application will have to register to the Broadcast Receiver which is an Android component for receiving location updates. These Permissions for location updates are registered as shown in Fig.4 in Android Manifest file.

```
<uses-permission android: name="android.permission.
ACCESS_FINE_LOCATION"/>
```

Figure 4. Permission for location access

Location information is retrieved with the help of Location Manager System by invoking the command *getSystemService (Context.LOCATIONSERVICE)*.Code for invocation is shown in the Fig 5.

```
lm = (LocationManager)
getSystemService(Context.LOCATION_SERVICE);
locationListener = new MyLocationListener()
lm.requestLocationUpdates(
    LocationManager.GPS_PROVIDER, 0, 0,
locationListener);
```

Figure 5. Location Manager invocation command

Applications having a Location Manager are able to do the following:

f Query for the list of all Location Providers of last known location.

f Register/unregister for periodic updates of the user's current location from a Location Provider.

f Register/unregister for a given Intent (message) to be fired if the device comes within a given proximity of a required latitude /longitude

Location changes can be tested in the emulator using Keyhole Markup Language (KML) files that provides geographical location details. KML file is created using Google earth.The .kml file output from the Google earth is converted into android compatible format using ge2adt tool. Fig 6 shows the Droid Debug Monitor Server (DDMS) perspective in eclipse displaying the emulator control view.

Four points on the path of location of interest were chosen and loaded in the KML tab of Android emulator control.

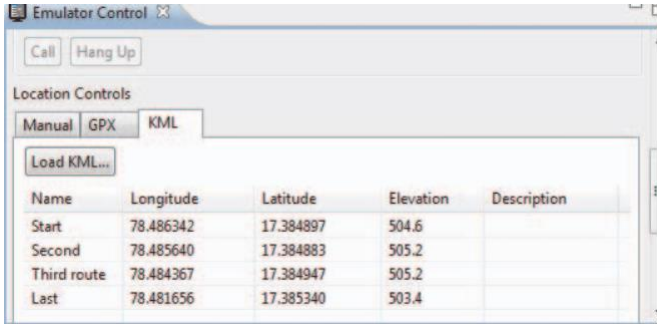

Figure 6.Emulator control showing KML files

C. Database

Task data is stored in the SQLite database and can be viewed using special third part browser while running the program. Database entries are pulled from the device in DDMS perspective and downloaded to the user system for further analysis. Latitude, longitude, distance of interest and essential product details along with product identification code and shop name are stored in MySQL backend for shopping offers display.

D. Discount Information

Retailers wishing to publish product discount information can do so by registering into the webserver. Once done, the administrative rights of uploading discount information are given to the retailer. Request communication from mobile to the web server is done through Hyper Text Transfer Protocol (HTTP). Matched discount information corresponding to latitude and longitude will be passed back to the Android mobile using JSN format and the same will be displayed.

V. OUTCOME

Android project for location tracking has various fields for task entry in the emulator. Fields includes task name, location details tags, date time and priority of the task. Once done user can save these task details.

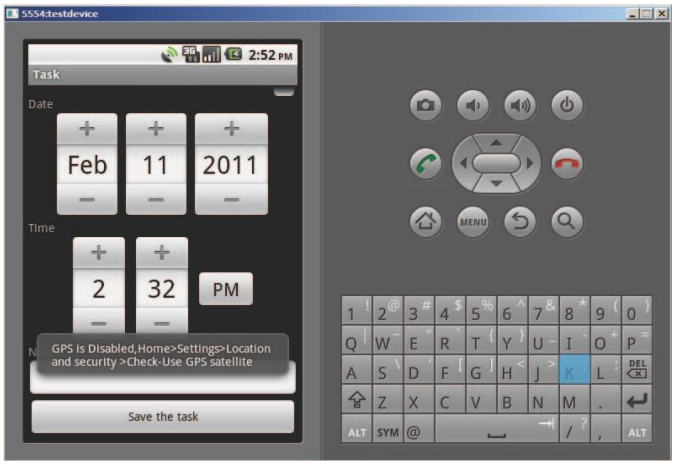

Figure 7.Task entry screen showing GPS disabled status message

GPS status is checked once the task is loaded into the database. Status of GPS is shown as a toast message in the emulator screen. If the status is disabled then the toast message displays the path to invoke location service. Disabled GPS status is on emulator is captured and shown in Fig 7 and the GPS enabled status is shown in Fig 8.

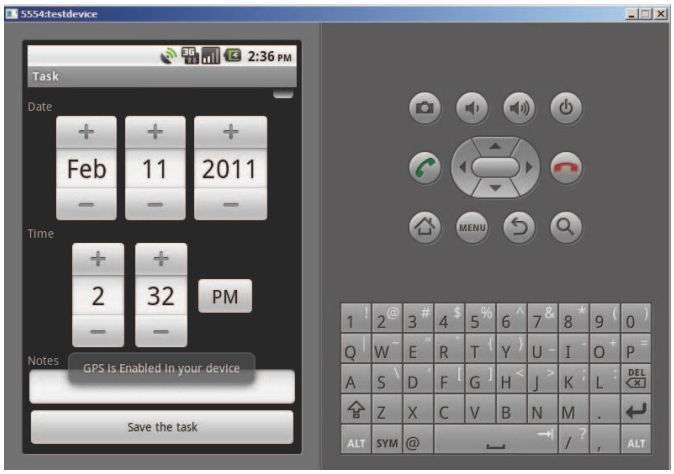

Figure 8.GPS enabled status shown on emulator

Intents will receive location updates constantly and will check for location changes every 3 seconds and once change in location is determined it invokes the web server and updates to the SQLite database.

Figure 9.Location changes display

Change in location is found using the service and displayed in the emulator as shown in Fig 9.On reverse geocoding corresponding location name is obtained which can be displayed on the mobile screen. Distance is calculated between the current position and that in database and if found to be less than the desired user range, then the task information is displayed back on user screen.

VI. CONCLUSION

Future battle in the telecom industry is least expected to be based on the hardware or the features like SMS and call cost, but the battle would be based on the enhanced user friendly applications provided by the service provider and adaptability for such applications provided by device manufacturers. Setting up of infrastructure for a location based service using the GPS facility, to alert a user on reaching a desired location is emulated using the Android 2.2 platform and the desired output is obtained successfully. Thus this Location based intelligent observer application using GPS tracking is developed so as to add value and organize users' task intelligently.

VII. FUTURE WORK

Invocation of web server and retrieving the relevant discount information into a mobile device is in progress. Thus marching towards building a complete location based service .In the same way one control the other applications by means of GPS locations. It will be very useful for security purposes and to control the activities of the users in a certain area. For example inside the educational buildings and office arenas entertainment applications can be restricted to use.

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Sustainable Production of Highly Active Pharmaceutical Ingredients (HAPIs)

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B. Tech., Chemical Engineering

Abstract- This paper deals with the sustainable and best methods that should be employed in the production of Highly Active Pharmaceutical Ingredients (HAPIs). We start with a brief introduction of HAPIs, which includes their basic definition, market value and applications. We then study the conventional HAPI manufacturing process and its drawbacks. Finally we move on to propose some methodologies which, if practiced, would lead to better manufacturing standards in terms of safety, cost and sustainability.

Index Terms- Containment, Good Manufacturing Practices (GMPs), Highly Active Pharmaceutical Ingredients (HAPIs), Occupational Exposure Limit (OEL)

I. Introduction

HAPIs are the compounds in medications that provide therapeutic effects. What differentiates HAPIs from APIs is their potency. They are the active ingredients that make a drug product effective and provide the pharmacological activity of any drug product or dosage form.

MARKET POSITION OF HAPIs:

The high potency market has seen steady growth in recent times and according to market researcher RNCOS[1], (HAPIs) represent the fastest growing segment in the global API industry. RNCOS estimates this market will reach US$15.3bn by 2017. Such potent active ingredients typically include particular hormones, peptides and cytostatic[2] agents, as well as many new chemical entities (NCEs), i.e., chemicals that have not yet been fully characterised.

APPLICATIONS:

The selective targeting property of HAPIs is widely deployed in the treatment of cancer. HAPIs are also increasingly being used in the form of Antibody Drug Conjugates (ADCs)[3] which is an important and effective breakthrough in cancer treatment. ADCs are a combination of monoclonal antibodies and biologically active drugs. They combine the unique targeting ability of monoclonal antibodies and the cancer-killing ability of cytotoxic drugs. Highly potent anti-cancer drugs are efficient as they target cancers while minimizing the drug's exposure to the healthy tissues.

II. HAPI MANUFACTURING- CONVENTIONAL PROCESS

The process begins with un-milled HAPI powder being brought at the Production Plant.

- **MILLING:**

Milling is the process of mechanically reducing the size of solids. It is also referred to as comminution, grinding, disintegration and pulverizing. It is an important step in the process of turning the raw materials into viable drug products. It increases the rate of in-vivo[5] dissolution and/or increases its bioavailability. It also results in narrower particle size distribution which makes products more uniform and effective. Particle size distributions impact powder mechanical properties, compression characteristics and dissolution performance. Milling can take place either in gas (dry milling) or in liquid (wet milling).

- **BLENDING:**

Subsequent to milling, the HAPI powder is blended. The purpose of blending is to homogenize the batch. Batch homogenization serves two related purposes. First, it means fewer samples have to be taken to obtain a representative sample of the powder population. Second, it helps ensure final product consistency.

III. MANUFACTURING PROCESS

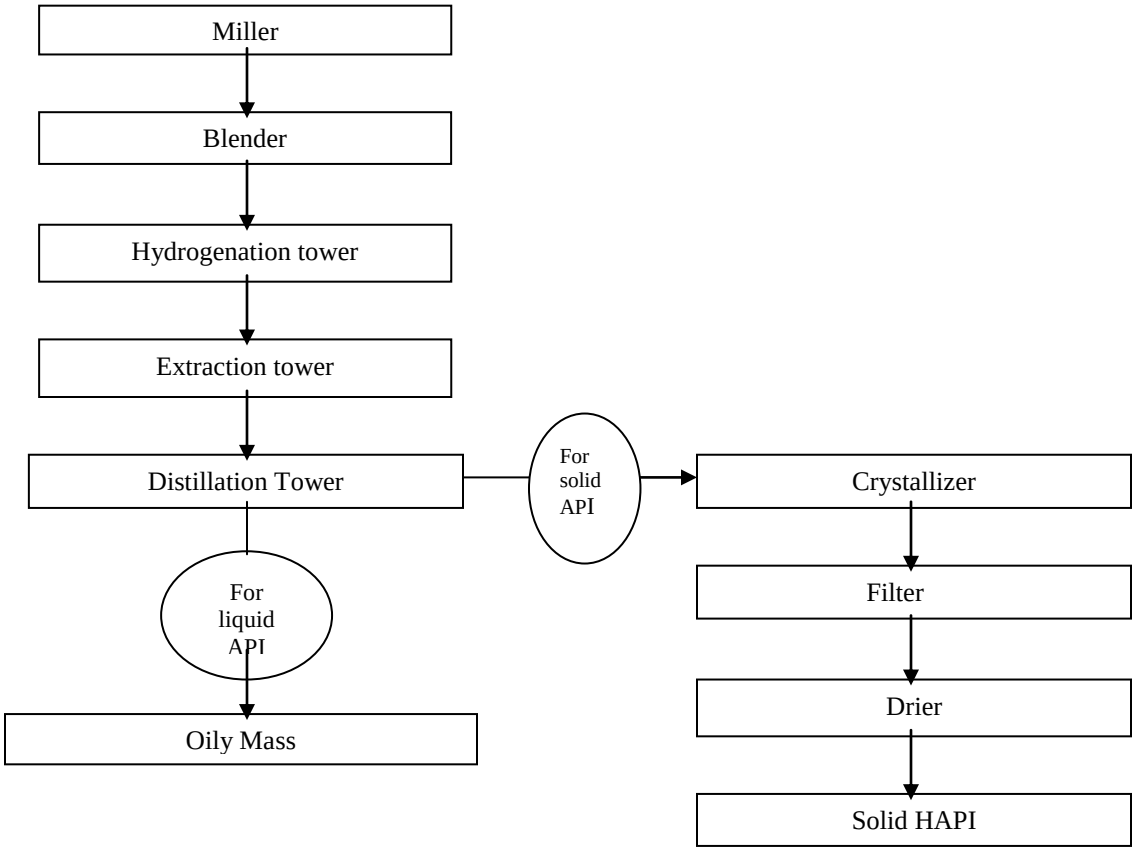

Figure 1: Block diagram for HAPI manufacturing

IV. DRAWBACKS OF THE CURRENT PROCESSES

The conventional process of HAPI manufacture has quite a few drawbacks when considering the environmental sustainability of the process.

- Milling generates fine dust particles. Hence milling units need to be deeply analysed and investigated to ensure proper levels of containment, ergonomy[4] and process accuracy.
- A cleaning step takes place between successive batches. If the next batch utilizes the same HAPI, the operator might perform a cursory cleaning step since he will not have to worry about cross contamination. If the next batch utilizes a different HAPI, then the operator performs a thorough, verifiable cleanse of the processing equipment to prevent cross-contamination. This process is quite time-consuming and we estimate that in the current process setup it can take seven to ten days for cleaning and verification.
- HAPIs have the potential to cause serious health effects in workers at very low airborne concentrations. They are known to exhibit carcinogenic, mutagenic, teratogenic[5] or cytotoxic[6] effects. The current process is such that it runs huge risk of environment and worker exposure.
- Powder flow-ability might be an issue if the flow path of material from one unit of production plant to the other is not well taken care of. This may lead to production constraints.

V. PROPOSALS

We propose that manufacturers utilise safe handling systems to protect workforce and the environment against the adverse effects of HAPI materials. We suggest the following remedies:

- **USE OF CONE MILLS:**

Cone milling is one of the most common methods of milling in the pharmaceutical and allied industries. Cone mills produce less dust than alternative forms of milling, thereby reducing environmental contamination.

- **USE OF CONTAINMENTS:**

'Containment' focuses on methods and equipments that prevent environment and operator exposure to HAPI powder by using engineered equipment solutions, administrative controls and Personal Protective Equipment (PPE).

Containment device selection: The principles of selecting containment equipment and verifying its effectiveness are: (i) A step by step analysis of the process to produce a detailed list of

all tasks that pose a threat to the environment and human workforce. (ii) Setting a containment performance target (CPT) (iii) Specifying and selecting containment equipment based on the task list and the CPT (iv) Verifying containment performance at the factory acceptance test (FAT)[7] and the site acceptance test (SAT)[8] (v) Assessing occupational exposure to workers during actual operations involving the HAPI.

Containment devices:

- *Barrier isolator:* The rigid or fixed walled isolator provides a contained environment within which a wide range of tasks can be performed. Thus whatever be the process taking place inside the containment, its effect on the outside atmosphere is nil. Typically, an isolator will operate at a slight negative pressure, though in some cases (to ensure product sterility) isolators can operate at a slightly positive pressure. The contained environment inside the isolator is ventilated with air entering and leaving the isolator. Operator access to the isolator chamber is usually via glove ports, which allow materials and equipment to be handled and to facilitate transfers in and out of the isolator.
- *Transfer chambers (passive):* The transfer chamber is an enclosed chamber attached to the isolator with one sealable opening with a door into the isolator and the other sealable opening with another door to the outer environment. The chamber is not under negative pressure. This arrangement can be used to pass materials into a clean isolator, opening only one door at a time. It improves product flow-ability and facilitates safe transfer of material.
- *Airlock (active):* The airlock is similar to the transfer chamber except that in this case the airlock is ventilated and is under negative pressure. This reduces the potential for airborne transfer from the contaminated isolator. If in addition, decontamination of materials leaving the isolator is possible, then this arrangement can be suitable for safe transfers out of the isolator whilst maintaining very high containment performance.
- *Bagging device:* The bagging transfer device (or bag-in/bag-out port) uses a specially constructed tube of flexible film material such as polythene (or continuous liner), attached to a port and fitted with double-seal rings. This arrangement enables continuous closed bags to be produced which can be used to enclose items transferred in or out of the isolator in a sealed bag. This solution to transferring materials and equipment is capable of high levels of containment.
- *Flexible charging bags:* A relatively recent innovation in containment equipment is the flexible charge bag. This device can deliver contained charges of small quantities of HAPI with good containment performance. One advantage of this device is its cost, allowing potent and highly potent APIs to be pre-packaged in a disposable contained transfer device.
- *Intermediate bulk containers:* These are large sacks or bags capable of holding one tonne or more of powdered or granular materials. Such containers are generally manufactured from woven fabric, generally polypropylene. In order to make these bags waterproof, an impervious inner liner is added within the outer envelope. The product being transported is actually contained within the inner line. Liners previously used have generally been in the form of a cylindrical length of polyethylene or other impermeable plastics material. In the filling region of the container one end of the liner may be brought through a filling opening in the outer envelope and may be tied off after the container has been filled. At the discharge end of the container the liner is closed off and may be either laid loosely within the outer envelope or disposed in a predetermined relationship to an outlet spout from the outer envelope. The liner constructions are loosely fitted within the outer envelope and are prone to distortion within the envelope. This invention seeks to provide a container that avoids the disadvantages previously experienced with liners, yet can still be completely waterproof.

Split butterfly valves: The split butterfly valve (SBV) is widely used for transfers of potent and highly potent APIs. It is particularly useful where large quantities of material are being transferred. The details and principle of operation of the valve are well established and allow for good containment performance during contained transfers.

Figure 2: Intermediate Bulk Containers

Figure 3: Split Butterfly Valve

Containment performance: This analysis will provide the information required to specify the design of the containment system and the containment performance target (CPT) for the containment device will usually be based on the OEL of the material being handled. The aim of containment performance verification should be to demonstrate that the airborne concentration will not normally be exceeded. The containment performance is broadly defined as the airborne particulate concentration measured around the containment device and in the operator's breathing zone during simulated or actual operations.

Containment performance verification: Overall containment performance of an isolator system or a device may not be predictable. It is therefore usually necessary to verify containment performance prior to handling the HAPIs in the containment device. Containment performance verification assesses performance of the contained device or system either as built at the factory (FAT), when newly installed in a production facility (SAT) or when in routine use (ongoing occupational hygiene testing). Where several ancillary devices are present, such as with transfer devices fitted to an isolator, the use of all devices must be included in the containment performance evaluation.

- **SEGGREGATION OF PRODUCTS BASED ON TOXICITY**

An occupational exposure limit is an upper limit on the acceptable concentration of a hazardous substance in workplace air for a particular material or class of materials. It is typically set by competent national authorities and enforced by legislation to protect occupational health and environment safety. It is an important tool in risk assessment and in the management of activities involving handling of highly active substances such as HAPIs. Hazard banding or control banding strategies can be used to ensure safe handling. Occupational Exposure Banding method shows 5 bands of products based on their Occupational Exposure Limit (OEL). HAPIs fall under the bands 4 and 5, i.e. OEL ranging from 100- 5000 µg/m³. Each control band is associated with a safe handling guideline which describes in detail how a material of that potency should be handled in the different environments encountered in the workplace.

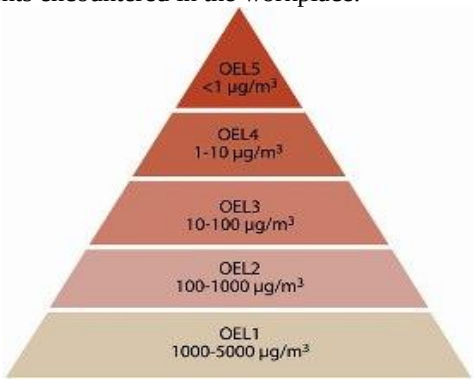

Figure 3: Occupational Exposure Banding

- **USE OF GOOD MANUFACTURING PRACTICES (GMPs):**

Maintaining the quality of HAPIs:

The quality of HAPIs is defined as meeting the appropriate specifications for the APIs and being produced in an appropriate facility. Good Manufacturing Practices (GMPs) govern pharmaceutical product quality. Within the US, the Food and Drug Administration (FDA) enforces product quality standards using its version of GMPs termed current Good Manufacturing Practices (cGMPs).

Cleaning in Place (CIP):

It is used in hygiene critical industries such as Food, Beverage and Pharmaceutical, to clean a wide range of plant. CIP refers to the use of a mix of chemicals, heat and water to clean machinery, vessels or pipe work without dismantling the plant. It is performed to remove or obliterate previous Cell Culture batch components. It is used to remove in-process residues, control bio-burden, and reduce endotoxin[9] levels within processing equipment and systems. Repeatable, reliable, and effective cleaning is of the utmost importance in a manufacturing facility. Cleaning procedures are validated to demonstrate that they are effective, reproducible, and under control. In order to adequately clean processing equipment, it must be designed with smooth stainless steel surfaces and interconnecting piping that has cleanable joints. The chemical properties of the cleaning agents must properly interact with the chemical and physical properties of the residues being removed. A typical CIP cycle consists of many steps which often include (in order):

- Pre-rinse with WFI (water for injection) or PW (purified water) which is performed to wet the interior surface of the tank and remove residue. It also provides a non-chemical pressure test of the CIP flow path
- Caustic solution single pass flush through the vessel to drain. Caustic is the main cleaning solution
- Caustic solution re-circulation through the vessel
- Intermediate WFI or PW rinse
- Acid solution wash – used to remove mineral precipitates and protein residues
- Final rinse with WFI or PW – rinses to flush out residual cleaning agents
- Final air blow – used to remove moisture remaining after CIP cycle

Critical parameters must be met and remain within the specification for the duration of the cycle. If the specification is not reached or maintained, cleaning will not be ensured and will have to be repeated. Critical parameters include temperature, flow rate, supply pressure and chemical concentration. Similar to CIP, there is Washing In Place (WIP). It is fully integrated with process controls and works by directing sufficient flow and pressure of water to remove residues inside the reactor. Cleaning cycles vary depending on the complexity of cleaning. After cleaning, the water re-circulates back into the system. Benefits include standardization of the cleaning process and reduced cleaning time.

VI. CONCLUSION

HAPIs play an important role in the drug product industry. They make a drug product effective. Owing to their curing abilities, their manufacturing amount cannot be reduced drastically. Having stated that, the harmful effects of the

manufacturing process cannot be ignored as well. Environmental degradation is a matter of global concern, and no such process should be allowed that adds to it. The best way to protect the environment and humans from their harmful effects of exposure is to take the necessary precautions at the root level itself. These include elimination or minimisation of the any and every possibility of environmental exposure. The methods in which the same can be accomplished have been stated above. Practicing these will make the HAPI manufacturing process an environmentally sustainable one.

APPENDIX

1. RNCOS- industry research and consultancy firm
2. Cytostatic agent- a drug that blocks cell division
3. Antibody Drug Conjugates (ADCs) - drugs designed as a targeted therapy for the treatment cancer
4. ergonomy- science of equipment design, to maximize productivity by reducing operator fatigue and discomfort
5. teratogenic- causing malformations of an embryo or a foetus
6. Cytotoxic- producing a toxic effect on cells.
7. Factory Acceptance Test- test conducted to determine if the requirements of factory are met
8. Site Acceptance Test- test conducted to determine if the requirements of the site are met
9. Endotoxin - heat-stable toxin present in the intact bacterial cell but not in cell-free filtrates of cultures of intact bacteria

ACKNOWLEDGMENT

We would like to thank our fellow classmate, Janani Venkatesh, for all her valuable inputs.

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Architectural considerations while developing Enterprise Mobile Applications

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Abstract- **T**oday's competitive environment is demanding employees to be productive on the way. Employees can work while at home, travelling or from on-site. Mobile devices are proving to be extremely helpful in increasing productivity of employees.

Enterprise Mobility is becoming an inevitable part of any organization and is playing crucial role in development of any organization. This paper is focused on discussing various aspects of Enterprise Mobile Application Development from an architectural perspective.

Index Terms- Enterprise Mobile Applications, Enterprise Mobility, Mobile Application Architecture, Go Mobile

I. Introduction

In the present era of mobile, deciding the mobility strategy is gaining a lot of attention for any organization. In a broader sense the mobile applications can be classified as:

1) B2C (Business to Consumer) Applications
2) B2B (Business to Business) Applications

A. Business to Business (B2B) Applications

Business to Business (B2B) applications mainly focusses on various interactions viz. transactions between the businesses. B2B applications also defines the communication and collaboration between the various business units. B2B applications also caters employee needs to connect/interact with each other across/within various business units to fulfil the business needs.

B. Business to Consumer (B2C) Applications

Business to Consumer (B2C) applications mainly falls into Retail Mobile Application domain. Retail is considered as a sale from a business to its end-user i.e. consumer. B2C applications are targeted towards creating virtual market place where business and consumer can exchange goods/services against the compensation.

Another classification of mobile applications is based on the type of services provided by the respective mobile application.
The mobile applications are classified as
1) Enterprise Mobile Applications
2) Consumer Mobile Applications

A. Enterprise Mobile Applications

Enterprise Mobile applications are designed for an organization and are focusing on addressing the business needs of an organization. The Enterprise mobile application may interact with the existing system to pull/push data to/from the system. The typical tasks carried out by Enterprise Mobile system can be procurements. Order processing, Viewing Reports, On-Site reporting, Real Time data gathering (may be data processing in some cases, though the processing of data can be limited by the processing power of mobile device). Within a particular organization, the Enterprise Mobile Applications can be used by various departments like: Sales, Marketing, Production, Higher Management, etc. The Enterprise Mobile Applications can be related with Enterprise Resource Planning (ERP), Business Intelligence (BI) and Customer Relation Management (CRM). Many organizations prefer to adapt suitable MEAP (Mobile Application Development Platform) to build mobile applications.

B. Consumer Mobile Applications

Consumer Mobile Applications are mainly focused on end customer. These types of applications mostly provided services based related with user location, Social Media, mobile commerce, etc. Generally these are the mobile applications which provides context-aware services. These apps mainly focused on user interests, likings, geo-graphical location, user intentions, user time zone, etc.

II. The need of enterprise mobile applications and steps to 'go Mobile" for enterprise

The mobile revolution which was started by Apple in 2007 after launching of iPhone has totally changed the face of mobile spectrum. It has generated the "Going Mobile" need for enterprise to be in and lead the competitive market. Mobile has proven to be very effective way for an Enterprise to extend its services to large amount of consumers. Every organization is striving to improve the way in which the services are delivered to employees and end customers. The main focus is on accelerating the employee productivity and enhancing the end-user experience. CIOs of companies are having mobility on their high priority list. Every Enterprise is looking for building their own presence in mobile spectrum.
The following are the steps for any organization willing to "Go Mobile"
1) Define Mobile Strategy
2) Develop mobile application Strategy

3) Development, Deployment and Management of mobile applications

A. Defining Mobile Strategy

A Mobile strategy is a plan devised in order to decide / create / improve mobile presence of any organization. A typical mobile strategy is based on some factors and answers to some of the below questions.

1) What are the problems faced by employees and end customers presently?
2) How "Going Mobile" can address their problems?
3) Which all sections of Enterprise needs mobility?
4) What are the applications needed in Business to Business (B2B) and Business to Consumer (B2C) categories?
5) What application strategy is needed for Business to Business (B2B) and Business to Consumer (B2C) applications?
6) Does Enterprise have backbone (mobile network infrastructure) in place for mobility support or Enterprise need to build mobile network infrastructure?
7) In case backbone is available, is that capable of serving mobile applications or Enterprise need some modifications to it?
8) Does the staff is literate enough to use mobile applications or Enterprise need to educate them?
9) If the training to staff is required, what will be the level of training is required?
10) What is the mobile usage index in the geographical areas where the end customer is based?
11) Does organization will provide mobile devices to the employees or organization is willing to follow BYOD (Bring Your Own Device) policy?
12) What MDM (Mobile Device Management) methodology Enterprise need to follow in order to maintain the security/authorization for Enterprise data?
13) Which all mobile platforms needs to be targeted?
14) How the application(s) are going to be distributed to the end user?

B. Development/Refinement of mobile network infrastructure

Any organization may or may not have the existing enterprise system (which may provide web/desktop interface). In case of existing system, organization need to think on extending the same system for mobile applications. It need to build interface for mobile applications to interact with.

In case of absence of such system, the organization need to build it in order to support mobile applications.

C. Develop mobile application strategy

A Mobile application strategy is a plan devised in order to build effective mobile applications.
This plan should be in line with the organization's mobile strategy. It should cover the various goals to be achieved through the mobile applications. It should address the network and security constraints of the organization. Mobile Application Strategy should help to decide the platform and architecture. It should also help to decide the development methodology for the applications.

D. Development, Deployment and Management of mobile applications

Finally organization needs to develop the applications. Once development and testing is carried out, organization need to deploy the application. The deployment is highly driven by the platform selection of application. The Business to Business (B2B) applications can be distributed through Enterprise licensing model which ensures that the application is available only to the specific users (for instance Employees). For Business to Consumer (B2C) applications, organization may prefer to distribute the application through application distribution platforms which are typically provided and operated by respective platform owner. Below are some of the application distribution platforms:

1) App Store – iOS
2) Google Play - Android
3) Windows Phone Store – Windows Phone
4) BlackBerry App World – BlackBerry

The organization also needs to make sure effective management of these apps. B2B applications can be managed by leveraging one of the available Mobile Device Management (MDM) solutions.

III. Importance of Sound Mobile Application Architecture

Application Architecture is the design process and its outcome is structured approach which will fulfil the business, functional and technical requirements of application. Mobile Application Architecture encompasses the set of significant decisions about the organization of a mobile application.
Developing an architecture involves:

1) Selection of the various structural elements within application and their interfaces by which a system is composed.
2) Architecture specifies the behavior as specified in collaborations among those elements.

The Architecture is related with decomposition of the system into various components or modules or various subsystems.
Architecture defines:

1) Component interfaces – Component interface is related with capabilities of component i.e. what a component can do. Interface extends the details about what a component will do when one tries to consume the component.
2) Communication among components – Architecture details out the various communication channels which can be consumed when one component consume/provide services from/to other component.
3) Dependencies – Architecture lists out the dependencies related with functionality or consumption of any component.

A. Importance of Architecture

A sound mobile application architecture always leads to the successful application delivery. The good software architecture is very important to the success of the project/application because:

1) Good architecture always aims for higher quality keeping the cost low.

2) Optimizations can be carried out in better, efficient and easy way.
3) It promotes the better code reusability in turn leads to faster software development.
4) Good architecture ensures the scalability, performance, modifiability and maintainability of the application.

The below sections list outs the various advantages of architecture to various stake holders of the system.

B. Advantages of good software architecture for end-users

1) Performance – The performance of application plays an important role in mobile applications. Mobile users expects quick response from the application specifically compared to desktop/web applications. If the application is taking long time to retrieve or display the details, there is a high possibility that the users would not like the application and they might stop using the application. A mobile application architecture should ensure to meet the performance expectations of the users.
2) Availability – Good Architecture should ensure the availability of the application. Availability is one of the important requirement of Enterprise Mobile Application. Availability refers to the virtue of the application to be available to server when user needs it. If user is in need of using the application and it is not available at that time may lead the user to move away from using the application.
3) Usability – Usability plays an important role specifically in case of the mobile applications especially considering the small amount of screen real estate availability. The architecture should be built to ensure the usability requirements of the application.
4) Security – In Enterprises, data is of the prime importance and Security of the data is one of the major non-functional requirement of the application. The good architecture should always be robust enough to address the security concerns of the Enterprise and it should be in compliance with the organization's security policies.

C. Advantages of good software architecture for developers

1) Maintainability – Considering the requirement change due to change in environment, market, demand, Enterprise Policies, always there is a need of maintenance for the Enterprise Mobile Applications. A Good Mobile Application Architecture ensures the high maintainability of the mobile application. It reduces the efforts and complexity of the change implementation which is in favor of the developers.
2) Reusability – Reusability always leads to faster application development and structured development approach. Good Architecture always considers the reusability aspect during design of components and interfaces.
3) Portability – Portability is the ability of the system to react to the environmental changes. In case of Enterprise Mobile applications, the change in environment may be frequent considering the technology, market, demand changes. These changes may result in change in servers, database, etc. The good Mobile Application Architecture ensures the system to be portable enough to respond to these changes keeping the impact of change at minimal level.
4) Testability – The Enterprise application needs to undergo rigorous testing processes in order to ensure the consistency of the application under various conditions. This raises a need to rigorous testing of each component/module of the system. Good Mobile Application Architecture ensures that the each component is separately testable.

IV. Architectural Considerations

Building an architecture for mobile application involves a lot of considerations. A wrong decision taken by ignoring / misunderstanding any of these considerations will lead to product failure which in turn result in loss of organization. The various architectural considerations for Enterprise mobile applications are listed below.

A. Platform Selection

Any organization willing to "Go Mobile" need to decide the mobile platforms to be supported. The selected platform may be iOS, Android, Windows Phone, BlackBerry, etc. Some organizations may opt to support multiple platforms.

B. Development Approach

Depending upon the types of platforms to be supported, the development approach could be Native, HTML5 or Hybrid. These approaches are briefly discussed below.

1) Native – Native mobile application development approach is specific to a given mobile platform and it uses the development tools and language that the respective platform supports. For example, Native Android development is carried out using JAVA language.
2) HTML5 – This approach uses standard web technologies, typically HTML5, JavaScript and CSS. The application developed using HTML5 runs in browsers of the devices.
3) Hybrid – This approach uses the HTML5/JavaScript approach in combination of power of the native platform by wrapping a Web application inside the native container and leveraging the bridge available to interact with device native features.

B. Client Type

The application strategy helps to decide the type of client needed. The mobile application can be designed to be a Rich client, thin client or rich internet client.

1) Rich client – The Mobile Application will designed as a rich client when it requires to carry out local processing and likely to operate in an occasionally connected scenario. Generally a rich client applications are more complex to maintain.
2) Thin client – If Mobile application strategy denotes that the application will be governed by server processing and will always be fully connected, then the architect should suggest and design a thin client.
3) Rich Internet Client (RIA) - If there is a need of a rich user interface, not much access required to local resources, portability to other platforms is of high priority, the architecture should built for a rich internet client.

C. Device Type and Capabilities

The selection of devices to be supported by the application is an important decision for an Enterprise. When choosing which device types to support, below factor plays an important role:

1) Screen Size – The fragmentation in Android devices in terms of various screen sizes has considerable impact on the decision to decide the supported devices.
2) Resolution (DPI) – Considering this is important factor majorly when it comes to support Rich User Interface.
3) CPU Performance Characteristics – CPU performance is very important specifically for Rich Client mobile applications.
4) Memory and Storage Space – Some mobile application may require high amount of processing which may demand high RAM whereas some mobile applications may demand larger storage space to store the application data. Enterprise need to consider these factors while deciding on the devices to be supported.
5) Native Feature Support – Some applications may require usage of native features like Accelerometer, GPS, Camera, etc. The selected devices should be capable of supporting these features.
6) Battery Life – The device battery life plays an important role in some of the mobile apps. The architecture should make sure the less consumption of battery. The battery intensive application features should be architect in such a way to reduce the battery consumption. Wireless connections like GPS, Backlighting are the examples of features which demands more battery.

D. Security Requirements

In most of the Enterprise Mobile Applications, data security is at most priority. The application architecture should be robust enough to secure the data accessed/consumed by the application. The architecture of Enterprise Mobile Application should be in sync with organization's security ecosystem. Any data stored on the device (in-memory or persistent) should be encrypted to ensure security. The organization may opt for Mobile Device Management (MDM) tool to impose security constraints on the application. The application architecture should be able to accommodate any interface to such Mobile Device Management tools.

E. Internationalization

An Enterprise may have its business across different geographies and languages. Supporting multiple language is an important consideration for Enterprise Mobile Applications. The architecture should have provision to support internationalization in an elegant way. The architecture should support addition of new languages seamlessly.

F. Internet Absence/Presence

There can be a requirement of an Enterprise where the application is expected to work in the absence of internet or in case of less internet connectivity available. The Enterprise Mobile Application Architecture should consider these scenarios and the application should be capable of storing and securing all the data which is needed by the application locally in case of no internet scenario. The application should also take care of securing the local data. Mobile applications should also cater to scenarios when a network/internet connection is intermittent. The Architecture should support state management in such cases.

G. Authentication

Most of the Enterprise Mobile Applications need users to authentic themselves before using the application. Architecting an effective authentication strategy is important for the Enterprise. This is crucial consideration for the reliability and security of the mobile application. There can be some challenges in implementation as:

1) Mobile operating system unlike desktop operating systems are built to be single-user system and does not provide user profile and security support beyond just a password (textual or pattern).
2) The application strategy should also focus on the scenario where users are trying to authenticate in absence of internet.

H. Authorization

An Enterprise can have different users holding different positions willing to use the mobile application. In such cases some of the application features may/may not be available to some user groups. This is something known as role-based access. The Mobile Application Architecture should be capable enough to switch on/off the access to particular user based on the access rights defined.

I. Caching

Here Caching refers to storing data locally for the application in case of instant access needed especially in "no internet" scenarios.

The mobile application architecture should not enforce storing of unnecessary data on a device and it is especially not good when device has limited resources. Caching decisions are highly driven by the frequency of data change. For example, in case of storing master data like list of cities, the data change frequency might be very low. But in case of stock market data, the data changing frequency is very high and there is always a risk of cached data getting stale. In this case relying on cached data may not work as expected.

The caching of Enterprise data always comes with a security concern. Storing of sensitive data in persistent/in-memory without encryption is a security breach.

J. Synchronization

In case of mobile applications, Synchronization may refer to syncing the local data with Enterprise server. In case of Enterprise application, data synchronization will often involve sensitive data. The security of synchronization data over the air is required. The mobile application architecture should suggest elegant ways to handle connection interruptions graciously during synchronization. This can be achieved by abandoning the operation or by allowing it to restart on connection availability.

K. Logging

Logging refers to the process of storing some information on device for later use. Logged data can be used to troubleshoot the application issues or to judge the application behavior. The log synchronization between the mobile logs and the server logs provide audit capabilities on the server.

The mobile application should have some provision to pass on the logged data to server in order to analyze the same. For logging, application architecture should consider the limited memory on mobile devices and accordable demand limited logging.

L. Architecture Type - Layered

The layered architecture is suggested to be the best for Enterprise Mobile Applications. The layered approach improves the reusability and maintainability of the application. The layered approach leverage the concept of layers to maximize separation of concerns.

The typical Enterprise Mobile Architecture looks like:

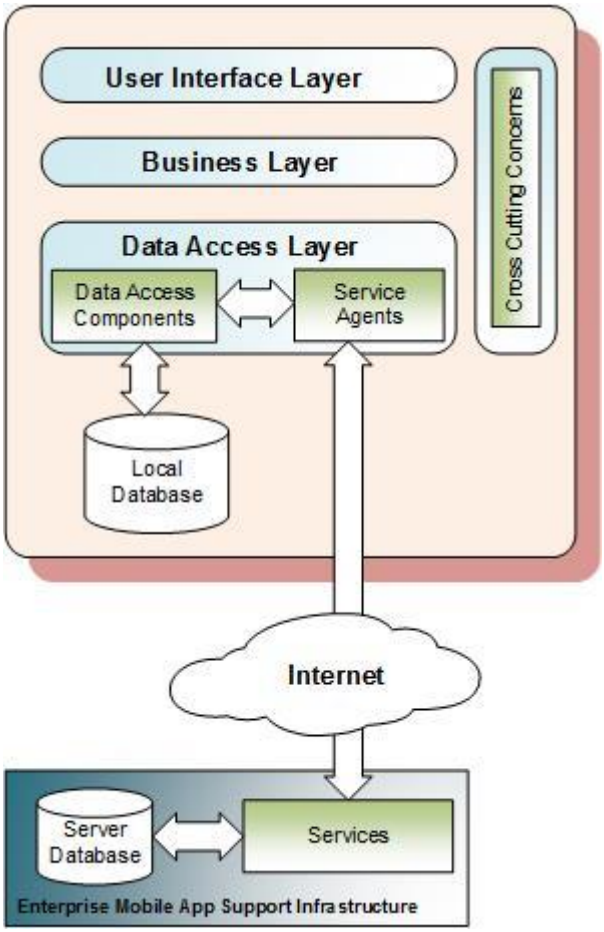

Figure 1: Typical Enterprise Mobile Application Architecture

i. User Interface Layer

It is also known as Presentation Layer. Presentation layer presents the application user interface to the user and it also accepts the inputs from the user.

ii. Presentation Layer

Presentation layer presents the application user interface to the user and it also accepts the inputs from the user.

iii. Business Layer

Business layer holds the business components, various business entities and it governs the business workflows.

iv. Data Access Layer

The main function of Data Access Layer is to abstract the data access from the rest of the application. This layer ensures to retrieve the data from local data source or Enterprise server depending on the business needs.

v. Cross Cutting Concerns

Cross cutting concerns are generally the application non-functional requirements which spread across the layers. Some of the Cross Cutting concerns are Security, Authorization, Caching, Logging, etc.

V. FINDINGS

Architecting Enterprise Mobile solution is one of the most important step for any organization willing to "Go Mobile". The Architectural concerns should be very well addressed during the initial phase of the application development. Any discrepancy in mobile application architecture can be very costly to fix for the organization. There are many strategy related and technical decisions are involved in arriving at an Enterprise Mobile Application Architecture.

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Automobile Service Center Management System

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Abstract: Now a day, technology is on a boost. People wish to live a luxurious life with minimum physical work.

Here we provide a mobile application for 'Automobile Service Center Management System'. This application is an android app which can be run on any android compatible tablets and mobile phones. The app will enable any car user to search and communicate with any car service center in the vicinity. The user can find the service center , get it's location and check and select any of the services provided by the respective service center. The user can send request for pick and drop , appointment for servicing , test drive as well as accessories purchase to the dealer. The dealer processes these requests and gives a response back to the user through push messages.

This app also enables the user to set alarms for next servicing date , payment of insurance installment , etc. The app is provided with an extra feature of EMI calculator too.

Thus we are developing an application which goes hand in hand with the new age technology and characterizes – user friendliness, informativeness and time saving.

Keywords: android application, server, mobile phones, android tablets, notifications, push messages, database, GPS.

I. INTRODUCTION

Internet tends to be the backbone of all the technologies. The Automobile Service Center Management System (ASCM) is a progressive step in the field of service centers. Any car user can make use of such app to locate and communicate with the service centers in the vicinity. The proposed system can be used by any automobile user.

II. LITERATURE REVIEW

The survey regarding this application includes information gathering from various sources. These sources include some of the car showrooms and service centers , various related web sites and similar projects developed previously. IEEE papers are used for clearing the concepts and algorithms included in this project. E.g Google cloud messaging paper for push message services , Dijkstra's Algorithm for finding shortest path algorithm , etc.

Mazda company had developed similar kind of application. Mazda Motor Corporation is a Japanese automaker based in Fuchū, Aki District, Hiroshima Prefecture, Japan. 'MyMazda' was the application developed by this company. This app consisted of features like giving user car info , locating and mapping of service centers , set appointments , etc. References of above applications and additions of some extra features are made in the proposed system. Extra features include-

(1) Navigation to the service center using gps services.
(2) Request for all the services other than just appointment.
(3) Accessories chart.
(4) Set alarm.
(5) EMI calculator.

III. PROPOSED SYSTEM

Purpose

The purpose of this project is to provide car or any other automobile servicing system more effectively than the existing system. There are some disadvantages of the existing service center management systems. These disadvantages are overcame by the automobile service center management system. And it can be made handily available to every person. Previously people could not get help or locate the service centers conveniently in case of their car break-down or any other emergencies. Thus ASCM is proposed to assist people and fulfill their requirements easily.

Architecture

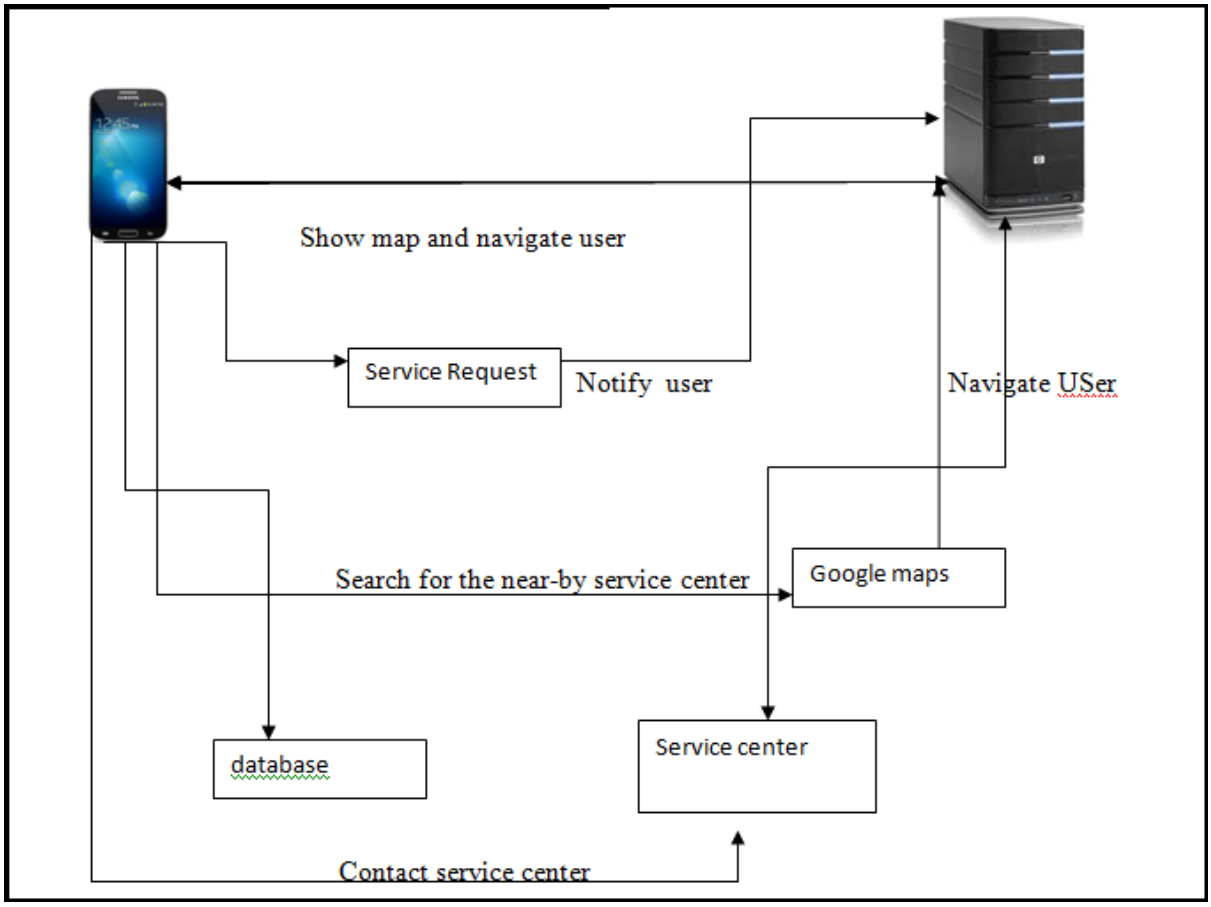

Fig. 1 Architecture Automobile Service Center Management System

Mathematical Model

A mathematical model is a description of a system using mathematical concepts and language.
The process of developing a mathematical model is termed mathematical modeling.
Mathematical model consist of three parts:
1. Mapping
2. State Diagram
3. Set theory

In proposed project there 'N' number of users and system. Therefore our mapping is many to many. The users are represented as {U1,U2,U3…..Un }. And our system represented as {S1,S2,S3…Sn}.

User set:{U1,U2,U3…..Un}
System set:{S1,S2,S3…Sn}.
Relationship: Many to Many
The 'Haversine' formula is used to calculate the distance between 2 points.

Haversine formula:

$$a = \sin^2(\Delta\varphi/2) + \cos(\varphi_1).\cos(\varphi_2).\sin^2(\Delta\lambda/2)$$
$$c = 2.\text{atan2}(\sqrt{a}\sqrt{(1-a)})$$
$$d = R.c$$

Where
φ is latitude
λ is longitude
R is earth's radius (mean radius = 6,371km)
Note: Angles are in radians.

IV. FEASIBILITY STUDY

Feasibility Analysis is the process of determination of whether or not a project is worth doing. Feasibility studies are undertaken within tight time constraints and normally culminate in a written and oral feasibility report. It helped in taking decisions such as which software to use etc.

[1] Technical Feasibility
[2] Economical Feasibility
[3]Operational Feasibility

Technical Feasibility

Technical feasibility determines whether the work for the project can be done with the existing equipment, software technology and available personnel. Technical feasibility of proposed project refer to the software and hardware requirements. The project is developed using android SDK. SQLite is used for DBMS. The proposed project can be implemented on any tablet or mobile phones having android operating system version 4.0 and above.

Economical Feasibility

Economical feasibility determines whether there are sufficient benefits in creating to make the cost acceptable, or is the cost of the system too high. The softwares used to develop the proposed system are cost efficient. Android SDK and SQLite are available for free on Google Market. It is assumed that the user already possesses tablet or mobile phones supporting android OS.

Operational feasibility

As our system provide various function, it is important to measure the feasibility of each function for measuring overall feasibility of our system. Mapping , navigating , notifications , etc are easily operated using proposed project.

V. SYSTEM FEATURES

1. Notification: Used to notify user of the service response
2. Car Catalogue: List of the car detail and there info.
3. Push Message: Used to inform user regarding the offer and product
4. Alarm: Used to set Alarm of the next servicing, installment date, etc.
5. Mapping: It is use to map nearby service centers.
6. Service Request: User request for services provided by service center.
7. EMI Calculator: Used to calculate the easy monthly installments.
8. Dealer And Personal Inforamation.

[A]Functional Requirements

- Admin authentication using user id and password.
- RS 232 Serial communication mode.
- Power generator.
- RFID receiver.

[B]Non-functional Requirements

- 24 X 7 availability.
- Better component design to get better performance.
- Flexible service based architecture will be highly desirable for future extension.
- Ease of Use-flexibility, performance.
- Security- Privacy, Confidentiality, Integrity, Authentication.
- Comprehensiveness- Transferability, Divisibility, Standardization.
- Maintenance.

VI. FUTURE SCOPE

The goal of this project is to produce an interactive and entertaining application for the Android marketplace. Automobile Service Center Management system is composed of two main components: a client-side application which will run on Android

handsets, and a server-side application which will support and interact with various client-side features. The system is designed to provide features of all the vehicles, services provided by the service centers, locations of all the service centers in the vicinity etc. The above proposed model is easy to implement considering the available technology infrastructure. The models is simple, secure and scalable.

The proposed model is based on serial communication. But for future scope in enlarging the system we can use connectionless system. We can even start online for registration and information based website.

VII. CONCLUSION

The proposed paper shows the flow, structure and working of the Automobile Service Center Management (ASCM) system. ASCM is user friendly i.e. easy to use. It is free of cost on android store. Thus , it is time a time saving as well as cost efficient application. So , we can conclude that the proposed system can be used to reduce human efforts and luxuriate human lives, hand in hand, with the modern technology.

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Three Fold Security System

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Abstract: The paper is divided into following sections namely, text password recognition, text-dependant speech recognition, face recognition. The first stage involves simple alphanumeric character recognition. Mel Frequency Cepstral Coefficients (MFCCs) are the most popularly used speech features in many speech and speaker recognition applications. Speaker identification can be Text-Independent or Text-Dependent. This paper describes an approach of Text-Dependent speaker recognition by using the MFC Coefficients extracted from speech signal of spoken words. The third stage comprises of face recognition for which the proposed method is based on the principle component analysis algorithm. The algorithm MFCC used in this project for speech recognition is the best. This is because it analysis the speech signal on the basis of the human perception of the sound i.e. in the Mel scale. The PCA algorithm is a simple algorithm. This algorithm is used to reduce the computational time of the overall project.

Index Terms*: MFCC, PCA*

I. INTRODUCTION

Speech signal provides information in form of analog signal. It conveys the words and messages being spoken and also provides the identity of the speaker. Speaker recognition is the process of automatically recognizing who is speaking by using the speaker specific information.

Speaker recognition is classified into speaker identification and speaker verification: Speaker identification is the process of determining from which of the registered speakers a given utterance comes. In identification, the number of decision alternatives is dependent on the size of the population. Speaker recognition methods can also be divided into text-dependent (fixed passwords) and text-independent (no specified passwords) methods. This project uses text dependent speaker identification system.

Further, this project implements a face recognition system using the Principal Component Analysis (PCA) algorithm. Automatic face recognition system tries to find the identity of a given face image according to their memory. The memory of a face recognizer is generally simulated by a training set. The training set consists of the features extracted from known face images of different persons. Thus, the task of the face recognizer is to find the most similar feature vector among the training set to the feature vector of a given test image. This project uses PCA as a feature extraction algorithm. This algorithm recognizes the identity of a person where an image of that person (test image) is given to the system.

II. PROPOSED METHOD

A. TEXT PASSWORD

First, the user would be asked to input his or her password which would be a string of minimum 8 alphanumeric characters. Now this password is confirmed and stored in the system. Next time the user logs in, he/she would be required to input his/her password. The password entered would be compared using a string comparison technique. If the password matches, he would be granted access or will be denied.

B. SPEAKER IDENTIFICATION

- **SPEECH PREPROCESSING**

Pre-processing is considered as the first step of speech signal processing, which involve with the analog signal to digital signal conversion [1]. The silence has been removed from the speech signal before any processing has been done on it. The signal is then sampled at a rate of 10000Hz. The speech samples are then segmented into frames of the time length within the range of 20-40msec, also known as Framing. Framing enables the non-stationary speech signal to be segmented into quasi-stationary frames, and enables Fourier Transformation of the speech signal. It is because, speech signal is known to exhibit quasi-stationary behavior within the short time period of 20-40msec. Each individual frame is windowed in order to minimize the signal discontinuities at the beginning and the end of each frame. Here, hamming window is most commonly used as window shape in speech recognition technology which integrates all the closest frequency lines. Impulse response of the Hamming window is shown in the equation below:

$$w(n) = 0.54 - 0.46\cos\left(\frac{2\pi n}{N-1}\right) \quad , 0 \le n \le N-1 \ldots\ldots\ldots..(1)$$

$$= 0 \quad , \text{otherwise}$$

Where N is the number of samples in each frame

- **MFCC**

The feature is the spectral envelope of the speech spectrum which is represented by the acoustic vectors. MFCC (Mel Frequency Cepstral Coefficients) is the most common technique for feature extraction which is computed on a warped frequency scale based on known human auditory perception. Based on human perception experiments it is observed that human ear acts as filter i.e.it concentrates on only certain frequency components. Psychophysical studies have shown that human perception of the frequency contents of speech signals does not follow a linear scale. Thus for each tone with an actual frequency, f, measured in Hz, a subjective pitch is measured on a scale called the 'Mel' scale [2], [3]. The Mel-frequency scale has linear frequency spacing below 1000 Hz and a logarithmic spacing above 1000 Hz. Therefore we can use the following approximate formula to compute the Mels for a given frequency f in Hz:

$$Mel(f) = 2595*\log10\left(1+\frac{f}{700}\right) \ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The idea acts as follows as in Figure 1.

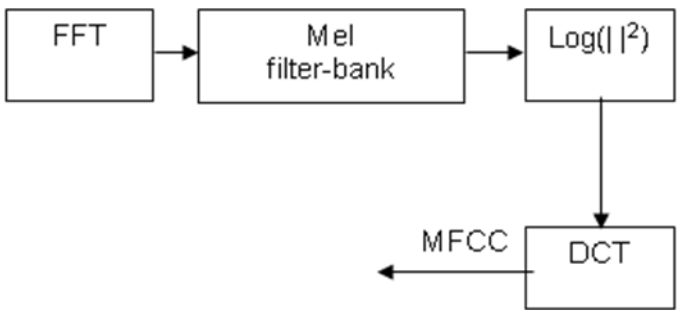


Figure 1. Obtaining Mel cepstrum from windowed frames

Particularly, for the filter banks implementation, the magnitude coefficient of each Fourier Transform speech segment is binned by correlating them with each triangular filter in the filter bank. To perform Mel-scaling, 17 triangular filters having triangular frequency response. The triangular filters are used as they can smoothen the harmonics .There are few filters spaced linearly below 1000 Hz, and the remaining filters spread logarithmically above 1000 Hz. The results of the FFT will be information about the amount of energy at each frequency band. Human hearing, however, is not equally sensitive at all frequency bands. It is less sensitive at higher frequencies, roughly above 1000 Hertz. It turns out that modeling this property of human hearing during feature extraction improves speech recognition performance. Peak (referred to as formants) in the spectrum denote dominant frequency components in the speech signal and carry the identity of the sound. The spectral envelope is used for speaker Identification. We now need to separate spectral envelope and spectral details from spectrum. The next step is to take the logarithm which simply converts the multiplication of the magnitude in the Fourier transform into addition making the extraction of the formants simpler. In general, the human response to the signal level is logarithmic. It is because humans are less sensitive to slight differences in amplitude at high amplitudes compared to the low amplitudes. In addition, using a log makes the feature estimates less sensitive to variations in input (for example, power variations due to the speaker's mouth moving closer or further from the microphone) [4]. The final procedure for the Mel Frequency Cepstral coefficients (MFCC) computation is to convert the log Mel spectrum back to time domain where we get the so called the Mel frequency cepstral coefficients (MFCC). Because the Mel spectrum coefficients are real numbers, we can convert them to the time domain using the Discrete Cosine Transform (DCT) and get a featured vector. The DCT compresses these coefficients to 13 in number. This features vector is considered as an input for the next stage, which are concern with training the features vector and pattern recognition. The cepstrum is more formally defined as the DCT of the log magnitude of the DFT of a signal and is given by:

$$C(u) = a(u) + \sum_{x=0}^{N-1}\left(f(x)\cos\frac{\pi(2x+1)u}{2N}\right)\ldots\ldots\ldots\ldots(3)$$

For u= 0,1,2,...N-1; x=0,1,2,...N-1 and a(u) is defined as -

$$X = (x_1, x_2, \ldots x_r)$$

- **DECISION MAKING ALGORITHM**

The decision is made based on Least Mean Squared Error (MSE). This refers to the mean value of the squared deviations of the predictions from the true values.

$$\mathbf{MSE} = \frac{1}{n}\sum(\grave{Y}_i - Y_i)^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

C. FACE RECOGNITION

2.3.1 TRAINING AND TESTING PHASE

In the training phase, feature vectors are extracted for each image in the training set. Let Ω_A be a training image of person A which has a pixel resolution of $M\ X\ N$ (M rows, N columns). In order to extract PCA features of Ω_A, we first converted the image into a pixel vector ϕ_A by concatenating each of the M rows into a single vector. The length (or, dimensionality) of the vector ϕ_A will be MXN. In this project, the PCA algorithm is used as a dimensionality reduction technique which transforms the vector ϕ_A to a vector ω_A which has a dimensionality d where $d << M\ X\ N$. For each training image Ω_i, feature vectors ω_i were calculated and stored. In the recognition phase (or, testing phase) let j be the identity (name) of a person. As in the training phase, feature vector of this person using PCA were computed to obtain ω_j. In order to identify Ω_j, the similarities between ω_j and all of the feature vectors ω_i's in the training set were computed using Euclidean distance. The identity of the most similar ω_i will be the output of the face recognizer. If $i = j$, it means that algorithm correctly identified the person j, otherwise if $i \neq j$, it means that the program has misclassified the person j.

2.3.2 IMPLEMENTATION OF PCA

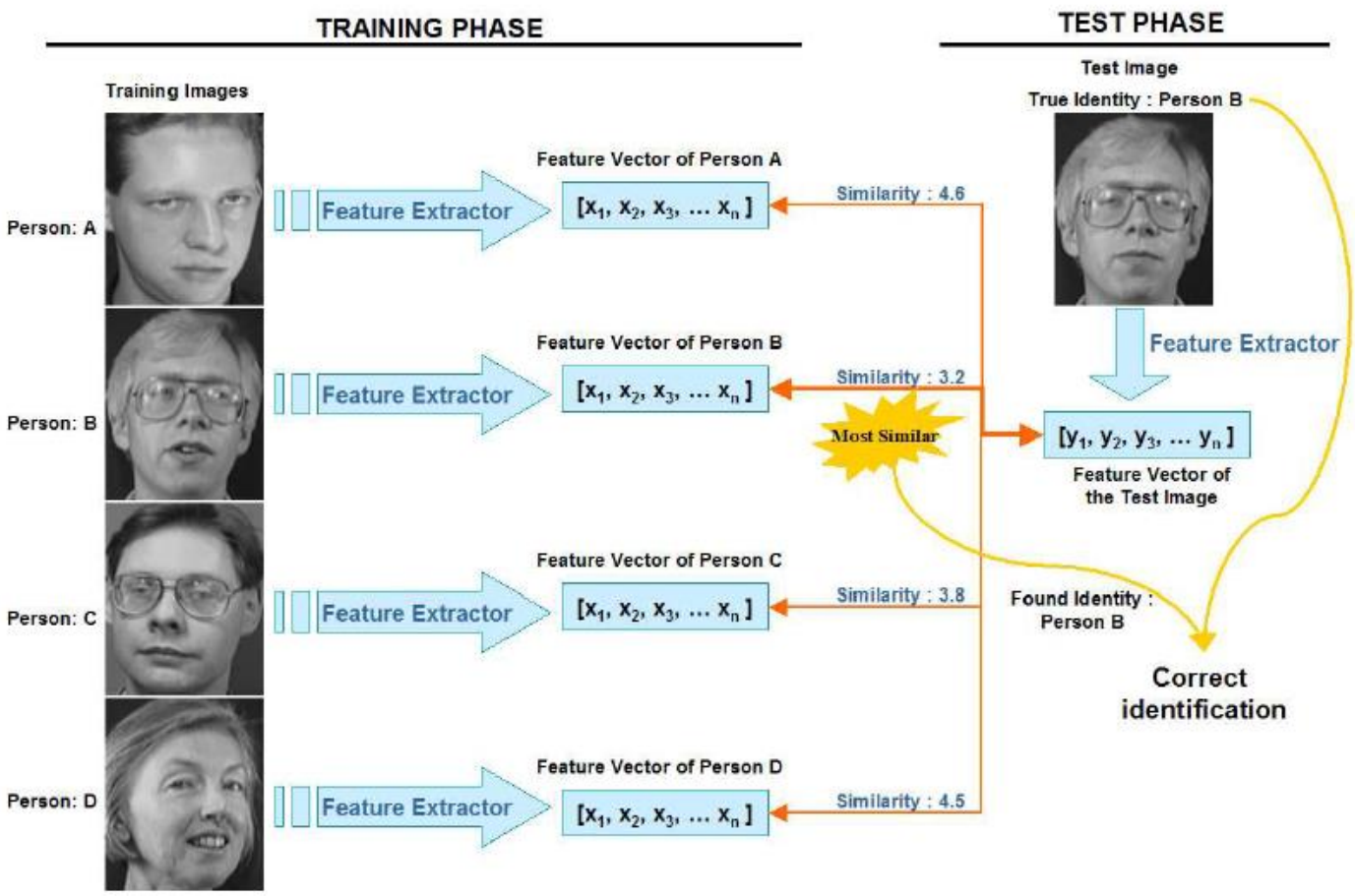
In this section, the use of PCA as a feature extractor is explained. Assume that there are p training images: Ω_i; $i = 1, 2 \ldots\ldots p$. For each training image pixel vectors ϕ_i where $\phi_i\ \varepsilon\ R^k$; ($k = M\ X\ N$) are formed. The aim is to compute feature vectors ω_i where $\omega_i\ \varepsilon\ R_d < d$; ($d << k$). In order to apply PCA to the training set, first a training data matrix A is formed which contains p rows: at each row ϕ_i's are stored. Thus the dimensionality of A is pXk. First, the covariance matrix of A: C_A is computed. Then the Eigen values and their responding eigenvectors of C_A are computed. There will be k eigen value and eigen vector pairs where each eigenvector e_i is of dimensionality k. The eigen values are sorted in decreasing order, and the biggest d eigen value and eigenvector pairs is selected. The transformation matrix A is formed by simply putting the selected eigen vectors as columns of A. A is used to compute ω_i's from ϕ_i's .The computation of ω_i is simply done by:

$$\boldsymbol{\omega_i = \Psi^T \phi_i^T} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad \mathbf{(5)}$$

where Ψ^T and ϕ_i^T are the transposes of Ψ and ϕ_i, respectively. Each column of Ψ corresponds to an Eigen vector which is of length k. This is equal to M x N which is the dimensionality (resolution) of input images. Thus, algorithm converted each eigenvector to an image by reversing the concatenation operation. These converted eigenvector images are called Eigen faces since they are similar to human faces.

Once the ω_i's are obtained using the largest d eigenvectors, the image of person i gets reconstructed. Using all k eigenvectors instead of d when forming Ψ, the reconstructed image will be the same as image Ω_i. However, since the aim is dimensionality reduction and $d << k$, reconstructed image $\grave{\Omega}i$ will be an approximation of the actual Ωi. You can reconstruct $\grave{\Omega}i$ by converting the pixel vector: $\grave{\Omega}_i = (\Psi\omega_i)^T$ to an image of resolution MXN. If more eigenvectors are used, then the reconstructed image is more similar to the original face image.

Figure. 2



(Schematic diagram of face recognizer)

III. EXPERIMENTAL RESULT

A. PASSWORD

The Text Password Recognition step looks like:

Figure 3. User Interface of Text password

B. SPEECH

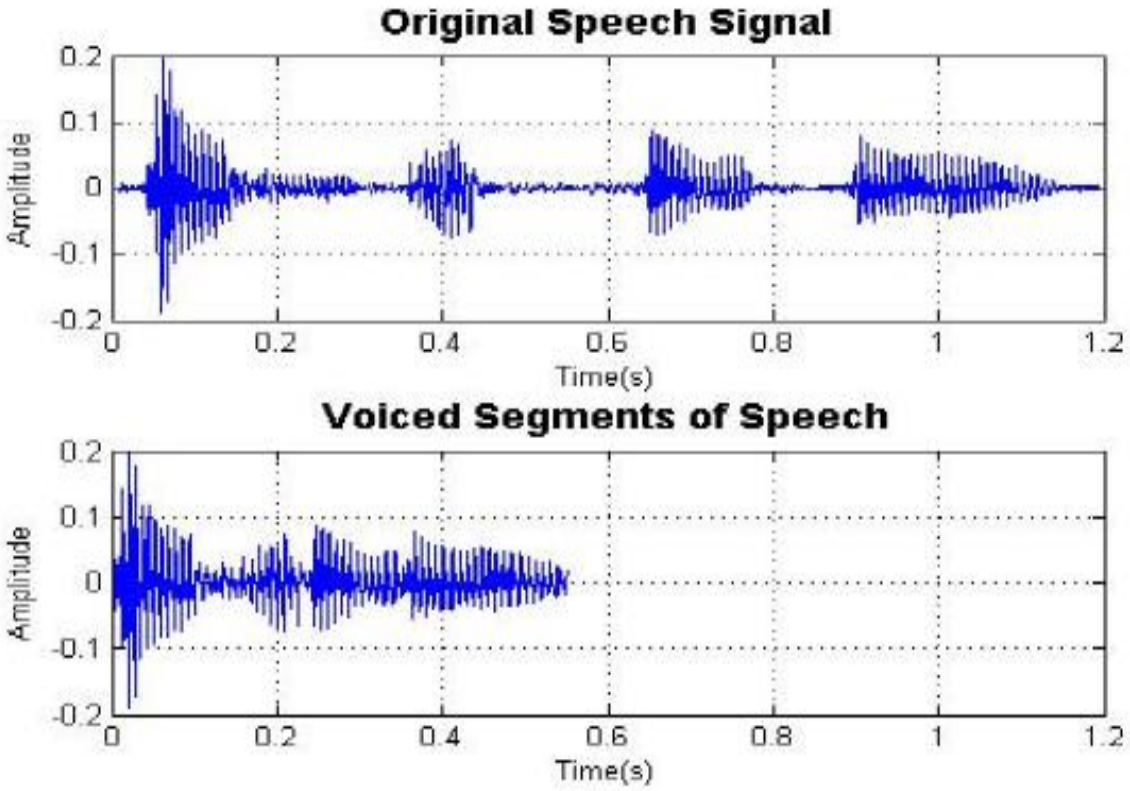


Figure 4. Input and end point detected speech

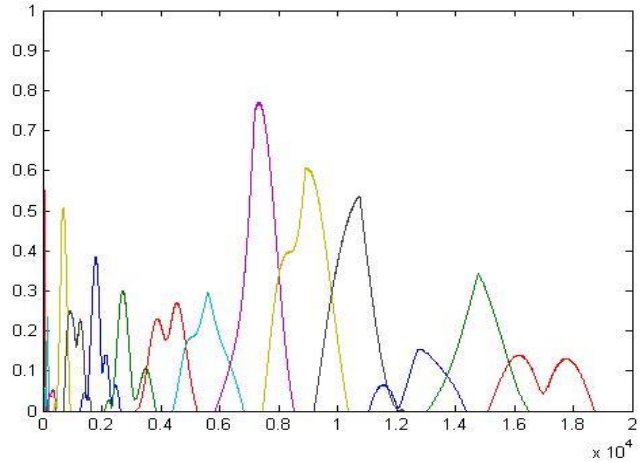


Figure 5. Output of Mel scale filter bank

C. FACE

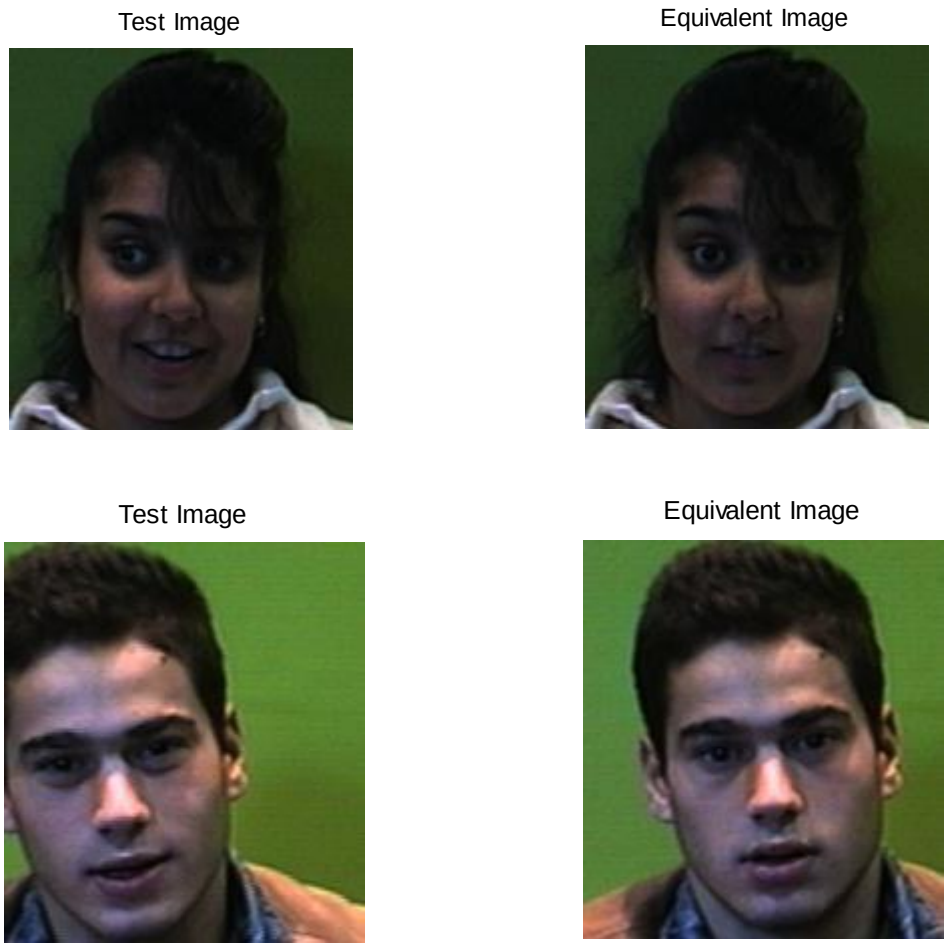
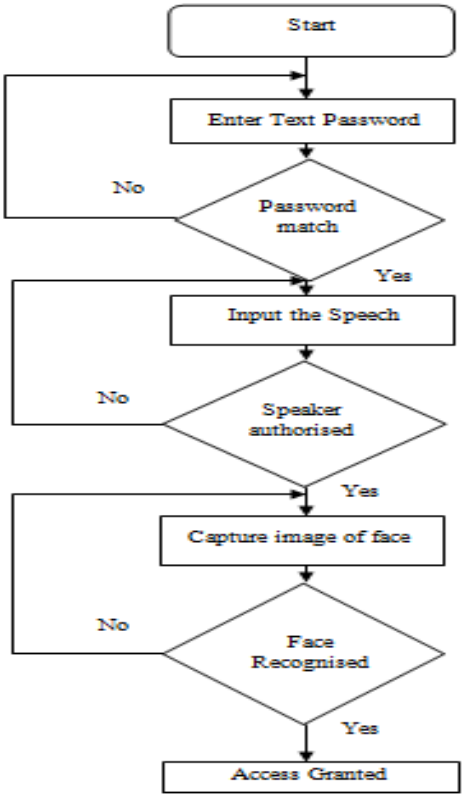


Figure 6. Output of PCA algorithm

IV. CONCLUSION

In this paper, we have presented an approach for a three way Security System allowing access only to authorized users. The text based Password system asks for a login ID and password specific to each user. Further, this paper has evaluated the use of MSE, made using the feature vectors obtained by doing MFCC on the pre-processed speech signal, for Robust Speaker Identification. The results of experiments show that the method is effective. Our project proposes a data security system having three levels of authentication processes which are difficult to surpass, thus avoiding access to those who fail the authentication process. This project can be integrated and used for defense, at entry point of atomic and nuclear research centers, museums, accessing a computer system, an online cloud account which has important documents, online transfer of money for registered user.

V. FLOWCHART OF THE PROJECT



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Prediction of effects of whole blood donation on hemoglobin levels among frequent donating males.

Dr Sheikh A, Dr Agha A, Dr Nusrat N, Dr Minhas S, Dr. Agha S.

I. BACKGROUND

Blood donors are often volunteers which donate blood due to generosity and kindness yet it is imperative to make both the donor and the recipient ends safe. The hemoglobin level is the most used parameter to screen blood donors for anemia. Health education of the donor community about the symptoms of weakness and blackout often observed after donation is required as these occur even with normal hemoglobin levels.

II. OBJECTIVE

To estimate the hemoglobin levels among frequent donors and compare it with normal physiological range of hemoglobin as deemed necessary to promote donor return.

III. STUDY DESIGN AND METHODS

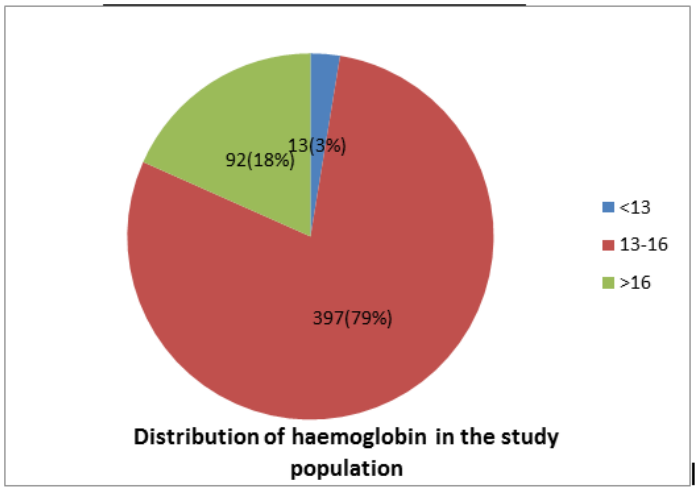
A descriptive cross-sectional study was conducted on the secondary data of whole blood donors to estimate hemoglobin levels .A non probability purposive sampling technique was used to collect data for a 3 month period from Dr Ishrat ul Ibad Institute of blood diseases,Dow University of Health Sciences, Karachi, Pakistan. Frequent donors with different levels of hemoglobin are categorized accordingly. The data was analyzed on SPSS 16.0 with a confidence interval of 95% estimated error of 5% + -and P value >.05 was taken as significant.

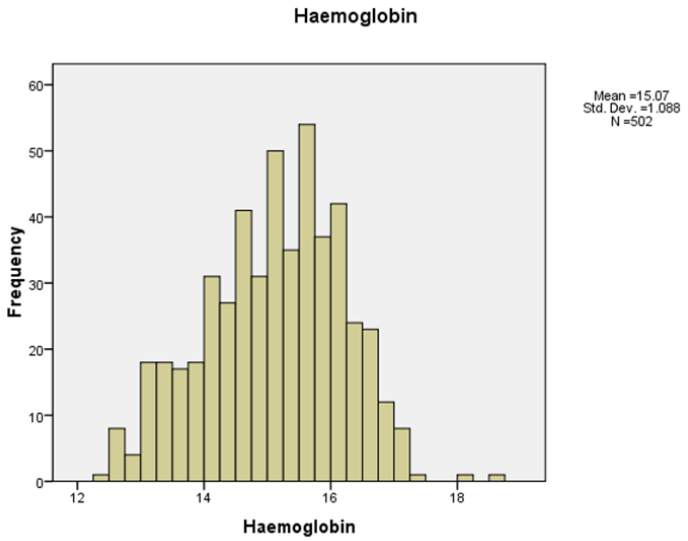
IV. RESULTS

Of the 502 samples, 397(79%) showed hemoglobin levels of 14-16mg/dl, 92(18.3%) ranged between 13-16%mg/dl and 13(2.6%) donors had hemoglobin levels below 13mg/dl.
The mean hemoglobin being 15.07(+- 1.008)

Statistics

Haemoglobin Categories	frequency(%)
<13	13
13-16	397
>16	92





V. CONCLUSION

To conclude the study identified that majority of the volunteer blood donors who frequently offer themselves for donations fall within the normal range, few donors however were below 12.5%mg/dl of hemoglobin which is the minimum level in reference to the selection criteria as set by WHO standards, the reason for anemia in such cases may be due to indirect factors which needs to be addressed by health education.

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Management Approach to Disaster Scenario in Bangladesh: An overview

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Abstract- This paper focuses on an overview of disaster scenario in Bangladesh. It is generally true that no one can be eliminated natural disaster but the extent of its damage can be reduced to its reasonable limit to minimize the loss of lives and properties by implementing disaster action plan and co-ordinate disaster management method. Both qualitative and quantitative techniques were applied to carry out this study. It is necessary to the work before the disaster occur to mitigate, preparedness and collaboration with different organization can reduced the loss of huge lives and properties. Communication technology play an important role in management approach to disaster especially preparedness phase of disaster. The main aim of this research is to examine existing Disaster Management System (DMS) and investigation of current development of DMS. This paper attempts to develop a proposed model for enhancing DMS which reducing loss and copes with all kind of disaster in Bangladesh. It can be concluded that number of victim people caused by disaster decreases because of technological advancement but disaster occurrence increases from past to recent due to climate change impact.

Index Terms- Disaster scenario, Disaster technology and Disaster Management System

I. Introduction

Bangladesh is a natural disaster-prone country of an area about 1, 47, 570 sq. km with population about 140 million (BBS, 2012). Bangladesh is facing various types of natural disaster due to its geographic and geologic setting (Carter, 1991). Bangladesh suffers regularly and frequently from disasters like flood, cyclone, drought, earthquake and landslide etc. (Fig.1). Disasters are annual event in Bangladesh (Nasreen, 2004). From time immemorial, the geographical location, land characteristics, multiplicity of rivers, monsoon climate and coastal morphology of Bangladesh have been a mixed blessing (Sabur, 2012). Bangladesh does not meeting all the necessities of pre, during and post disaster activities that cannot deal with to have large collaboration of different organization with highly advanced equipment. Disaster management in Bangladesh is mainly concerns to disaster mitigation and preparedness (Kafiluddin, 1991). In case of any devastating natural disaster, collaboration of Government agencies with non-Government agencies, international and UN agencies play a crucial role in terms of massive immediate response and subsequent rehabilitation of the affected people (Khan, 2000). The adverse impacts of all the natural hazards affecting socio-economic condition need to be reduced for sustainable development (Pande, 1992). Disaster management needs to effective communication, collaboration between different departments; NGO's can reduce and minimize the loss of lives and properties (Shafiq, 2013). The diversity, complexity and the dynamics of disasters management of Bangladesh need an elaborate system giving warning well ahead of time. The complexity of the problems make it very difficult to predict the impending danger and the socio-economic conditions and the logistic support facilities make it more difficult to take appropriate actions (Rahman, 1991). Early warning system is used to minimize the risk of a disaster in the mode of technology advancement (Meadows, 1972). Information technology in the form of internet, GIS, GPS satellite and electronic communication are beneficial for planning and implementation of hazard reduction in Bangladesh (Islam, 2011). A policy assessment in partnership approach to Disaster Management in Bangladesh was carried out by Khan and Rahman (2007). There is a problems being faced during the disaster management in Bangladesh that is absence of common disaster preparedness plan, communication gap, bureaucratic hassle, confusion about legal framework and the collaboration between national and local level. The purpose of the study focuses on disaster preparedness of Bangladesh in order to get quickly government and community responses. This study makes a bridge among the sporadic research work. By this paper an attempt has been made to overview of disaster management scenario in Bangladesh about how to manage and ways and means to overcome the effect of these disasters. The objective of this paper is to manage and recommended measures to reducing loss of a disaster.

II. Methodology

This paper has used secondary data and information to understand the disaster management in Bangladesh. The relevant secondary data were collected from various institutes such as Disaster Management Bureau, Bangladesh Meteorological Department and agencies working on disaster management directly or indirectly. The sources includes relevant government report, online databases, literature, books, journal and other document analysis in order to know the overall picture of disaster scenario in Bangladesh where the study was carried out. All data have been processed and analyzed with the help of conventional statistical techniques. The research is both qualitative and quantitative in nature with discussion outputs and recommendations.

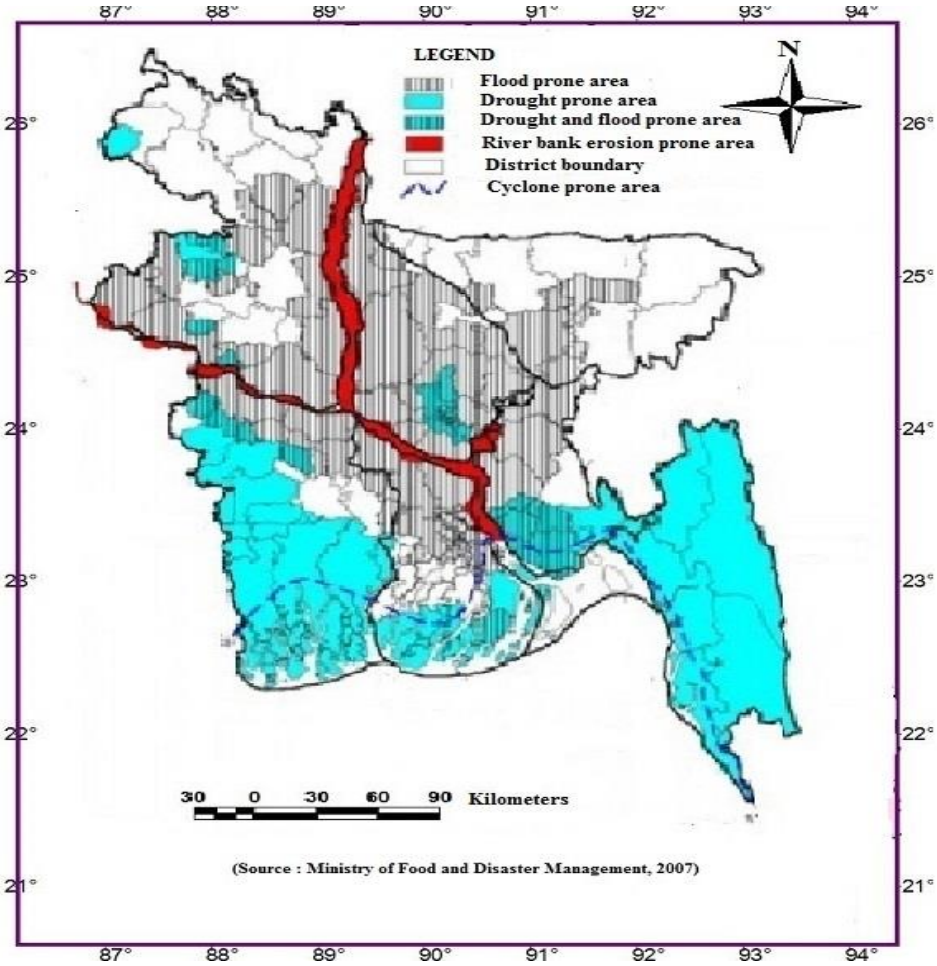

Figure 1: Map showing the location of major disaster prone areas in Bangladesh

III. Disaster Management Cycle and Phases

Disasters are gigantic in nature and paralyze human life activities which need to strengthen and coordination of different organization that are responsible and cope with them (Shafiq, 2013). Disaster management is a cyclic phase, normally in a cyclic phases ending of one phase is starting of second phase but in case of disaster management, more than one phase can execute simultaneously (Warfield, 2005). The essence of disaster management cycle is the collaboration and coordination of different organization and organized effort to respond against disaster, prepare for adverse event and recover from comical destruction of the disaster (Fig.2). Quick response and management of natural disaster is not easy job (Walker, 1994). For that reason requires massive chain of activities with effective management system in order to humanitarian ground of exigency in all the phases of disaster management (Das, 1997). Understanding of disaster and its management is divided into four distinct phase (Fig.3). Each of these phase involve a specific set of task to be accomplished. Although, no identical rule will be apply to explain various phase of disaster management. Disaster management task can be carried out in accordance with nature, purpose and also exact objective set by different coping organization in a specific phase of disaster management.

Figure 2: Disaster Management Cycle (Modified after Warfield, 2005)

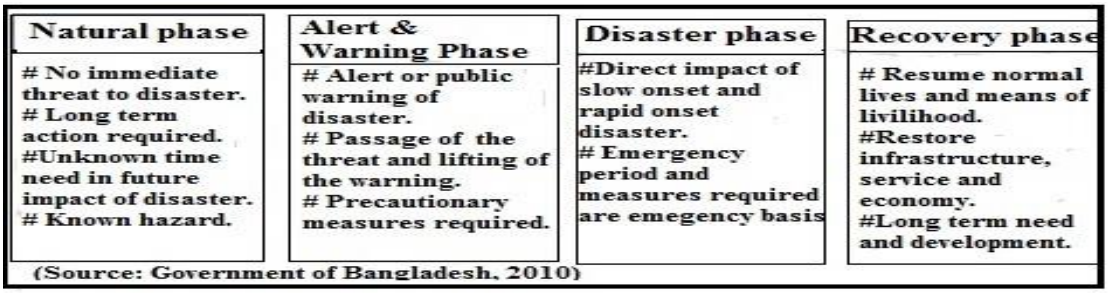

Figure 3: Disaster management phases of Bangladesh

IV. Disaster in Bangladesh Scenario

Bangladesh is a developing country which cannot afford to manage properly natural disaster. Developing country like Bangladesh is disproportionately affected disaster because of its limited resource, weak infrastructure, and lack of disaster preparedness plan (Watson et al., 2007). Due to its geologic setting and unique geography, Bangladesh is fatally under attack of various kinds of natural hazard. Cyclone on 29 April, 1991 is the most devastating one in its history. In the last couple of years Bangladeshi people were suffering from both natural and human induced disaster. Natural disaster in Bangladesh including cyclone, flood, earthquake, drought, landslide while man-made disaster like as fires, political unrest, terrorism, epidemics, transport and industrial accident (Nizamuddin, 2001). Natural and man-made disasters have been affected people and their livelihood throughout the history of human kind of Bangladesh, causing enormous losses of human lives and material destruction (Haen, 2006). Both losses of life and property are unbearable and direct impact of this type of disastrous event on social and economic life of Bangladeshi people is overstraining (Sabur, 2012). Like other developing countries, Bangladesh is facing the damage and destruction due to natural hazard. Bangladesh established her coping deficiencies so many times against violent natural disaster events. In a disaster situation early response is very much important to minimize the casualties and the damages to human lives caused (Chandio et al., 2006). Here the table 1 shows the associated damages and estimated economic loss caused by two recent disasters in Bangladesh. According to world disaster report 2013, the table 2 that demonstrates total number of killed and affected people by disaster in Bangladesh from 1980 to 2012. Ongoing disaster management system and policies shows great deficiencies in all phases of disaster management cycles. This lacking shows poor institutional arrangement in order to solve disaster related problems as well as weak collaboration and communication gap between different level of Govt. and NGO sector and also deficiency of concrete policies of reconstruction and rehabilitation. In this reality, the Government of Bangladesh has undertaken a lot of plans and programs for disaster reduction through disaster management. Problem is hinder for implementing disaster management plans; the Government of Bangladesh initiated a project "Comprehensive Disaster Management Programme (CDMP)" with overall goal to reduce the human, economic and environmental costs of disaster in Bangladesh. One of the objectives of this research was to increase the capacities of the households and local communities in the highly disaster prone areas through the coping with cyclones, floods and other potentially disaster situations

Table 1: Damage caused by two most recent disaster in Bangladesh

Date	Disaster	Area affected	No. of death	Estimated economic loss
13 May 2013	Cyclone Mahasen	Coastal areas of Patuakhai, Coxsbazar district	17	US $ 5.14
22 March 2013	Tornado	Brahmanbaria district	36	US $ 1.41

Source: http://www.en.wikipedia.org/wiki/cyclone & http:// www.en.wikipedia.org.wiki/tornado

Table 2: Recent disaster of Bangladesh reported total number of killed and affected people

Reported total number of people killed (1980-2010)	Reported total number of people affected (1980-2010)	Reported total number of people killed (2011-2012)	Reported total number of people affected (2011-2012)
191836	323,480,847	1311	1647973

Source: http://www.preventionweb.net.htm

V. Result and Discussions

Bangladesh is highly vulnerable to floods, cyclone, landslide and tornado etc. Ten biggest disasters were occurred in the history of Bangladesh since 1988 to 2013. Major disasters have adversely impacted upon millions of lives and uncountable damage of property in Bangladesh. Mainly flood and cyclone have occurred frequently in our country and caused a heavy disastrous effect. Flooding in Bangladesh is very common disaster because of low lying deltaic region. Strong cyclone is responsible for producing unexpected flood (Mirza, 2011). The most devastating flood was occurred in 1988 and 2007 that killed 1517 people and 1110 people respectively (Table 3). The 1988 flood inundated 84 % of the land area of 52 districts and it affected about 45 million people. Again the flood of 1998 was disturbing for its unprecedented duration of 65 days and 1050 people lost their lives and its economic impact was equivalent to 3 billion US dollars (Haris, 1999). Past years report flood indicates that number of occurrence of small to large flood were 69 and frequency of flood decreases in recent years (Fig.4). The last reported flood in 2007 affected 13771380 people. Both 1998 and 2004 floods were inundated 61 % and 68 % area of the country respectively (Khatun, 2013). From the result, it can be interpreted that damage and loss of property and lives caused by disaster decreases in recent year due to proper application of DMS. Cyclone was mainly appearing with 47,211 square km area facing the Bay of Bengal in the coastal zone of Bangladesh (Islam, 2004). From 1980 to 2013, 169 cyclones and tornado were occurred in Bangladesh (Fig.4). Cyclone in Bangladesh is happened to be quite frequent almost every year. The two recent cyclones were killed 4234 and 330 in 2007 and 2009. Cyclone in 1991 was occurred and 138866 people were killed and 15438849 people were affected in addition to the total victim were 15577715 people (Table 3 & Fig.5). In year of 1991, the worst cyclone of the Bangladesh created landslide on coastal area. Human death toll rose to 0.14 million and property losses exceeded two billions of US dollars (Haris, 1999). A strong cyclone Mahasen struck in 2013 of the coastal part of Bangladesh but people aware about it and evacuated vulnerable zone because of developed early warning and response system. The result indicates that death toll was little (17 people) in 2013 cyclone than previous cyclone yet affected 12, 8550 people of Bangladesh (Fig.5). From the table it can be interpreted that the number of occurrence of major cyclone has drastically increased in the recent year due to global climate change impact but decreasing the loss of live and property due to technological development in Bangladesh. Landslide is a common disaster in southeastern part of Bangladesh. One notable landslide was occurred on 27 June 2012 which caused 362587 victim and death toll 122 people (Table 3 & Fig.5). From 1980 to 2013, major 4 landslide occurrence associated which highlighted in figure 4. Tornado causes a local damage and it requires an early warning response. A ruthless tornado struck in 1996 caused 545 deaths and injured about 34000 people (Table 3 & Fig.5). Tornados are a very common phenomenon in Bangladesh during late chaitra and baishak months and are known in Bengali as Kalbaishaki (Chowdhury, 1978). Drought is recurrent event in Bangladesh and present change of land use pattern made the country more vulnerable to drought (Shahid and Behrawan, 2008). Mainly 3 drought occurrence associated within 1980-2013. Bangladesh was experienced a horrible drought in 1994 affected 53 % of the people (Akter, 2009). Rangpur is one of the most vulnerable divisions to drought in Bangladesh. In Rangpur 25 % of total population caused immense crop damage due to drought (Khatun, 2013). The number of occurrence of earthquake and epidemic were 10 and 29 events from 1980 to 2013 (UNISDR, 2013).

Table 3: Most recent disaster in Bangladesh

No	Date	Disaster	Total killed	Total affected
1	20 August 1988	Flood	1517	73000000
2	29 April 1991	Cyclone	138,866	15,438,849
3	13 May 1996	Tornado	545	34,000
4	8 July 1998	Flood	1050	15,000,050
5	12 August 2004	Flood	747	36,000,000
6	1 September 2007	Flood	1110	13,771380
7	15 Nov,2007	Cyclone	4234	89,23259
8	25 May 2009	Cyclone	330	50,000
9	27 June 2012	Landslide	122	3,62465
10	13 May 2013	Cyclone	17	1,28550

Source: "EM-DAT": The OFDA/CRED International Disaster Database, Universite catholique de Louvain, Brussels, Belgium. http://www.cre.be/emdat/intro.htm

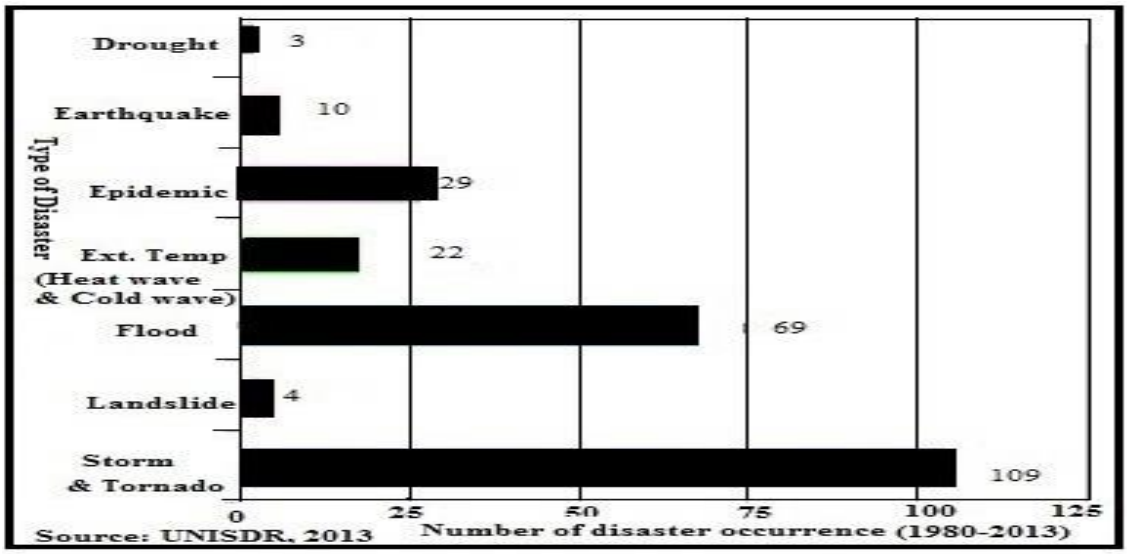

Figure 4: Disaster occurrence in Bangladesh from 1980 to 2013.

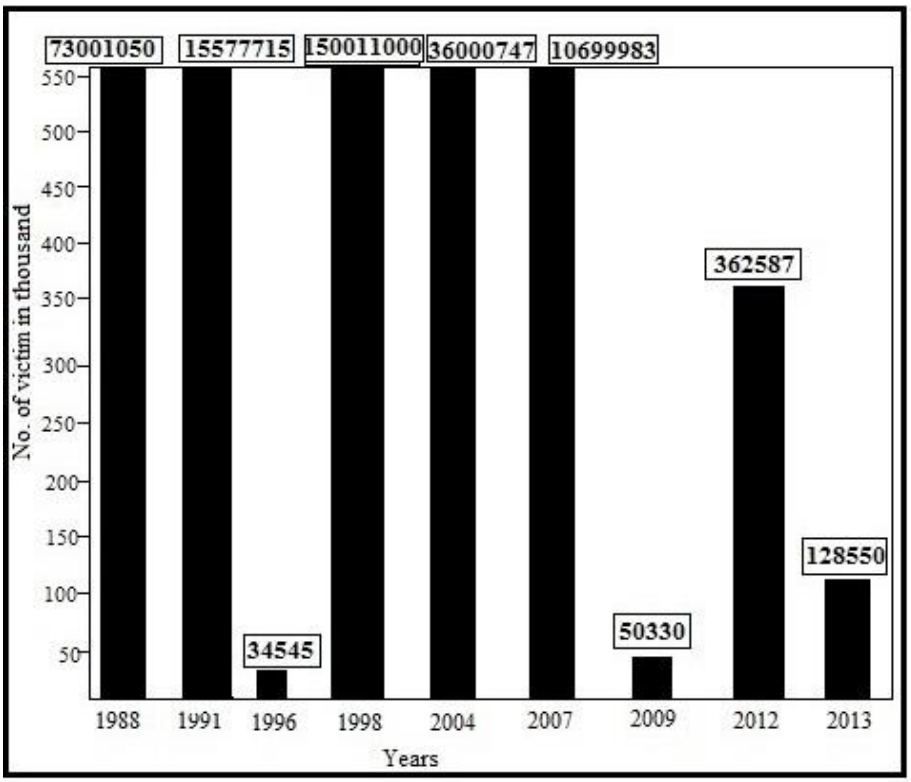

Figure 5: Reported victim of Disaster in Bangladesh from 1988 to 2013.

There is a need for effective handling of disaster situation with proper disaster management system (DMS). It is not possible to manage disaster without strengthening of national institutional structure, strict legal jurisdiction, collaboration and communication and also awareness build up at all levels of the community. The present research is proposed for disaster management system (DMS) modal which is a way to overcome the problem existing disaster management system in Bangladesh (Fig.6). Proposed DMS modal indicate that preparedness plan and related measure such as awareness build-up, community risk assessment, enhancement of institutional capacity and suitable technological advancement in disaster prone area whatever necessary. DMS model demonstrated that forecasting, warning dissemination system, also the standing order for evacuation, the organization of rescue, relief and also the short-term rehabilitation and long-term reconstruction activities are very necessary factor in a disaster occurrence period. The model also suggests that mitigation measures into suitable plan, policy and act of disaster management and also guideline for development partner with NGOs task at top to bottom levels to mobilize people for increasing their own capacity to cope with and recover from disaster in disaster prone area and also structural and non-

structural measures to reduce the risk and the consequences of disaster occurring in Bangladesh. Review the literature of disaster management system in Bangladesh is to identify the relevant existing practice and theory of disaster management. Proposed DMS modal is linked with the gap and issues of existing DMS and its instant need to enhance DMS in Bangladesh.

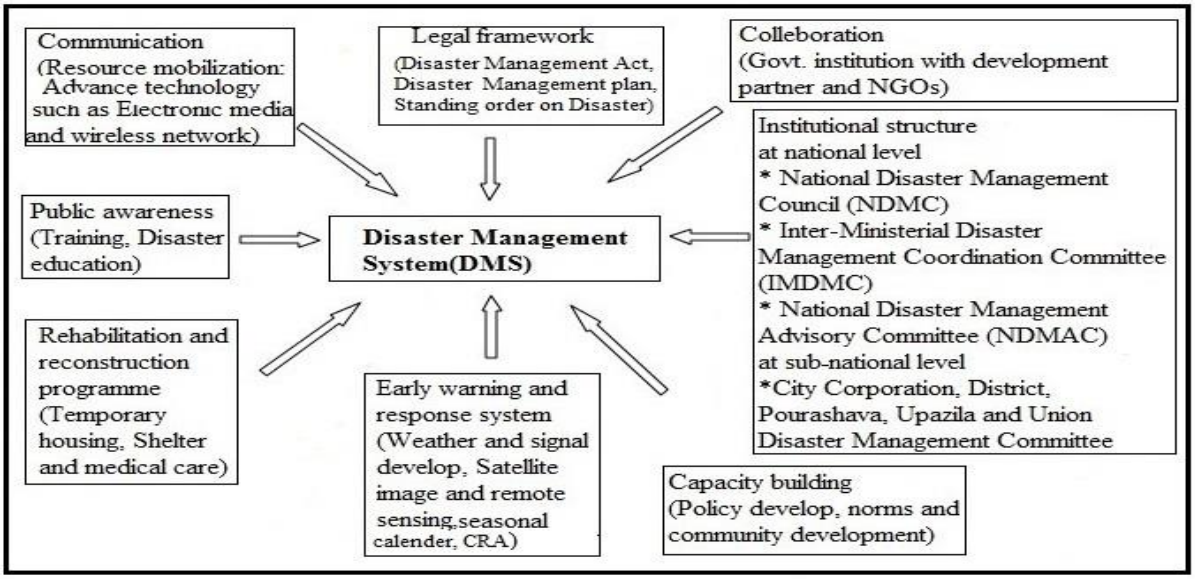

Figure 6: Proposed model of Disaster Management System (DMS) in Bangladesh

VI. Conclusion and Recommendations

Disaster in Bangladesh is frequent event and impossible to control it but effective DMS can ensure to save thousands of lives and property. The Government of Bangladesh is motivated to establish a sophisticated and practiced disaster management system from national to local level to mitigate the effects of disasters. Having limited resource and the vulnerable condition of the country to natural disaster, the GoB has been made an effort to safer Bangladesh in the 21st century and seeks logistic and financial help of development partners and NGOs. This paper revealed that the number of natural disaster frequency was increasing in recent decade but at the same time the loss of lives and property by disaster was reduced at reasonable limit due to technological advancement in Bangladesh. Further research and study will require for improvement of early warning dissemination in Bangladesh. Collaboration, coordination and technology advancement are used to effective DMS beneficially in Bangladesh. There are required improvement in the area of communication, remote sensing, and computing capabilities in the field of knowledge shearing and information of Disaster management. Based on these realities and existing DMS in Bangladesh, the following recommendations are require:

1. To build up awareness at all level of the community concerning practical ways to reduce disaster risk through training, education and collaboration with national curriculum board and text book of Bangladesh.
2. To enhance the knowledge and skill of the key personnel and capacity building and prerequisite of relevant operational guidelines in the outline of disaster management handbook.
3. To set up disaster management action plan in the most vulnerable districts, upazilas, unions and resource mobilization of local community in most disaster prone area to prepare and shelter themselves and improvement of their own capacities to cope with recover from disaster.
4. To improve the early warning broadcasting practices and follows the guideline for facilities at protection and evacuation site for highly at risk people.
5. To collaborate in making timely stipulation of meteorological and hydrological information from neighboring country for disaster forecasting and other disastrous events.
6. To coordinate between Government and development partner with NGOs for professional management of disaster situation at the national level to local levels.
7. To support the national institutional capacity for DMS through emergency and exigency situation by disaster management committee at district, upazila and union levels.
8. To reduce bureaucratic hassle for proper implementation of disaster management system in Bangladesh at all levels.

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First report on: Acute toxicity and gill histopathology of fresh water fish *Cyprinus carpio* exposed to Zinc oxide (ZnO) nanoparticles

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Abstract – Nanotechnology is an advancing field of research which has revolutionized all industrial needs, such as medical, environmental and other industrial applications. Despite the rapid progress and early acceptance of nanotechnology, the potential for adverse health effects due to prolonged exposure at various concentration levels in humans and the environment has not yet been studied. With the widespread application of nanomaterials, numerous nanoscale products might consequently be released into aquatic environments and elicit an impact not only on one particular ecosystem but also on human health. The environmental impact of nanomaterials is expected to increase dramatically in near future. Zinc oxide (ZnO) nanoparticles have wide ranging applications in a diverse array of industrial and consumer products, ceramic manufacturing, paint formulation, sunscreen and hair care products. Toxicological studies indicate that ZnO nanoparticles have adverse impacts on human health and environmental species. Hence it is due process to characterize the health and safety aspects of ZnO nanoparticles to humans and environment. The present study has been conducted to develop first hand information on the acute toxicity (LC_{50}) and gill histopathology of ZnO nanoparticles in fresh water fish, *Cyprinus carpio*. It was found that the 50% lethal concentration (LC_{50}) of ZnO nanoparticle for *C. carpio* is 4.897 mg/L. Gill histopathological damage exposed to sub-lethal concentration of ZnO nanoparticles for 21 d are also discussed in this paper.

Key words: Nanotoxicology, Ecotoxicology, Zinc oxide (ZnO) nanoparticles, Common carp (*Cyprinus carpio*), Acute toxicity, Gill histopathology.

I. Introduction

In recent decades, nanoparticles have been increasingly manufactured and used in daily consumer products, such as textiles, pharmaceuticals, and cosmetics, as well as in pollution treatment and remediation processes [1, 2]. Among numerous nanomaterials, Zinc oxide (ZnO) nanoparticles have attracted special attention worldwide due to their excellent properties in applications such as cosmetics, sunscreens, paints, ceramics, photocatalysis, UV filters and biosensors [3-8]. The potential adverse effects of few nanoparticles are widely studied in organisms, including humans and mammals [9-13]. However, most of the data has been obtained on limited types of particles and mostly *in vitro* cell cultures or *in vivo* respiratory exposures on rodents [14]. Therefore, it is important to develop an understanding of the effects of nanoparticles. Hence it is due process to characterize the health and safety aspects of ZnO nanoparticles to humans and environment. The present study has been conducted to develop information on the acute toxicity (LC_{50}) and gill histopathology of ZnO nanoparticles in fresh water fish, *Cyprinus carpio* and the result will be first hand information in the field of aquatic ecotoxicology and nano-ecotoxicology.

II. Materials and methods

Zinc oxide (ZnO) nanoparticles

ZnO nanoparticles (<100 nm) were purchased from SIGMA-Aldrich (Product Number-544906). Suspensions of nano-scale ZnO are prepared with aerated single-distilled water and dispersed with a bath sonicator (33 kHz) for 1 h every time before exposure to fish [15].

Experimental animals

Common carp, (*C. carpio*) with a mean age of 120 d, mean length of 3.02± 0.33 cm, and mean weight of 0.22±0.05 g were obtained from the Tamil Nadu fish farm, Thiruvallur District. Animal experiments were performed in the laboratory, fulfilling the criteria of Good Laboratory Practice. Selection of fish and experiments were performed according to OECD guideline [16]. Distilled water, rather than standard laboratory water was used to prepare the ZnO nanoparticle suspension, so as to avoid the influence of other environmental factors on toxicity of ZnO nanoparticles [8, 17]. Fish were stocked in standard laboratory water and acclimatized in distilled water for 10 d with a natural light-dark cycle (12 h light /12 h dark) and fed twice daily. During this period, the water temperature was maintained at 23±2 °C, and no fish died.

Acute Toxicity (LC_{50})

In median lethal toxicity study, lethality was the endpoints. Test concentrations for lethality were 0, 2, 4, 8, and 16 mg/L for ZnO nanoparticles. Test suspensions were prepared and dispersed using bath sonicator for 1 h immediately prior to use without the addition of any stabilizing agents. Ten fish were randomly exposed to each concentration for 96 h in 2.5 L container with 1.5 L of the test solution. To ensure a constant concentration, all the test solutions were changed every 24 h (semi-static method). The control group was provided with distilled water without nanoparticles. Each treatment was run in triplicate and placed under the same conditions. In order to maintain water quality, fish were not fed on the day before or during the experimental period to minimize the absorption of the nanoparticles in food and the production of faeces. The 96 h LC_{50} were calculated according to the EPA probit analysis.

Histopathology of gill

Four batches of ten fish each were exposed to three sub-lethal concentrations fixed via 5, 10 and 20 % from the calculated

LC_{50} value and one batch was maintained as control for 21 d. Fish were anesthetized, and they were dissected. Gill arches (first and second from the eye) were excised and fixed in Bouin's fluid for 48 h, dehydrated in graded ethanol series, cleared in xylene and embedded in paraffin wax. Sagittal sections of 5 micron thick were cut and mounted on glass slides. Sections were deparaffinized in xylene, hydrated in ethanol and stained with haematoxyline-eosin (H&E) for structural analysis of tissue. Histological alterations were examined and micrographs were taken in Carl ZEIS AxioCam MRC microscope.

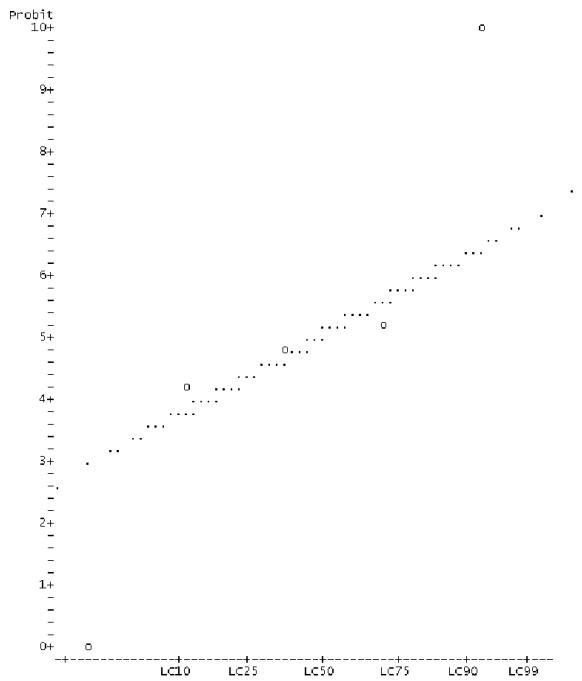
III. Result

Acute toxicity

During the exposure period, the water temperature was maintained at 23±2°C. The pH and dissolved oxygen content (DO) of the water were monitored (6.7–7.2 and DO no less than 5.10 mg/L respectively). The number of dead fish was recorded every 12 h, and they were removed immediately to avoid contamination of the exposure solutions.

The toxicity of ZnO nanoparticles to common carp was increased with particle concentration, demonstrating a dose dependency. Although ZnO nanoparticles at a concentration of 1 mg/L produced no mortality in common carp (*C. carpio*), as in the control group, the 16 mg/L ZnO nanoparticles suspension caused 100% mortality with a calculated 96 h LC_{50} of 4.897 mg/L at 95% confidence limits and predicted regression line as shown in Graph 1.

Graph 1. Plot of adjusted probits and predicted regression line



Gill

Gill of common carp (*C. carpio*) was composed of filament, lamellae, pillar cell, epithelial cell, secondary lamellae, water cannel and mucous cell. Primary gill lamellae consisted of cartilaginous skeletal structure, multilayered epithelium and vascular system. Numerous secondary lamellae were lined up along both sides of primary lamella. Secondary gill lamella was constituted of epithelial cells supported by pillar cells. Histological observations showed normal structure of gill in control fish through out the duration of the experiment (Fig.1A). Pathological lesions after 21 d exposure at three different sub-lethal test concentrations are shown in Fig.1(B-F). In 5% exposure group, lamellae with marginal channel dilation, epithelial lifting, desquamation and necrosis, alteration in secondary structure and loss of secondary lamellae were of serious concern (Fig.1B&C). In 10 % exposure group, acute cellular swelling and blood congestion were observed (Fig.1D). In 20 % exposure group, hyperplasia of epithelial cells, lamellar fusion, aneurism, lamellar disorganization and curling were newly recorded (Fig.1E&F).

IV. Discussion

Acute toxicity

Relatively small amount of work is available in the literature that discusses the toxicity of ZnO nanoparticles in fish [18]. As stated earlier most studies have focused on *in vitro* analysis. Present study shows acute toxicity of ZnO nanoparticles for common carp (*C. carpio*) as 4.897 mg/L and this is well in accordance with the acute toxicity of ZnO nanoparticle in zebra fish (96 h LC_{50} of 4.92 mg/L) and principal toxic mechanisms were probably associated with the physical and chemical characteristics of ZnO nanoparticle and also reported as nanoparticles will cause toxic effect [19].

Gill

Fish gill is a crucial organ for respiration [20], osmoregulation and there is close relationship between gill morphology and stress [21]. Histological study of the gills shows a typical structural organization of the lamella in the control group (Fig.1A). In this study, the treated group (Fig.1B-F) shows progressive architectural distortions like alteration in secondary structure, blood congestion, lamellae with marginal channel dilation, hyperplasia of epithelial cells, epithelial lifting, lamellar fusion, desquamation and necrosis, aneurism, acute cellular swelling, lamellar disorganization, curling, and loss of secondary lamellae at 21 d exposures were observed due to ZnO nanoparticle toxicosis. Pathological alterations like hyperplasia of epithelial cells, epithelial lifting and lamellar fusion may increase the space of contact of toxicants with the vascular system of the gill, resulting in impairment of respiration as well as fish health. Aneurism was observed due to collapse of pillar cells in the secondary lamellae and rupture of blood vessels, releasing large quantities of blood resulting in the lamellar disorganization. Desquamation and necrosis are the direct deleterious effects induced by ZnO

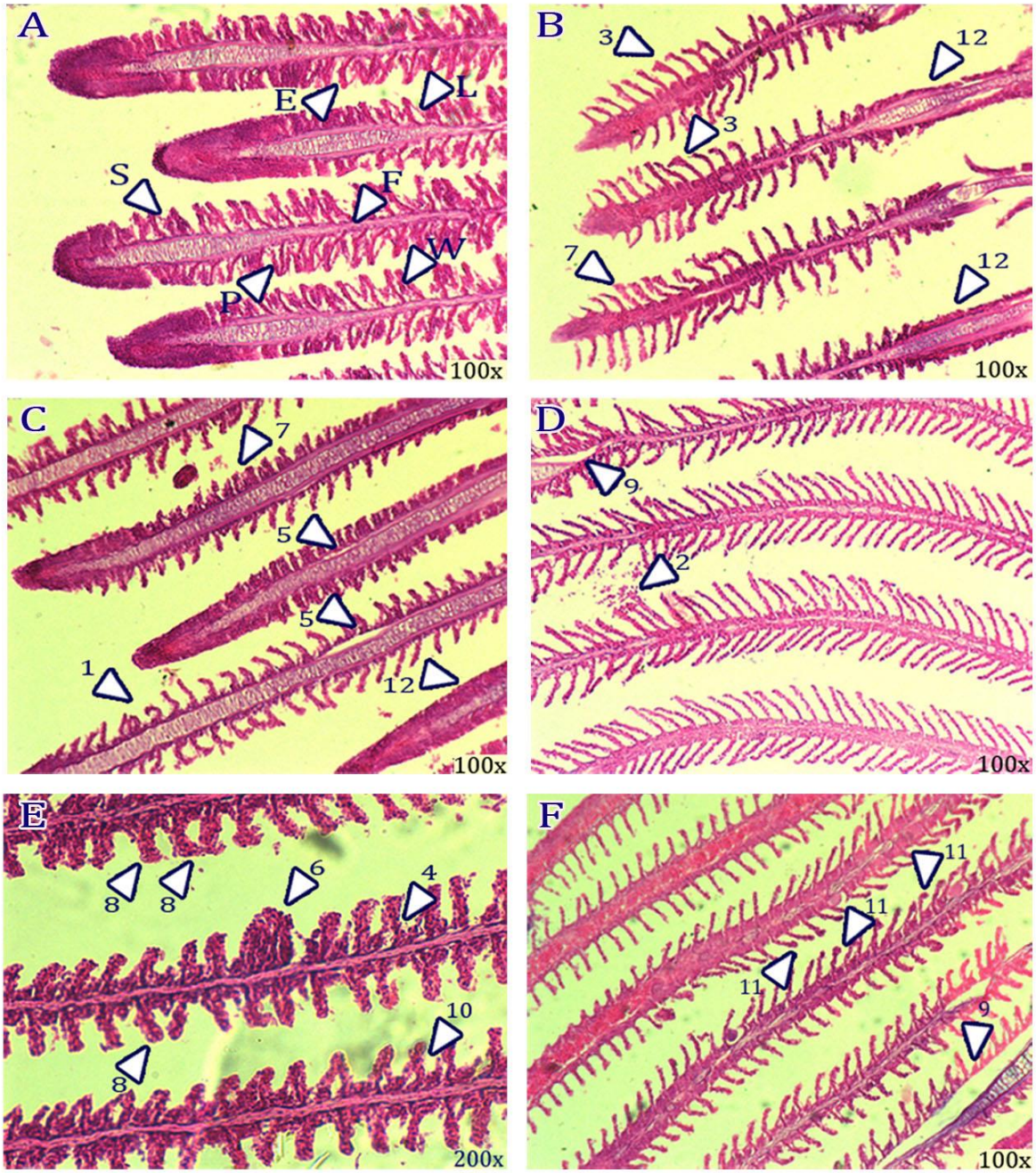


Fig. 1 Histology of gill tissue. A. Gill tissue of Control fish, B&C. Gill tissue exposed to 5% of test solution, D Gill tissue exposed to 10% of test solution, E&F. Gill tissue exposed to 20% of test solution.

F-Filament, L-Lamellae, P-Pillar Cell, E-Epithelial Cell, S-Secondary lamellae, W-Water cannel, M-Mucous cell, 1.Alteration in secondary structure, 2.Blood congestion, 3.Lamellae with marginal channel dilation, 4.Hyperplasia of Epithelial cells, 5.Epithelial lifting, 6.Lamellar fusion, 7.Desquamation and necrosis, 8.Aneurism, 9.Acute cellular swelling, 10.Lamellar disorganization, 11.Curling, 12.Loss of secondary lamellae.

nanoparticles exposure. Similar histological lesions were reported for different xenobiotics including heavy metals [22], pesticides [23,24] and few metal and metal oxide nanoparticles [25] and other abiotic stress by many researchers. The findings of this study are the first of its kind with regard to a detailed survey of gill histopathology.

V. Conclusions

ZnO nanoparticles suspension were prepared using distilled water, rather than standard laboratory water and dispersed using sonicator for 1 h. Acute toxicity of ZnO nanoparticles to common carp (*C.carpio*) were determined at 96 h (LC_{50}) as 4.897 mg/L. The histopathologal alterations in gill indicated that sub-lethal concentration of ZnO nanoparticles may cause severe damage resulting in dysfunction and ultimately the death of fish at higher concentrations. The histopathological changes in the cellular level in gill of common carp and their direct correlation with the concentration and exposure period of ZnO nanoparticles indicated that gill histopathological changes can be considered as a biomarker for the ZnO nanoparticles induced toxicity. According to the results, gill can be good target organs, and common carp can be used as a test fish for ZnO nanoparticles toxicity in freshwater.

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Hepatoprotective Effects of Moringa Oleifera Leaf Extract on Mercury Induced Renotoxicity in Adult Wistar Rats

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Abstract- Moringa oleifera leaf extract has been reported after analysis of its phytochemical constituents to have natural antioxidants that aid in natural defence. The hepatoprotective evaluation of leaf extract of moringe oleifera on mercury induced renotoxicity was studied. Twenty four healthy adult wistar rats weighing between 190-270g were grouped into four groups (A, B, C & D) of six animals each. Group A served as the control and were orally administered with 0.5ml of distilled water; the experimental groups (B, C & D) received the following: Group B received 0.5ml of Moringa oleifera leaf extract, group C received 0.3ml of mercury while group D received 0.3ml of mercury + 0.5ml of Moringa oleifera leaf extract orally for twenty eight days. The animals were weighed after the last administration and sacrificed. Kidney tissues were removed, weighed and trimmed down for histological studies. There was weight gain in group B and D relative to the control while group C had a reduction in weight. Histological results showed normal cytoarchitecture of the kidney tissues of group B and D relative to the control A while group C animals had distortion of cytoarchitecture of kidney tissues.

Index Terms- Wistar rats, Kidney weight, Body weight, Renotoxicity, Kidneys.

I. INTRODUCTION

Moringa oleifera is a fast growing evergreen deciduous tree. It can reach a height of 10-12m [1] and the trunk can reach a diameter of 4.5cm [2].The Moringa tree is grown mainly in semiarid, tropical and subtropical areas. It is grown in home gardens and as living fences in southern India and Thailand where it is commonly sold in local markets [3].

In the philipines, it is commonly grown for its leaves which are used in soup. Moringa is also actively cultivated by the world Vegetable center in Taiwan with a mission to reduce poverty and malnutrition in developing countries through improves production and consumption of vegetables [4].

In some regions, the young seed pods are most commonly eaten [5] while in others, the leaves are the most commonly used part of the plant [6].The leaves are the most nutritious part of the plant, being significance source of B-vitamins, vitaminC, provitaminA, vitaminK,manganese and protein among other nutrients [7].

When compared with common food particularly high in certain nutrient per 100g fresh weight, cooked Moringa leaves are considered source of these same nutrients [8, 9]. Moringa oleifera tree have been used to combact malnutrition especially among infant and nursing mothers [10]. The nutritional properties of Moringa oleifera are now so well known that there seems to be a little doubt of the substantial health benefit to be realized by consumption of Moringa leaf powder in a situation where starvation is imminent [11].

Therefore, there is need to investigate the hepatoprotective effect of Moringa oleifera leaf extrct on mercury induced renotoxicity in adult wistar rats.

II. MATERIALS AND METHODS

2.1 Procurement of plant

Moringa oleifera leafs were plugged from Nibo in Awka South Anambra State. It was authenticated in the department of Botany, Nnamdi Azikwe University Awka.

2.2 Drug Preparation

Fresh leafs of Moringa oleifera were plugged, shade dried and grinded into powder weighing 700g before extraction. The powder was macerated into absolute alcohol at room temperature. The filtrate was concentrated under reduced pressure and later evaporated in a water bath using evaporating dish at 45 ℃.

2.3 Experimental Protocol

Twenty adult wistar rats weighing between 190-270g were procured for the study. The animals were allowed to acclimatize to the laboratory environments in the department of Anatomy for two weeks and were fed ad libitum with guine feed and water. The animals were grouped into four groups (A, B, C & D) of five animals each. Group A served as the control and were orally administered with 0.5ml of distilled water; the experimental groups (B, C & D) were orally administered with different doses of drugs as follows: group B received 0.5m of Moringa oleifera leaf extract; group C received 0.3ml of mercury plus 0.5ml of Moringa oleifera leaf extract. The administration lasted for twenty eight days using intubation method. The animals were weighed after last administration and anaesthetized under chloroform vapour and dissected. Kidney tissues were removed, weighed, and trimmed down for histological studies.

2.4 Tissue Processing

The tissues were processed through process of fixation, dehydration, clearing, infiltration, embedding, sectioning and staining. Fixation was carried out in zenkers fliud. The tissues were washed overnight in running tap water after four hours in zenker fluid. Dehydration of the fixed tissues were carried out in different percentages of alcohol 50%, 70% and 90% absolute. The tissues were then cleared in xylene and embedded in paraffin wax. Serial sections were deparaffined hydrated and stained using the routine haematoxylin and eosine method. The stained sections were then examined under the light microscope.

III. RESULTS

3.1: Morphometric Analysis of Body Weight

Table 1: Comparison of mean initial and final body weight and weight change in all groups (A, B, C & D)
(Mean ± SEM given for each measurement)

	GP A	GP B	GP C	GP D	F-RATIO	PROB OF SIG
INITIAL BODY WT	217.33±4.79	231.60±4.64	263.86±7.63	248.50±6.94	56.32	<0.05
FINAL BODY WT	225.50±6.60	242.51±7.21	234.25±8.53	257.65±9.10	27.52	<0.05
WT. CHANGE	6.17± 0.120	6.05 ± 0.161	8.75 ± 0.225	6.71 ± 0.172	51.84	<0.05

The final body weight of group B and D increased significantly ($<$0.05) relative to the control while group C body weight decreased significantly when compared with control and other experiment groups (B, D).

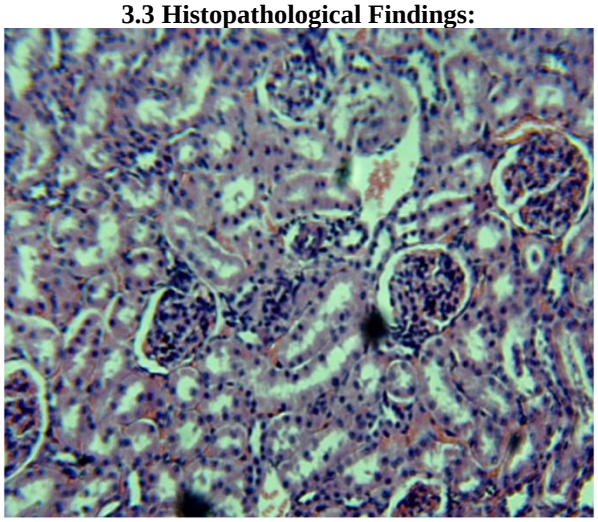
3.2: Morphometric Analysis of organ (kidney) Weight

Table 2: comparison of mean relative kidney weight in all the groups (A,B,C & D)
(Mean ± SEM given for each Measurement)

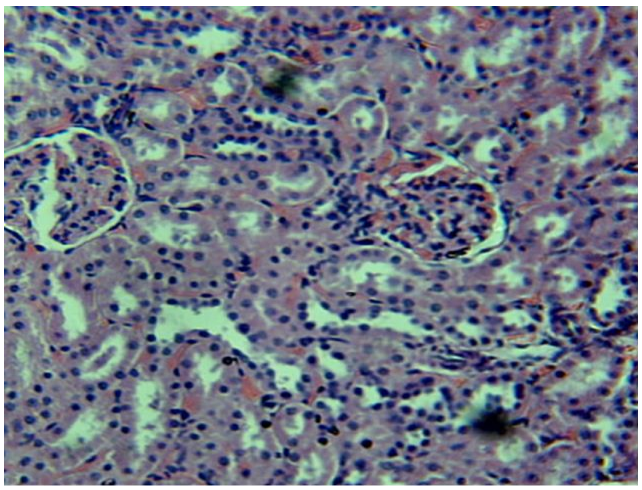
	GP A	GP B	GP C	GP D	F. RATIO	PROB OF SIG
SPLEEN WEIGHT.	5.20±0.170	5.28±0.217	7.10±0.420	5.32±0.140	54.80	<0.05

The relative kidney weight of group B and D increased significantly ($<$0.05) relative to the control while group C had elevated weight when compared with the control and groups B and D.

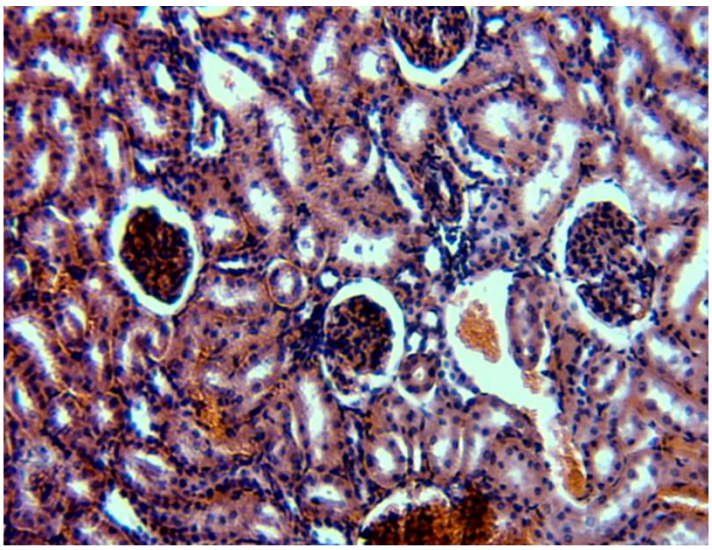
3.3 Histopathological Findings:



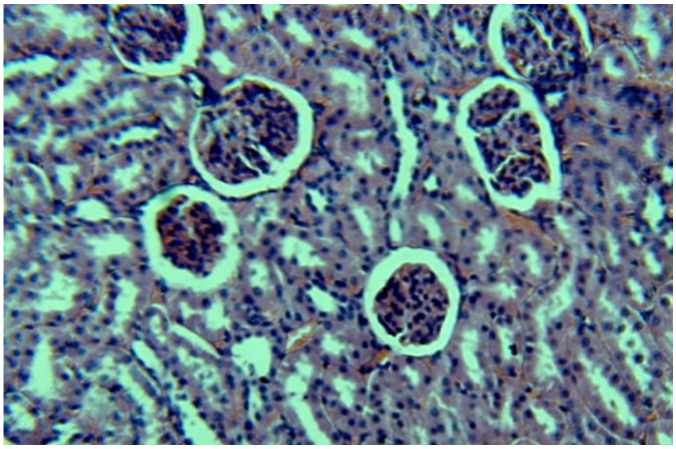
Micrograph 1(control) showing normal histological structure of renal corpuscle, proximal convoluted tubule ,distal convoluted tubule, henles loop, and collecting tubule stained by H & E technique,



Micrograph 2 Group B, (treated with 0.5ml of Moringa oleifera leaf extract) showing normal histoarchitecture of the kidney, stained by H & E technique, x 200.



Micrograph 3 Group C, (treated with 0.3ml of mercury), showing distortion of the histological structure of the kidney, stained by H & E technique, x 200.



Micrograph 4 Group D,(treated with 0.3ml of mercury + 0.5ml of Moringa oleifera leaf extract), showing normal histological structure of the kidney, stained by H & E technique, x 200.

IV. DISCUSSION

Moringa has been used in folk medicine [12] including siddha medicine and Ayurvedic traditional medicine and in the philipians [13].

In Ayurvedic traditional medicine, the leaves are believed to affect blood pressure and glucose level [14] In Africa, Indonesia and philipians Moringa leafs are given to nursing mother on the believed that they increased lactation [15] When measuring in urinary proteins and sugar in rats model of diabetes, Moringa oleifera appears to abolish all urinary proteins and sugar with 14 days of treatment with 200mg/kg of water extract of the leaf [16].

The antioxidant properties appear to underlie a reduction in urinary proteins and glucose in diabetic animals, suggesting a protective effect that may attenuate the rate of kidney failure in diabetes.

In presence study, the final body weight of groups B and D animals increased significantly relative to the control while group C have reduction in body weight.The relative kidney weight of group B and D are similar with control group A while C had elevated organ weight. There were no Histopathological lesions observed in groups B and D animals when compare with the control, but group C animals had destruction of the kidney cytoarchitecture. The dynamic result of groups B and D animals when compared with the control could be as a result of hepatoprotective and antioxidant properties possessed by Moringa oleifera leaf extract.

Therefore, the present study agrees with previous researches on hepatoprotective and antioxidant properties possessed by Moringa oleifera leaf extract.

V. CONCLUSION

From this study, Moring oleifera leaf extract has protective effect and antioxidant properties that could prevent damage to the kidney cells.

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Perception And Adoption of Technology Based Services by Students of Higher education

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Abstract- It is very important for both businesses and governments to be able to understand and analyze the time and process through which a technology-based service will be accepted by potential consumers. They should understand all the motives and perceptions that may have an effect on customers' technology readiness as these factors could be part of new service development strategies. Customers' technology readiness must play a lead role on predicting the perception and behavior of consumers. People's beliefs about technology must be analyzed in order to determine their predispositions to use new technologies. In this research, which steps on Parashuraman's and Colby's study, the technology readiness index is tested within Greek culture and particularly higher education students. The goal is to find whether there are differences between the technology readiness index as it is and the technology readiness of Greek consumers.

Index Terms- : technology readiness, technology based services, technology segments

I. Introduction

On account of technologies' broadening characters in service delivery, it is necessary to comprehend customers' readiness to use technology-based systems such as e-service (Parasuraman, 2000; Burke, 2002; Lin et al., 2007). Customers' technology readiness (TR) should be taken into account in order to accurately predict the perception and behavior of customers (Parasuraman, 2000). Customer readiness (CR) is a mental desire that plays a role in determining whether to use and continue using SST (Lin and Hsieh, 2006; Parasuraman, 2000). Studies investigating predictors of technology usage have generally focused on ease of use, usefulness, and other technology design features (Meuter et al. 2005; Zhu et al. 2007) as well as consumer demographics and traits (Dabholkar and Bagozzi 2002; Bruner and Kumar 2007; Weijters et al. 2007).

Previous research on technology acceptance suggests that individual differences, including personality traits, generalized beliefs, and affects about technology, as well as demographics, may affect the acceptance (Im, Bayus, & Mason, 2003; Meuter et al., 2005; Parasuraman, 2000). For example, the lack of security feeling surrounding technology may negatively reflect on one's willingness to embrace technology based services. So, it is of great interest to gain an in-depth understating of which are the drivers that lead to the acceptance or rejection of technology acceptance (adoption and usage)

Considering the commercial value of technology, electronic services can be described as the result of a protracted industrial approach, research and development and continuously evolving innovation plans and actions. Given the fact that technology based services are introduced and promoted to specific target markets, the importance the process of consumer's adoption process must be highlighted. The innovation in technology has changed how services are conceived and delivered (Massey et al. 2007). It offers customers convenient channels to access services, allows producers to better meet customer demands, and increases customer satisfaction (Liljander et al. 2006).

Diffusion is a process whereby an innovation spreads across a population of potential adopters over time through various channels (Fichman and Kemerer, 1999). Individuals within the cultures are not passive recipients of innovations. Although it varies in terms of the extent, they seek innovations, experiment with them, evaluate them, develop feelings about them, complain about them, and gain experience with them often through dialogue with other users (Greenhalgh et al., 2004). Consequently, the element of interactivity, that characterizes technology based services, creates experiences and value for the customer, resulting to a high diffusion rate. Also the characteristics of an innovation have a major impact on its rate of adoption among members of a social system (Rogers, 2002).

Fifteen years ago, the Clinton Administration stated that "Over the next decade, advances on the GII [Global Information Infrastructure] will affect almost every aspect of daily life, education, health care, work, and leisure activities. Disparate populations, once separated by distance and time, will experience these changes as part of a global community."

According to David Dean et al (2012), the Internet has become pervasive and its economic impact considerable. It will represent more than 5 percent of GDP in the G-20 nations by 2016, and in the most advanced countries, that figure will exceed 12 percent. As The Boston Consulting Group's latest update to the BCG e-Intensity Index indicates, the gap between the world's Internet leaders and laggards is widening. Governments of countries that are at the top of the e-Intensity Index rankings-or are rapidly moving up-encourage Internet use among consumers, businesses, and within government itself, because they recognize that it can be a powerful edge in the competitive global economy. Countries further down the list in many cases have failed to implement effective policies that encourage widespread adoption and use. These countries risk falling further behind if they do not act.

The digital economy is often described as the "always on" or "real time" economy. The challenge for governments and businesses is to be always on too, in touch with the technology's impact on their functions and continually evaluating ways to promote its use. Governments and businesses need to adopt a different style of policymaking. By choosing the right approach

and organizing themselves accordingly, they can make sure that they keep up with the best and move ahead by promoting their technology based services' particular advantages.

II. TECHNOLOGY READINESS

Technology readiness refers to people's propensity to embrace and use new technologies for accomplishing goals in home life and at work (Parasuraman, 2000). TR construct can be viewed as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person's predisposition to use new technologies. At the measurement level, the Technology Readiness Index (TRI) was developed to measure people's general beliefs about technology. TR construct comprises four sub-dimensions: optimism, innovativeness, discomfort, and insecurity. Optimism relates to a positive view of technology and a belief that technology offers people increased control, flexibility, and efficiency. Innovativeness refers to a tendency to be a technology pioneer and thought leader. Discomfort consists of a perception of lack of control over technology and a feeling of being overwhelmed by it. Insecurity involves distrust of technology and skepticism about its ability to work properly (Chien-Hsin Lin, 2007).

Optimism and innovativeness are drivers of TR, while discomfort and insecurity are inhibitors. Positive and negative beliefs about technology may coexist, and people can be arrayed along a technology belief continuum from strongly positive attitude at one end to strongly negative attitude at the other. The correlation between people's TR and their propensity to employ technology is empirically confirmed by Parasuraman (2000). Consumers' TR has a positive impact on their online service quality perceptions and online behaviors, but empirical findings are scarce (Zeithaml, Parasuraman, & Malhotra, 2002) and confounding (Liljander, Gillberg, Gummerus, & van Riel, 2006). Therefore, the role of TR may be minor in explaining individuals' online behaviors (Liljander et al., 2006). The limited knowledge about TR constitutes a need to investigate TR in a broader framework.

In describing TR, Parasuraman and Colby (2001) identify five distinct groups: Explorers, Pioneers, Skeptics, Paranoids, and Laggards. Explorers score higher on the contributors (optimism, innovativeness) and lower on inhibitors (discomfort, insecurity) than the other segments. Explorers are a relatively easy group to attract when a new technology-based product or service is introduced and represent the first wave of customers. Laggards are the opposite of Explorers, ranking lower on the contributor factors and higher on the inhibitor factors than all the groups as a whole. Laggards are also typically the last group to adopt a new technology-based product or service Demirci A. E. et al (2008).

The middle three segments (Pioneers, Skeptics, and Paranoids) have more complicated beliefs about technology. Pioneers share the optimism and innovative beliefs of Explorers, but they simultaneously feel some discomfort and insecurity. They desire the benefits of technology, but are more practical about the difficulties and challenges. Skeptics tend to be dispassionate about technology, but also have few inhibitions; thus, they need to be convinced of the benefits. Paranoids may find technology interesting, but they are also concerned about risks, and exhibit high degrees of discomfort and insecurity (Massey, Khatri and Montoya-Weiss, 2007). According to Parasuman's results, Table 1 shows the characteristics of technology segments (Jaafar et al., 2007).

Table 1. Characteristics of technology segments

Technology segments	Optimism	Innovativeness	Discomfort	Insecurity
Explorers	High	High	Low	Low
Pioneers	High	High	High	High
Skeptics	Low	Low	Low	Low
Paranoids	High	Low	High	High
Laggards	Low	Low	High	High

Source: Parashuraman (2000)

III. RESEARCH METHODOLOGY

The Technology Readiness Index (TRI), developed by Parasuraman (2000), was used as the survey measurement for this study. TRI is a multi-item scale comprising 36 technology belief statements, both positive and negative, related to one of the four TR dimensions. Each item was rated on a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). All the statements in the survey instrument were mandatory. As the survey instrument was designed originally in English, a pilot study was carried out with 30 people to test the clarity of the statements translated into Greek. The final shape was given after the necessary corrections were made. Answering all the questions in the survey took the participants' 6-8 minutes.

1200 students were reached, through convenience sampling method, and were asked to fulfill the questionnaire from which 748 statistically usable answered questionnaires were gathered. 38 questionnaires were not taken into consideration as the answers were not complete or statistically unusable. The rate of return in this study is 62.3%.

The respondents were divided according to the area of science that they study: economic, law and political sciences, philosophy (which include psychology, philosophy, pedagogy etc), faculty of sciences (which include mathematics, chemistry, biology, informatics etc) and independent faculties (which include agriculture, theology, fine arts etc.).

IV. RESULTS

Of the 748 respondents 54.28 percent were male and 45.72 wee female. Almost 20% of them were at their first year of study, almost 24% at their second, 45.72% at the third and finally 10.56% were at their last year of their studies. 26.20% were studying in a school that is included in the faculty of economic, law and political sciences, almost 22% in a school that belongs to the faculty of philosophy, 33.02% in a school of the science faculty and lastly 18.85% were students in a school in the faculty of independent studies, Table2.

Table 2. Study demographics

Study demographics

Characteristics	Frequency	Percentage
Gender		.
Male	406	54.28
Female	342	45.72
Year of study		.
First	148	19.79
Second	179	23.93
Third	342	45.72
Fourth	79	10.56
Type of studies	.	
Economic, law, and political sciences	196	26.20
Philosophy	164	21.92
Science	247	33.02
Independent faculties	141	18.85

As stated above there are 36 items in total which may drive or inhibit technology readiness in the TRI measurement scale of Parasuraman. Two-level principal component factor analysis was implemented in order for the variables to be sorted out. used in this study. Eleven items had loadings less than 0.40 and they were excluded from the final analysis which was performed with the remaining items. In concordance with Kaiser's (1974) criteria, only the factors with eigenvalues greater than 1 were retained; and only the items with factor loadings and communalities greater than 0.40 were included in the final factor structure.

Each factors' internal consistency was confirmed through the estimation of the Cronbach's alpha values for each dimension. The Kaiser-Meyer-Olkin (KMO) was 0.820, indicating that the sample was adequate for factor analysis (Kaiser, 1974).

The results of the principal component analysis revealed five factors that had eigenvalue equal or greater than 1. There was a total of 56.2 of the variance. The names of the factors were Innovativeness, Optimism, Discomfort, Insecurity and Suspiciousness. Innovativeness had the greater significance of all factors, according to the results of the factor analysis, with 21.48 of the total variance. The five elements concerning the level of the readiness that people have towards an innovation were included.

Table 3. Factors and items on technology readiness

Factors and items on TR

Factors	Mean	Standard Deviation	Factor Loadings	Cronbach 's Alpha	Eigenvalues (% of variance)
Innovativeness				,870	5,986 (21,48%)
INN2	3,64	0,89	0,63		
INN3	3,82	1,150	0,68		
INN5	4,14	0,98	0,79		
INN6	4,26	0,92	0,67		
INN7	3,75	0,82	0,84		
Optimism				,820	3,285 (13,80%)
OPT1	3,13	,960	0,64		
OPT2	3,89	1,110	0,78		
OPT4	4,84	1,280	0,52		
OPT6	4,01	1,070	0,59		
OPT7	4,16	0,88	0,68		
OPT8	3,82	1,16	0,54		
OPT9	3,08	1,21	0,71		
OPT10	3,94	0,87	0,76		
Discomfort				,840	2,532 (9,12%)
DIS2	3,46	0,94	0,61		
DIS3	3,95	0,93	0,82		
DIS6	4,57	1,040	0,76		
DIS7	3,05	1,09	0,89		
DIS10	4,56	1,13	0,63		
Insecurity				,670	1,687 (6,7%)
INS1	4,28	1,28	0,61		
INS3	4,08	1,32	0,72		
INS5	3,92	1,01	0,59		
INS7	3,88	0,85	0,67		
INS9	3,25	0,87	0,76		
Suspiciouness				0,76	1,237 (5,10%)
DIS8	3,94	1,14	0,87		
DIS9	4,58	0,99	0,76		

The factor that was second in significance was Optimism. It explained 13.80 of the total variance and it includes eight elements that are refer to the level of optimism that people show towards technology-based services. The third factor, called Discomfort, explained 9.12 of the total variance and it is consisted of five elements that are related to the discomfort that people show towards technology-based services.

The fourth factor, named Insecurity, explained 6.7 of the total variance and is consisted of five elements that are related to the feelings of insecurity that people have towards technology-based services. The last factor, called suspiciousness, explained 5.10 of the total variance and is consisted of two elements that are related with the feelings of suspiciousness that people show towards technology-based services . All factor loadings were greater than 0.40 and the cronbach alphas are greater than 0.69, while the total scale reliability is 0.67

According to the ANOVA and t-tests results on the demographics in respect each technology readiness factor, it was found that insecurity, in terms of gender, was the one that was significantly different from the other factors. Concerning the year of study, none of the factors of technology readiness were found to be statistically different. Discomfort and insecurity were statistically different according to the types of study.

Table 4. Demographics and factors of technology readiness

Factors	**Gender**		**Year of study**		**Type of studies**	
Innovativeness	1.954	.028	0.358	0.742	1.715	0.107
Optimism	0.513	.487	0.323	0.861	2.304	0.049
Discomfort	0.832	.692	1.102	0.289	4.998	.000**

Insecurity	-2.712	.000**	1.080	0.379	4.237	.009**
Suspiciousness	0.089	.924	0.053	0.887	2.017	.112
*p<0.05, **p<0.01						

V. CONCLUSIONS

In this research, as stated above, the technology readiness index is tested within Greek culture and particularly higher education students. The aim of this study was to find whether there are differences between the technology readiness index as it is and the technology readiness of Greek consumers.

The survey results showed clearly that insecurity, in terms of gender, is the only factor of technology readiness that was found to be statistically different. This means that gender affects the feelings of security that people have towards new technology based services. Discomfort and insecurity are statistically different, in terms of type of study. In this case feelings of discomfort and insecurity towards technology based services are affected by the field of each students' study.

VI. . LIMITATIONS AND FURTHER RESEARCH

The study is limited on a special sector of consumers that is university students. University students belong in a specific age range and may have different behaviors from people older people. Further research on a more diversified sample could provide more detailed results about the connection of technology readiness and the perception and adoption of technology based services.

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