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Review article on wheat flour/wheat bran/wheat husk based bio composites

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Abstract- In recent years, extensive studies have been carried out on natural fiber reinforced thermoplastics due to their low cost, high specific properties, simple fabrication methods, biodegradable nature and diverse applications touching all commercial sectors. The challenge is to make composites with properties that are not overly compromised by the use of low technology. In this work, we review the performances of these resources, that is, wheat flour/wheat husk/wheat grain. By adding natural fibers, composites are also obtained by extrusion process. These composites exhibit performances which allow their use only for short duration. The mechanical, morphological, chemical, water absorption and thermal properties of biocomposites were studied.

Index Terms- Biocomposite, Natural Fiber, Wheat flour, Wheat Husk, Wheat Grain

I. INTRODUCTION

The use of natural fiber for the reinforcement of the composites has received increasing attention both by the academic sector and the industry. Natural fibers have many significant advantages over synthetic fibers. Currently, many types of natural fibers have been investigated for use in plastics including flax, hemp, jute straw, wood, rice husk, wheat, barley, oats, rye, cane (sugar and bamboo), grass, reeds, kenaf, ramie, oil palm empty fruit bunch, sisal, coir, water, hyacinth, pennywort, kapok, paper mulberry, raphia, banana fiber, pineapple leaf fiber and papyrus. Thermoplastics reinforced with special wood fillers are enjoying rapid growth due to their many advantages; lightweight reasonable strength and stiffness. Some plant proteins are interesting renewable materials, because of their thermoplastic properties. Wheat gluten is unique among cereal and other plant proteins in its ability to form a cohesive blend with viscoelastic properties once plasticized. For these reasons, wheat gluten has been utilized to process edible or biodegradable films or packing materials. Hemp is a bast lingo cellulosic fiber comes from the plant Cannabis sativa and has been used as reinforcement in biodegradable composites. Composites based on biologically degradable polyester amide and plant fiber (flax and cottons) with good mechanical properties such as sufficient water resistance and biodegradability have also been investigated. Kenaf, Hibiscus cannabinus L a member of hibiscus family is also a biodegradable and environmentally friendly crop. It has been found to be an important source of fiber for composites and other industrial applications. The mechanical properties of composites manufactured from polyester resin with Kenaf fiber that blows to a height of at least 10 meter. Traditionally hemp has been used to make ropes but these days its fiber is used to make items such as clothing, toys and shoes. The fiber is fully biodegradable, non-toxic and may be recycled.
Natural fibers are renewable resources in many developing countries of the world; they are cheaper, pose no health hazards and finally, provide a solution to environmental pollution by finding new uses for waste materials. Furthermore, natural fiber reinforced polymer composites form a new class of materials which seem to have good potential in the future as a substitute for scarce wood and wood based materials in structural applications. Fibers obtained from the various parts of the plants are known as vegetable fibers. These fibers are classified into three categories depending on the part of the plant from which they are extracted.

1. Bast or Stem fibers (jute, mesta, banana etc.)
2. Leaf fibers (sisal, pineapple, screw pine etc.)
3. Fruit fibers (cotton, coir, oil palm etc.)

Properties of plant fibers depend mainly on the nature of the plant, locality in which it is grown, age of the plant, and the extraction method used. For example, coir is a hard and tough multicellular fiber with a central portion called "lacuna". Sisal is an important leaf fiber and is very strong. Pineapple leaf fiber is soft and has high cellulose content. Oil palm fibers are hard and tough, and show similarity to coir fibers in cellular structure. The elementary unit of a cellulose macromolecule is anhydro-d-glucose, which contains three alcohol hydroxyls (-OH) (Bledzki et al., 1996). These hydroxyls form hydrogen bonds inside the macromolecule itself (intramolecular) and between other cellulose macromolecules (intermolecular) as well as with hydroxyl groups from the air. Therefore, all plant fibers are of a hydrophilic nature; their moisture content reaches 8-13%. In addition to cellulose, plant fibers contain different natural substances. The most important of them is lignin. The distinct cells of hard plant fibers are bonded together by lignin, acting as a cementing material. The lignin content of plant fibers influences its structure, properties and morphology. An important characteristic of vegetable fiber is their degree of polymerization (DP). The cellulose molecules of each fiber differ in their DP and consequently, the fiber is a complex mixture of polymer homologue $(C_6H_{10}O_5)_n$. Bast fibers commonly show the highest DP among all the plant fibers (~10,000). Traditionally these fibers have been used for making twines, ropes, cords as packaging material in sacks and gunny bags as carpet-backing and more recently as a geotextile material.

Natural fibers as reinforcement have recently attracted the attention of researchers because of their advantages over other established materials. Natural fibers are

- Environmentally friendly
- fully biodegradable
- abundantly available
- Renewable and cheap and have low density
- Plant fibers are light compared to glass, carbon and aramid fibers

The biodegradability of plant fibers can contribute to a healthy ecosystem while their low cost and high performance fulfils the economic interest of industry. When natural fiber-reinforced plastics are subjected at the end of their life cycle to combustion process or landfill, the released amount of CO_2 of the fibers is neutral with respect to the assimilated amount during their growth. The abrasive nature of fiber is much lower which leads to advantages in regard to technical process and recycling process of the composite materials in general. Natural fiber-reinforced plastics, by using biodegradable polymers as matrices are the most environmental friendly materials which can be composed at the end of their life cycle. Natural fiber composites are used in place of glass mostly in non-structural applications. A number of automotive components previously made with glass fiber composites are now being manufactured using environmentally friendly composites. Although natural fibers and their composites are environmental friendly and renewable (unlike traditional sources of energy, i.e., coal, oil and gas), these have several bottlenecks. These have: poor wettability, incompatibility with some polymeric matrices and high moisture absorption. Composite materials made with the use of unmodified plant fibers frequently exhibit unsatisfactory mechanical properties. To overcome this, in many cases, a surface treatment or compatibilizing agents need to be used prior to composite fabrication. The properties can be improved both by physical treatments (cold plasma treatment, corona treatment) and chemical treatments (maleic anhydride organosilanes, isocyanates, sodium hydroxide permanganate and peroxide). Mechanical properties of natural fibers are much lower than those of glass fibers but their specific properties, especially stiffness are comparable to the glass fibers.

The performance of bio-composites depends on the properties of the natural fibers used in them. However, using natural fibers in building materials has also some disadvantages such as low modulus elasticity, high moisture absorption, decomposition in alkaline environments or in biological attack, and variability in mechanical and physical properties. To understand these problems, it is necessary to study fibers precisely. Generally, cell wall polymers and their matrices are the reason for chemical and physical properties of natural fibers. For instance, dimensional stability, flammability, biodegradability, and degradation are attributed to acids bases and UV radiation that alters the bio-composites back into their basic building blocks (carbon dioxide and water). However, the properties of natural fibers that result from the chemistry of the cell wall components make some main problems in bio-composites. Therefore, to address these problems, improving the natural fiber properties by modifying the basic chemistry of the cell wall polymers has been recommended.

II. MATERIALS AND NATURAL FIBER PREPARATION

Wheat flour of starch content above 85 % and lower than 12 % protein content was provided by Grand Moulin (Paris, France). Glycerol and magnesium stearate which was used as a additives for production of thermoplastic were taken as laboratory quality. Fibers are obtained from any of local sources. Light yellow color fibers called as a wheat husk which was grown up in Germany and collected through IGV institute, Germany. Wheat gluten was taken from Milan, Italy and also wheat and spelt bran also bought from same place.

The wheat flour and wheat husk was dried in the die at 80^{o}c to remove moisture and other presence of impurities. Wheat gluten taken from wheat bran .Preparation of sisal or cotton fiber with wheat flour based thermoplastic matrix biocomposites. Production of matrix contain glycerol and magnesium stearate then wheat flour then using different variation of fiber mixed using turbo mixer then pellets created by extrusion process. Then pellets were extruded again at 120^{o}c with rotating speed 60 rpm. Then using hydraulic press give pressure of 10 kg/cm^2 at same temperature to create composites.

III. BIO-COMPOSITES

Bio-composite are composite materials compromising one or more phase(s) derived from biological origin. The natural fibers and resins in composite materials, mostly called bio-composite. In terms of reinforcement bio-fibers may be classified in three main categories: straw-fibers, non-wood fibers and wood-fibers.

The matrix has the role to protect de fibers against the environment degradation and mechanical damage, but the main purpose is to hold the fibers together and transfer the loads on it. Generally, this matrix consists of a thermoset or thermoplastic resin, this existing composite uses polymeric materials as matrix. But whose non degradability property creates more environment concerns. To overcome this drawback there is a need for the development of bio degradable materials. So the for the bio-composite, the resin should be made from renewable resources.

IV. WHEAT FLOUR

C.I.Febles et al (2001) narrated in this study determined the phytic acid content of refined (hand-made and factory-made) and whole (factory-made) wheat flours much absorbed in the ganary Islands [1]. Also in this process 200 samples of wheat flours from different types (100 refined and 100 whole) were analyzed. Then Garcia-villanova was used for determination of phytic acid content in wheat flours. In refined flours had 2-4 mg/g of phytic acid and 6-10 mg/g for the whole ones. Also refined flours had lower phytic acid content than whole flours. The arithmetic mean achieving in the total the samples of flours is 6·05 mg/g. Ninety-percent of the whole variety granted values between 6 and 10 mg/g of phytic acid, 2–4 mg/g were found in 60·6 % of refined flours [1]. The arithmetic mean obtained from all the samples examined was 3·8 mg/g for hand-made refined flours, 3·0 mg/g for factory-produced refined flours and 8·50 mg/g for the whole ones.

A.Blandino et al (2001) noted feasibility of producing by Rhizopus stolonifer and Aspergillus, substrate taken as a cereal raw material was studied.in this process whole wheat flour acted as a good nutrient source for the cultivation of the microorganisms and exo- then endo-polygalacturonases were formed in submerged culture. Also the synthesis of both enzymes developed in both strains in the absence of pectin, demonstrating the constitutive nature of these enzymes [2]. In this process two types of fungi, Rhizopus stolonifer and Aspergillus awamori, were involved. The strain of Rhizopus stolonifer was achieved from the Type Culture Collection in Valencia, Spain. The strain of Aspergillus awamori 2B.361 U2/1, which according to the Commonwealth Mycological Institute is classified in the Aspergillus niger complex, produces a range of hydrolytic enzymes .then it has been used with whole wheat flour to generate a generic fermentation medium. Both microorganisms were increased and stored on PDA (potato-dextrose-agar) slants at 4 °C.As they declared, the basic aim of this work was to review the feasibility and the efficiency of using cereal raw for the production of pectinases. However, production was increased by the addition of a small amount of pectin to the flour [2]. In this process for both strains, the highest endo-PG activity levels were got when whole-wheat flour plus pectin was used as the fermentation medium. So, the production of endo-PG can be inspired by the addition of a small amount of pectin to the flour based medium.

Abdulvahit Sayaslan et al (2003) told economic manufacture of wheat starch and vital gluten proves physical separation of starch granules and gluten particles in a neutral aqueous system [3]. Using of a second-grade starch stream and flour water-soluble then fibrous residues may change at contrasting processing steps. Also, small-scale exams are allowable to assess the wet-milling quality of flours to be wet processed by the martin, batter abd the HD processes. Also small scale wet-milling tests to assess the wet-milling quality and suitability of flour samples for the industrial process. Processes were different mainly in the form of the flour-water mixtures showed to the fractionation equipment and the initial separation of starch and gluten fractions from flour. Also there are no laboratory tests announced for the hydro cyclone process. Also the important factor was small-scale wet-milling tests to survey the wet-milling quality and suitability of flour samples for industrial process [3].
Jaroslav blazek and Les Copeland (2007) was reported the effect of content of total amylose, free amylose and lipid-complexed amylose then amylopectin chain length distribution, on swelling behavior and pasting properties of wheat flour and starch from varieties with expanded amylose content are checked [4]. No correlations available between amylopectin chain length distribution and swelling behavior of flours and starches. Thirty-eight wheat (Triticum aestivum L.) collections were used in the study. Of these, 35 varieties were developed through the Value Added Wheat CRC Pty Ltd. In this contrast to waxy starches and starches with ordinary amylose content, wheat starches with developing amylose content viewed characteristic patching properties that featured decreasing peak, breakdown and final viscosities with increasing T-AM contents [4].

Maya Jacop John and Sabu Thomas (2007) reported that the cellulosic fiber reinforced polymeric composites are used in many application like construction industry to automotive industry. Hybrid and textile bio composites were classification of composites into green composites [5]. In current trend new developments running with cellulose based nanocomposites and electron spinning of nano fibers were also discussed. In this process bio composite is applied to a staggering range of materials derived fully or in part from renewable biomass resources. We could stop the environmentally hazardous materials. This study of bio-based materials has become the key importance due to need of product to our environment. Also in this process finding many application of bio fibers in wide range of companies [5]. Finally we resulted the applications of cellulosic fiber reinforced polymeric composites have been inspected.

P.A.sreekumar et al (2008) reported that the use of wheat flour based thermoplastic matrix with waste cotton fiber as reinforcement. They got new composite materials by extrusion method. Varying composite 0 to 15% then utilizing x-ray diffraction and scanning electron microscopy they clarified the structure and morphology of the prepared fiber materials [6]. While adding the waste cotton fiber with wheat flour based thermoplastic based matrix improved tensile properties and it not affected thermal conductivity and resistivity of the prepared fiber material. In this study degradation of composite occurs in two steps. Addition of fiber may occur the stress failure and maximum tensile modulus [6]. Also the material referred in this work is as an insulator composites.

FU Lei et al (2008) announced resistant starch (RS) is the undigested starch also that grounding through the small intestine to the large intestine [7]. Using rapid visco analysis (RVA) and bra bender farino graph they can study about the pasting properties and the viscoelasticity of blends of RS (RS3 and RS2) and the three wheat flours. The strong gluten heat(SGW),intermediate gluten wheat(IGW) and weak gluten wheat(WGW) flours were expressed by wheat flour, at various levels of RS substitution(0,5,10 and 20 %).the impact of RS3 on the control wheat flours and RS-wheat flour blends were persistent with those of RS2. An increase in resistant starch contents from 0 to 20 % in the blends with peak, trough, breakdown, final and setback viscosities of wheat-RS blends decreased. Doughs forms using 0-20 % of RS-wheat flour blends. Also increase in resistant starch from 0 to 20 % in blends with PV, TV, BV, FV and SV decreased. The amylopectin in blends acts as a main role at an early stage (about 3.5 min) in the RVA pasting curve [7].

R.Saiah et al (2008) reported development of mono glyceride [8] on the structure and thermal stability of extruded thermoplastic films based on changed wheat flour have been checked using X-ray diffraction (XRD) and thermo gravimetric method (TGA).In this process wheat flour content mix (thermo regulated turbo mixer) with additives such as glycerol, sorbitol, silicium dioxide and magnesium stearate were used in material preparation. Also mono glyceride lipids were used for this work. While adding mono glycerid it decreased the intensity and widened the peaks received by XRD showing a reduction in crystal size. Also when quantity of mono glyceride was increase automatically apparent length of the crystal also be decreased. After the structure prepared samples has been tested with XRD experiments using a Rigaku miniflex wide angle X-ray diffractometer. The XRD analysis [8] exhibited that incorporation of lipid decrease the intensity and widening of peaks significantly for polymeric materials having 5 and 10% (w/w) of lipids and a reduction in the crystal size.

Fatih Mengeloglu and Kadir Karakus (2008) were announced thermal performance of wheat straw flour (WF) filled thermoplastic composites were studied by applying the thermo gravimetric analysis and differential scanning calorimetry [9]. Then morphology and mechanical properties were studied by scanning electron microscope and universal testing machine. In this process the thermoplastic matrixes were converted high density polyethylene (HDPE), converted polypropylene (PP) or 50-percent mixture of these two polymers. Recycled HDPE pellets were generated from water pipes. Wheat flour in thermoplastic matrix decreased the degradation temperature of the composites. In this process single wheat flour and thermoplastics and two main decomposition peaks were inspected [9]. Wheat flours mingle with thermoplastic showing improved adhesion. In this work of mechanical properties of WF filled reusable thermoplastic, HDPE and PP based composites granted similar tensile and flexural properties. Using coupling agents we could improve properties of thermoplastic composites. The composites composed with the combination of 50-percent mixture of recycled HDPE and PP achieved related with the use of both coupling agents. Also all produced composites presented flexural properties required by the ASTM standard for polyolefin-based plastic lumber decking boards [9].

Stefano D'Amico et al (2009) reported to study the potential of renewable polymers [10] based on wheat corn for wood bonding and wood composites was the main objective of this research. Economical wheat flour having mostly starch and proteins they these are used as a bio based glue. Also using differential scanning calorimetry (DSC) we studied thermal properties of the wheat flour glue. Then using micro visco-amylograph (MVA) inspected pasting profiles of the wheat flour slurry [10]. By increasing the temperature, the increase in bond strength up to a temperature of 105 ^{o}C was observed. Then mainly wood failure was observed. As they declared adhesive properties of wheat flour polymers for wood-to-wood bonding are strongly damaged by curing temperature.

Thimothy Thama et al (2009) investigated that for developing countries low cost methods is suitable for nature fiber composites. Using corn flour/wheat stalk flour then using waste peak density polyethylene we made a natural fiber composite [11]. Then using this composite moisture absorption, impact, tensile properties and flexural properties were analyzed. In this process outer ring of the corn stalk flour consumed more water. Compare to whole corn stalk flour it observe high water. In this analysis both corn and wheat stalk composites has a similar impact properties of the composites. Using silane or sodium hydroxide treatments the tensile or flexural properties of the corn stalk composites were enhanced [11]. Also selection of processing techniques and materials may be affected slightly their properties. As they issued water absorption properties of the outer ring CSFCs is high than the whole CSFSs. But impact properties of the two is not has much difference.

P.A. Sreekumar et al (2010) announced varying glycerol (20 %, 23 %, 25 %, 30 % and 35 % w/w) content with wheat flour based thermoplastic matrix were formulated using of extrusion through compression molding [6]. Also for this matrix two transitions peaks, one at low temperature then another one at high temperature by developing the volume of glycerol were observed. When correlated the value of matrix alone and adding sisal fiber to the matrix, addition of fiber with matrix will increase the storage and loss moduli at peak temperature region [6].

Jean Mark Saiter,Larisa Dobircau and Nathalie Leblanc (2011) told history of the evolution of material science and material technology shoe us that one tendency for the future should be the use of agriculture resources [12]. In this process we were review the performance of one of these resources, that name is wheat flour. We display that is possible to get thermoplastic film with properties quasi equivalent to which is obtained for expensive pure starch then if u adding natural fibers with this we can get composites also. In this work we have chosen to study is retrieved from a formulation based on a wheat flour buy product, to which various components were added to obtain a film-forming material by an extrusion process [12]. The starting composition of this system is derived from the work previously done at the Laboratory of Engineering Materials (LGMA) of the Engineering School in Agriculture (Esitpa) and has been the subject of a patent.

X.F.Ma et al (2012) reported that urea and formamide were used as a blended plasticizer for preparing the thermoplastic wheat flour (TPF) by single screw extruder. Method of making setup was wheat flour with plasticizer like urea and formamide [13]. Using scanning electron microscope (SEM) wheat flour granules were verified to transfer to a continuous phase. TG curves exposed that when the plasticizer weight content (PC) was under 40%, the whole plasticizer could be effectively belted to wheat flour. Also, TPF with 30% PC had the relatively good mechanical properties like tensile strength and elongation and young's modulus. Using X-ray analysis we could prove that the plasticizer effectively restrain the starch retro gradation of TPF also water absorption testing viewed that the lower pc was good water resistance for TPF. These are proved by using SEM and X-ray methods [13]. According to rheology study, TG analysis and mechanical testing, the optimum processing conditions are PC was between 30 and 40% then both the extruder screw speed and the processing temperature could effectively adjust the flow behavior of TPF.

V. WHEAT BRAN

M.Mastromatteo et al (2008) expressed the single and interactive effects of the spelt and wheat bran as well as glycerol on the properties of wheat gluten planted edible films were studied in this process with surface methodology [14]. Exams were run to find water vapor permeability (WVP), mechanical properties and color of the films as well as the rheological properties of the film forming solutions. In this process the Elastic modulus (Ec) of the composite films was increased with the increase of bran concentration and the decrease of glycerol. The tenacity elevated with the increase of glycerol and spelt bran up to a threshold value after which a decrease was calculated. The complex modulus (E*) of the composite films increased with the reduce of the glycerol concentration and with the increase of the wheat bran [14]. All film forming solutions granted pseudo plastic behavior. Also the apparent viscosity elevated with the increase of bran concentration due to the fact that a higher number of water molecules are damaged. Wheat gluten (10 g) (Sigma–Aldrich, Milan, Italy) was solubilized in distilled water–glycerol solution. The solution was shaked continuously using a magnetic stirrer hotplate until powders were fully dissolved. Then also, the wheat and spelt bran (Molino Bongiovanni) was added to the wheat gluten–water–glycerol solution and shaked again. In this process they reported this work was to show the water vapor barrier, the mechanical and dynamical properties then the rheological behavior of the wheat gluten-based edible films in order to obtain the optimal formulation for peculiar applications [14].

Yi Zou et al (2009) declared the whole and split wheat straws (WS) with length up to 10cm used with polypropylene (PP). Weps to make low weight composites with properties remarkable to jute-PP composites with the same density. Also, inspected about the effect of WS concentration and WS length then crack configuration on flexural and tensile properties of the composites [15]. Mechanically split WS-PP composites have 114 % greater flexural strength,38% better modulus of elasticity then 10 % higher tensile strength and 140 % higher young's modulus and lower sound absorption compare with jute-PP composites. In this work novel method used for usage of long WS with PP nonwoven webs to make composites. For whole WS-PP composites, WS at 60 % weight ratio then 5cm long are the required condition for mechanical properties among the conditions learned during the compression molding at 185 ^{o}c for 80 s [15].

Sara Arranz and Fulgencio Saura Calixto (2010) were proclaimed more analytical studies on polyphenols in cereals refer to compounds decided in aqueous-organic extracts and alkali hydrolysates [16]. The main detached of this work was to complete if sulphuric acid hydrolysis may release significant amounts of polyphenols to be considered for analytical and nutritional studies. But this substantial amount of polyphenols bound to cell wall constituents may remain insoluble in the residues of evocation then alkali hydrolysis. Also, in this process HPLC/MS analyses of polyphenols were achieved in methanol-acetone extracts, alkali and sulphuric acid hydrolysates of wheat flour and bran then pool of cereals of the diet [16]. The amount of polyphenols got in the acidic hydrolysates (200e1600 mg/100 g) was higher than in alkali hydrolysates (0.2e372 mg/100 g). Also Lower amount of polyphenols were got in the methanol acetone extracts (44e160 mg/100 g). Then Hydroxybenzoic, caffeic, cinammic and ferulic then protocatechuic acids were the important constituents of the hydrolysates. The addition of cereals to the intake of dietary polyphenols in Spain was anticipating around 360 g/person/day (65 mg of extractable and 295 mg no extractable polyphenols). All solvents used were analytical HPLC grade from Sigma Aldrich (St. Louis, Missouri, USA). Also, in this process water use as an ultrapure. Our values for extractable polyphenols [16] are in the same range (100 and 240 mg/100 g dry weight for wheat flour and bran respectively).

Youna M. Hemery et al (2010) reported wheat bran is currently minimized by-product then it could be processed into food ingredients with high nutritional potential [17]. Main objective of this study was to determine the influence of bran moisture content then the influence of sub-zero temperatures on the mechanical properties of whole bran layers and hand isolated bran tissues to get details on their potential breakage behavior during fractionation processes. The mechanical properties of bran strips were predicted by stress–strain tests using a dynamic mechanical thermal analyzer and temperature control then relative humidity control also. In this work exposed that it is possible to regulate the mechanical properties of bran samples by hanging their moisture content and the temperature [17]. Then two common wheat (Triticum aestivum L.) cultivars altering in kernel hardness (hard wheat: Tiger, and soft wheat: Crousty), collected in 2005 in Germany (Tiger) and France (Crousty) were referred. To access isolated grain tissues, the grains ends (germ and brush) were cut with a razor blade and the remaining parts were immersed in distilled water for 12–16 h at 20 ^{o}C. A crease incision was made then the endosperm was removed using a scalpel. Then it is possible to modulate their mechanical properties. Also, these results allow adapting fractionation processes for a better use of bran [17].

Aynur Gunenc et al (2013) described alkyl resorcinols (ARs) are phenolic lipids then it mostly found in rye and wheat brans.in this work the stability of AR content and homologue composition of hard red wheat bran (HRWB) then soft red wheat bran (SRWB) were inspected, using four various bread formulations [18]. Also ARs in wheat bran samples were separated with four different solvents whereas ARs in breads were extracted with hot 1-propanol then quantified using gas chromatography–mass spectrometry (GC/MS). The different equations used in four bread trial were 100 % white flour (control breads), 30 % wheat bran, 30 % residue bran after AR Extraction then 30 % wheat bran plus 2 % crude AR extract. The effects of baking on whole phenolic content (TPC) and antioxidant activity were also decided. A positive correlation was checked between oxygen radical absorbance capacity (ORAC) and TPC R2=0.89).In this work materials Hard red wheat bran (HRWB) and soft red wheat bran (SRWB) were got from Kraft-Canada. All other ingredients necessary for bread making were equipped by the Culinary Department of Algonquin College, Ottawa, Ontario (ON), Canada. In this work as we conclude seven bread trials were attended with the same baking conditions, using two various wheat bran samples to regulate whether AR contents and antioxidant capacity changed [18]. The results viewed that naturally occurring wheat bran ARs were heat stable during baking. The breads with the highest amount of ARs were the most elevated and raised trial breads.

VI. WHEAT HUSK

Carole Guillaume et al (2010) were reported how the structural, surface, water vapor and gas barrier properties of wheat gluten (WG) participated paper could be altered by features of paper. For this work surface treated (TP) and untreated paper (UTP) were compared [19]. Forcing of WG-coating into the bulk of paper was marked in UTP and TP. The enhanced of penetration not worthy affect the surface properties, the transfer properties of WG-coated papers were increased when WG-coating highly charged while WG-TP acted as a micro-perforated material and the WG-UTP behaved as WG-film [19].

Xiaoqing Zhang and Yesim Gozukara (2010) reported biodegradation of an array of chemically changed thermally processed wheat gluten (WG) based natural polymers were analyzed according to Australian standard (AS ISO 14855). Within 22days of compositing this type materials reached 93-100 % biodegradation. Chemical crosslinks [20] reduced the degree of the biodegradation with various for different modified systems. These segments contain shapes derived from the reaction with additives such as tannin or epoxidised soybean oil remained in the degradation residues while the glycidoxy propyl trimethoxy silane agent formed 20 % un-degraded having silicon-crosslinking structures. Component of the materials was also different with the protein and starch components degraded fast in biodegradation rate. Finally in this process they concluded chemically changed thermally processed WG materials [20] shows that most of the materials were still biodegradable but rate and degree of degradation could be varied due to formation of various network structures by various chemical modifications.

Yi Zou et al (2010) recorded whole and split wheat straws (WS) length upto 10cm used with poly propylene (PP) webs to generate light weight composites with properties remarkable to jute-PP composite with same density [15]. Also wheat straw concentration, length and wheat straw split configuration on flexural and tensile properties of the composite has been inspected. Also sound absorption properties of composite from whole straw and split straw have been learned [15].

Anne Chevillard et al (2011) expressed the aim of work is to inspected the influence of clay nanoparticles on the biodegradability of wheat gluten-based materials [21] via perfect understanding of multi-scale relationship between biodegradability then water transfer properties and structures of wheat gluten/clay materials. Wheat gluten/clay composites were produced through bi-vis extrusion by using an unchanged sodium montmorillonite (MMT) then organically modified MMT. Also three hypotheses have been proposed to account for underlying mechanisms based on the evaluation of the water sensitivity and multi-scale characterization of material structure. Molecular/macromolecular attraction between clay layers and wheat gluten matrix, ability of both components to improve interactions [21] appeared as the key parameter governing the nanostructure.

Pakanita Muensri et al (2011) told effect of fiber lignin content on biocomposite properties was inspected. In this study coconut fiber was managed with 0.7% sodium chlorite to decrease amount of lignin. Then mechanical properties, water sensibility, matrix glass progress and infrared spectra of bio composites processed with fiber having different amount of lignin were avaluated.in this process they described increment of coconut fiber significantly improved properties of wheat gluten biomaterials.

Beatriz Montano-Leyva et al (2012) declared bio composite from wheat by-products like wheat gluten and wheat straw fibers were produced using a thermo mechanical process [22]. Using three types of wheat straw fibers, morphological and surface reactivity's were done by successive grinding process. In this process main objective of the present study were to gain further scientific knowledge about the crush of the fibers characteristics on the mechanical properties of these composite materials and to evaluate in which extent the extension of wheat straw fibers could reduce the final cost of materials without altering their mechanical properties. Also mechanical properties were analyzed through tensile tests and considered in relation to the structure of material. Mainly, interfacial adhesion between the fiber and matrix [22]. Always increasing fiber content up to 11.1 vol % led improvement in both the young's modulus and the stress at break then reduction in the strain at break. In this process to determine that the adhesion at the interface wheat straw fiber/wheat gluten was developed by an increased hydrophobicity of wheat straw fibers, what was convinced by successive grinding and a greater specific surface of fibers what was avoided in the case of small fibers. In this work economic vital wheat gluten (WG) was kindly granted by Syral (Belgium) under the reference AMYGLUTEN 110. Its moisture and protein content was approximately 10 % and 80 %. Glycerol (Fluka, Sigma–Aldrich Chemie, and Steinheim, Germany) was used as a plasticizer. Wheat straw (WS) (T. aestivum cv. Apache) was granted by Fernand Meaux (Saint Jean du Sales, Aveyron, France), harvested in 2007 and was used for grinding experiments to obtain wheat straw fibers [22]. For this process, three types of wheat straw fibers arranged by successive grinding processes then showing contrasted. When increasing fiber content led to an increase in the Young's modulus then stress at break and to a reduction in the strain at break. Anyhow addition of wheat straw fibers reduce the final cost of the materials without altering the mechanical properties of wheat gluten-based materials [22].

Sudsiri Hemsri et al (2012) announced in this work coconut fiber-reinforced wheat gluten (WG) bio composite were fabricated [23]. Coconut fibers (CCFs) were chemically changed by sodium hydroxide or silane treatment then alkali surface treatment with silane treatment. In this process X-ray photoelectron spectroscopy (XPS) then gas chromatography or mass spectroscopy (GC/MS) analyses were worked to prove the presence of the silane on silane–treated coconut fiber (SCCF) then alkali-followed by silane-treated fiber (ASCCF). Using three-point bending test, the mechanical properties of composites with 15 mass % fiber loading were analyzed. Then also, scanning electron microscopy (SEM) was used to inspected fracture surface characteristics of composite [23]. Then fiber surface treatment with carbonate silane can increase WG matrix/coconut fiber adhesion.

E.Chabrat et al (2012) announced wheat flour plasticized with glycerol and associated with poly (lactic acid) in a one-step twin-screw extrusion process [24] in the presence of citric acid with or without extra water. Using these additives on process parameters and thermal, mechanical and morphological properties of inserted samples from the arranged blends was studied. In this process Compatibilizer as citric acid acted by boosting de-polymerization [24] of both starch and PLA. Finally they concluded by adding small amount of water during the extrusion process was useful to the whole process, facilitating compounding, developing starch plasticization and lowering

PLA depolymerization when small amounts of citric acid were used.

Takian fakhrul et al (2013) told due to low cost and high specific properties, simple fabrication methods universal studies have been implemented on natural fiber reinforced thermoplastics [25]. In this process using the effect of associating small amount (5 %) of wood sawdust and wheat flour they calculated mechanical, morphological, chemical and thermal then water absorption properties of polypropylene (PP). Now both types of composites at breaking condition yield strength and elongation decreased whereas the young modulus and flexural modulus were increased. In this process using scanning electron microscopy (SEM) we learned morphological properties [25]. Also thermo gravimetric analyses (TGA) and water absorption tests are accepted the composed composites shown higher thermal stability and water absorption in comparison with virgin PP. As they declared extension of wheat flour and sawdust to PP are changed its mechanical, morphological, physical and thermal properties greatly. Also mechanical properties of the both composites were lower due to poor adhesion between the fibers and plastic matrix accepted by the morphological study. Also due to small particle size of wheat flour has better mechanical properties compare to wood saw dust composites [25].

H.Abdillahi et al (2013) exposed the effects of citric acid on wheat flour /glycerol/poly (latic) acid (PLA) mixture prepared by one-step twin-screw extrusion have been considered to improve barrier properties of starch based materials. From prepared compounds with varying ratio (0-20 part) of citric acid to produced series of injected samples [26]. The power of citric acid on the water vapor permeability, oxygen permeability then water solubility in the film were measured. Also barrier properties results shown that citric acid perform as a compatiblizing agent between starch and PLA phases for ratio between 0 to 10 parts. Finally they concluded Citric acid was combined to wheat flour/PLA blends to improve the miscibility of PLA and wheat flour. Also, evaluate its effect on their barrier properties [26]. The tendency of film densities as a function in the WVP and oxygen permeability was contrasting from that observed for conventional plastics. Also, low citric acid content significantly reduced the WVP up to 80 % and overall 90 % the oxygen permeability [26].

Tamara Dapecevic Hadnadev et al (2013) revealed Experimental and theoretical influence of addition of various amounts of three types starch sodium octenyl succinate (OSA) granules (0-20%) were non-physically modified, pregelatinized and hydrolyzed spray-dried on rheological behavior of wheat flour dough systems under oscillatory strain conditions was inspected [27]. In this process two model parameters were used for quantitative description of the rheological behavior of the systems were effective modulus and the dumping coefficient [27]. The most fixed system with pronounced dumping effects was the dough improved with 20 % of the non-physically changed OSA starch granules (max of the effective modulus and min of the dumping coefficient). Then the softest system was dough with 20 % of the pregelatinized OSA starch. OSA starches as well as dough samples in which wheat flour was partially restored with OSA starches were noticed in a Jeol JSM 6460LV scanning electron microscope (Tokyo, Japan) with a 25-kV acceleration voltage. It primarily depends on the rigidity of added OSA starch granules and their efficiency external surfaces [27].

Hector A. ruiz et al (2013) reported main objective of this study were extraction of hemicellulose from wheat straw(WS) and its uses in the reinforcement of k-carrageenan/locust bean gum (k-car/LBG) polymeric blend films (PBFs). In this study barrier properties, mechanical properties and moisture content and opacity then thermal properties of the resulting PBFs were decided and associated with incorporation oh HE. In this study they showed reinforce k-car/LBG PBF and it can be other source in the application of hemicellulose according to bio refinery concept.

Beatriz Montani-Leyva et al (2013) issued bio composites from wheat gluten and wheat straw fibers were processed using thermochemical process [22]. Using three types of wheat straw fibers morphologies and surface reactivities were processed by successive grinding processes. Main objective of this study is to reduce the final cost of material without changing its mechanical properties [22]. Finally in this project they announced reinforcing effect of wheat straw fibers was increased to deplasticizing effect and particularly pronounced for ball milling wheat straw fibers.

While adding the waste cotton fiber with wheat flour based thermoplastic based matrix improved tensile properties and it not affected thermal conductivity and resistivity [6] of the prepared fiber material as has been confirmed by P.A.sreekumar and R.saiah (2008) et al. Wheat flours mingle with thermoplastic showing improved adhesion. In this work of mechanical properties of WF filled reusable thermoplastic, HDPE and PP based composites granted similar tensile and flexural properties then using coupling agents [9] we could improve properties of thermoplastic composites proved by Fatih Mengeloglu and Kadir Karakus (2008). Mechanically split WS-PP (wheat straw - polypropylene web) composites have 114 % greater flexural strength, 38 % better modulus of elasticity then 10 % higher tensile strength and 140 % higher young's modulus and lower sound absorption [15] compare with jute-PP composites accepted by Yi Zou and Shah Hudu (2009) et al.

Using silane or sodium hydroxide treatments we enhanced the tensile or flexural properties of the corn stalk composites [11] were approved by thimothy thamae, shanil vaja and yiyi shangguan (2009) et al. TPF (thermoplastic wheat flour) with 30% PC had the relatively good mechanical properties like tensile strength and elongation and young's modulus [13] were examined by X.F.Ma, J.G.Yu, and Y.B.Ma. Both types of composites (wood sawdust and wheat flour) at breaking condition yield strength and elongation decreased whereas the young modulus and flexural modulus increased [25] were proved by Takian fakhrul, rubayyat mahbub and M.A.Islam (2013).

Morphological examination of the fracture surfaces by scanning electron microscopy (SEM), carried out in order to investigate the variation of the measured mechanical properties. Using three types of wheat straw fibers, morphological and surface reactivity's were done by successive grinding process [22] received from Beatriz Montano-Leyva and Gabriela Ghizzi D.da silva (2012) et al.

Using these additives on process parameters and thermal, mechanical and morphological properties of inserted samples from the arranged blends was studied. In this process compatibilizer as citric acid acted by boosting depolymerization of both starch and PLA [24] were proved by E.Chabrat, H.Abdillahi (2012) et al.extension of wheat flour and sawdust to PP are changed its morphological properties [25] were announced by Takian fakhrul, rubayyat mahbub and M.A.Islam (2013).

Water absorption test results it is clearly that pure PP is severely hydrophobic and its water absorbing strength is grown by adding sawdust and flour. Water absorption is twice greater in the PP-composites. This might be associated to the fact that wood is clearly hydrophilic in nature due to presence of the hydrophilic hydroxyl groups of cellulose, hemicelluloses then lignin that is responsible for water absorption [25] were examined by Takian Fakhrul, Rubayyat Mahbub (2013) et al. Water absorption grown up with flour content while pure HDPE (High Density Polyethylene) takes in very little water over time. As lignocellulose materials have a peak concentration of hydroxyl groups (OH). Also they are very hydrophilic. In increasing, as the filler content improves given the same average particle size, the interfacial area increases. The interfacial area can be a pathway for movement of water molecules were reviewed by Espert et al, 2004.

While adding mono glyceride, it decreased the intensity and widened the peaks received by XRD showing a reduction in crystal size. Also, when quantity of monoglyceride was increase automatically apparent length of the crystal was decreased. Also, The XRD analysis exhibited that incorporation of lipid decrease the intensity and widening of peaks significantly for polymeric materials having 5 and 10 % (w/w) of lipids and a reduction in the crystal size [6] were proved by R.Saiah, P.A. Sreekumar(2008) et al.

VII. CONCLUSION

The flours connecting to the refined factory production show values lower than the rest. Quantity of monoglyceride was increase automatically apparent length of the crystal was decreased. The production of endo-PG (poly galacturonases) can be inspired by the addition of a small amount of pectin to the flour based medium. Wheat starch and vital wheat gluten are developed by wet-milling of wheat flours by four processes. Processes were different mainly in the form of the flour-water mixtures showed to the fractionation equipment and the initial separation of starch and gluten fractions from flour. Swelling power of flour is a simple test that reflects a number of industrially relevant characteristics of starch, and also it can be used as an indicator of amylose content and cementing properties of starch. Addition of fiber may occur the stress failure and maximum tensile modulus. Blending resistant starches with wheat flours derived in acceptable RVA (rapid visco analysis) parameters. Quantity of mono glyceride was increase automatically apparent length of the crystal was decreased. The water vapour barrier, the mechanical and dynamical properties then the rheological behavior of the wheat gluten-based edible films in order to obtain the optimal formulation for peculiar applications. Wheat flour in thermoplastic matrix decreased the degradation temperature of the composites. Adhesive properties of wheat flour polymers for wood-to-wood bonding are strongly damaged by curing temperature. Then, excellent adhesive bond strength could be achieved with the used wheat flour glue without any additives. Investigation of the response of frequency differnsation confirms that dynamic mechanical properties of the starch based polymer is sensitive. The total amount of polyphenols was greater in wheat bran (161.7 mg/100 g) than in wheat flour (112.2 mg/100 g). The mechanisms of paper-coating by proteins and hoe understand structural then surface, transfer properties of wheat gluten (WG) coated paper influenced by nature of the paper.

Chemically changed thermally processed WG (Wheat gluten) materials shows that most of the materials were still biodegradable but rate and degree of degration could be varied due to formation of various network structures by various chemical modifications. Rate of biodegradation of wheat gluten-based materials has been decreased by adding unchanged MMT (HPS) without affecting the last biodegradation level though the presence of an organically changed MMT did not significantly influence the biodegradation pattern.

Increment of coconut fiber significantly improved properties of wheat gluten biomaterials. Fiber surface treatment with carbonate silane can increase WG (Wheat gluten) matrix/coconut fiber adhesion. Adding too much citric acid led to a plasticization and/or hydrolysis effect of wheat flour/PLA blends thus involving a reduce in the WVP of those blends.

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