IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

BIO-PACKAGING USING ALMOND (SHELL &HULL) INCORPORATED WITH CELLULOSIC FIBER

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ABSTRACT: In recent years, there is large usage of plastic in that 79% of plastic is wasted only 9% is been recycled to reduce the usage of plastic our project is on developing biodegradable packaging. However, certain agricultural plants producing high biomass are founded to be suitable substitute. Among them almond waste (shell & hull), ground nut shell may serve partly as an alternative resource. In this study, the packaging material consists of almond hull &shell. The polyol composition is formed when the almond hull& shell process is done with liquefying agent (i.e., combination of ethylene glycol, citric acid and sulfuric acid which acts as a catalyst) and we extracted cellulosic fiber from ground nut shell by kraft's process. By the combination of both mixtures, we make sheet this can be used as cartons, paper board and other paper material. It is also a project from the waste material (almond shell & hull, groundnut shells). This is going to be more effective and cost-efficient packaging material in future.

KEYWORDS: liquefying, almond, hull, shell, bio packaging, cost efficient, sheeting, cellulosic fiber

INTRODUCTION:

Packaging is a coordinated system made up of any different materials, to be used for preparing goods for containment, Protection, transport, handling, distribution, delivery and presentation. Several researchers and authors in the packaging field have been described and defined them in various methods. Robertson, Paine and Livingstone and Sparks emphasize are seven fundamental functions of packaging for the product has to be protection, containment, preservation, apportionment, unitization, convenience and communication of the product. The legal consequence of action initiatives taken by governments and authorities can impact the way actors relate to the packaging functions. Some of the copyright, intellectual properties, trademarks and patent the laws fall into the category of protecting packaging designs and technologies. Packaging logistics primarily brings together different packaging disciplines with logistics and supply chain management disciplines to complement and support each other. Logistically it is an application-oriented management discipline of the "flow of things". Biodegradable packaging is less harmful and easy degradable material. They can be degradable using microorganism. Biodegradable packaging is eco- friendly and environment affect free packaging. Biodegradable packaging can be done with agriculture waste, so that waste can be placed with packaging material. Almond shell and hull have the best barrier like wood it capable and flexible for making secondary packaging's composition is comparatively like wood. Almond shells helps in enhance the strength of plastic more and they are most conventional materials and are being tested as a plastic filler replacement in all sorts of plastic products and packaging because of these properties almond shell and hull are used as the packaging material in this project. Groundnut shells account for approximately 21% of the dried peanut pod by weight, means that is significant amount of shell residual left after groundnut process. Increasing of groundnut production leads to the accumulation of the groundnut shells which is not utilized, thus either burnt

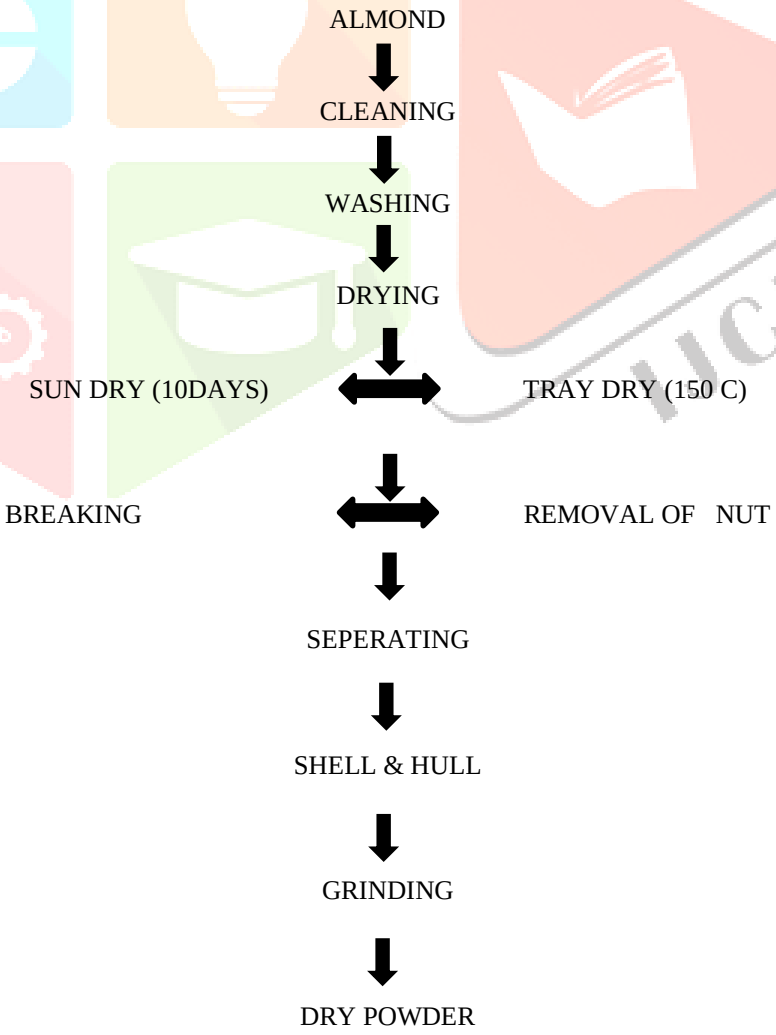
or buried. Groundnut shells contain of many functional compounds and composed of cellulose, hemicellulose and lignin, it is utilized as a binding agent for this packaging material. Corn starch is versatile, easily modified, and widely used in industry such as adhesives, in paper products, as an anti-sticking agent, and textile manufacturing. Corn starch used as an adhesive in pigmented coating for paper board and paper making. The main reason coating is done with corn starch is to enhance the appearance and printability of the paper, it is also been used in material Our main aim is to produce a biodegradable packaging material using bio waste. In order to avoid the wastage from nuts and plastic packaging material, we came up with the alternative way of bio packaging using almond waste (shell and hull) incorporated with cellulosic fiber from groundnut shell.

RESOURCE REQUIRED

1. AMOND SHELL
2. ALMOND HULL
3. GROUNDNT SHELL
4. ETHYLENE GLYCOL
5. SULPHURIC ACID
6. CITRIC ACID

MATERIALS AND METHODS

POWDER PREPARATION FLOW CHART



PROCESSING OF RAW MATERIAL

Raw materials were washed thoroughly to tap water to remove all the impurities and muddy particles. As ground nuts are obtained from ground, they may contain lot muddy substances on them. So, ground nut and almond must be washed completely in running water. After washing they are sun dried for 10 days to remove the moisture or the raw materials were tray dried at (150 C FOR 5DAYS). Once drying is completed almond shell and hull is separated by manual using hammer and the nut is separated likewise the ground nut shell is removed from the nut. After de-hulling and de-shelling of the nuts the shell and hull were grounded separately in the grinding mill and then the powder is sun dried to remove the excess moisture.

LIQUEFACTION PROCESS FLOW CHART

RAW MATERIAL (HULL & SHELL POWDER)

⬇

WEIGHING

⬇

ADDING LIQUEFYING REAGENT

⬇

ADDING CATALYST

⬇

MIXING

⬇

HEATING

⬇

STIRING

⬇

LIQUEFIED MIXTURE

LIQUEFACTION OF ALMOND SHELL & HULL

Liquefying reagent and catalyst were added to the container and heated. For liquefaction of almond residues, ethylene glycol (40:100) was used. Weighed raw material was then added into the flask, and mixed with the liquefying chemicals. Liquefaction was conducted with continuous stirring. After attaining the correct consistency, the heater was turned off, and the stirring should do until the mixture cooled down. The liquefied mixture was homogenous and was dark in colour and thick (viscous).

PREPARATION OF CELLOUSIC FIBER

The cellulosic fiber is prepared from ground nut shell. The cellulosic fiber is produced by chemical pulping using kraft's process. Groundnut Shells are taken and washed several times with water to remove dust and soil particles present on it. Later it is cut into long pieces. They are crushed and later dried at 80ºC for about 30 minutes to further reduce the moisture content. For fiber preparation chemicals must be taken in right proportions so that effective cooking would happen. The crushed shell is soaked in NAOH for 8 hours. At this tie the cellulose fibre in groundnut shell starts to separate. Next, It is heated to about 90˚C (boiling) for 4hr 30min with continuous stirring. The liquor is filtered thoroughly and the cellulosic fiber is kept aside for further process.



SHEETING PROCESS FLOW CHART

LIQUEFIED MIXTURE

⬇

WEIHING

⬇

ADDING CHEMICAL

⬇

HEATING

⬇

MIXING

⬇

LAYERING

⬇

DRYING

⬇

SHEET

PRODUCING SHEET FROM POLYOLS

Cross linking chemical is used to prepare the bio polyol sheet i.e cross-linking the polyol with the carboxylic acids and anhydrides to form a strong network. The weighed cross-linking chemicals were heated and mixed with stirring. The homogeneous mixture was molded into a container or coated onto a polished plate to form a uniform layer (2-3mm) and it is been dried in the method of sun dry for 24hrs the time can be differ based on the formulation and thickness of the sheets.



RESULT AND DISUSSION

COPONENTS	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4	TRIAL 5	TRIAL 6
ALMOND SHELL(g)	**30**	**80**	**70**	**50**	**60**	**60**
AMOND HULL (g)	**70**	**20**	**25**	**30**	**20**	**20**
CITRIC ACID (g)	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**	**2-3**
SULPHURIC ACID (%)	NA	**NA**	**NA**	**NA**	**5**	**5**
GROUND NUT SHELL (g)	**NA**	**NA**	**NA**	**20**	**15**	**15**
ETHYLENE GLYCOL (%)	30	40	30	30	30	40
CORN STARCH (g)	NA	NA	5	10	NA	5
RESULTS	BRITTLE SHEET	BRITTLE SHEET	CRACK SHEET	RUPUTURE SHEET	FLEXIBLE HEET	RIGID SHEET

As a result of six trials with different amount of sample we obtained six different sheets with different properties. The bio polyol source (almond hull and shell) on addition of liquefying agent and after formulation with citric acid (2-3g) it is sun dried for about 24 hrs. This results in two types of sheets. The sheets obtained are cracked and brittle in nature to obtain a flexible and stiff sheet ground nutshell pulp is added with almond shell and hull which gave strength, stiffness and flexibility to the sheets. Addition of groundnut shell pulp gives flexibility to sheet because it contains cellulosic fibers which act as a binding agent. The groundnut shell fibers possess gives good physical strength properties. It is composed of cellulose, hemicellulose and lignin. Tensile strength was also good and has a good water absorption capacity. Biodegradable sheets made of almond shell and hull with ground shell pulp as gave the result such as the sheet was found to slightly strong and good flexibility.

CONCLUTION

The preparation of biodegradable material plays vital role in upcoming year, this packaging material less harmful easy degradable consistence. It really believes that biodegradable packaging material will replace the sustainable packaging material at low cost producing environmentally and economically. In this project both almond hull & ground shell acts as best barrier character like wood .They both are converted into Nano particle, so that helps to easy preparation of packaging material . The project review that easy degradable with low cast material made from waste less expensive. Thus, the packaging material will acquire good stability. These Biodegradable sheets are strong, flexible, resistant to breakage and damage, and resistant to moisture and temperature changes because of its raw material composition, the largest application with the food industry.

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