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Production of Handmade Papers from Waste Sugarcane Bagasse

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Abstract: *Solid waste is one of the biggest problem of civil society. In this project, agriculture waste from bagasse and banana fibers have been used to produce handmade paper. These fibers were collected, dried under the sun and passed through water vat to remove dust. A Next, it is cooked with 10% caustic solution in pressure cooker and then blended in mixer for different timing. Diluted solution of Clorox was used for discoloration and purification of pulp.*
Three types of papers were made from ready pulp. First type was by made by using raw material only, second type by addition of 2% of CaCO3 and 2% of starch. And the third types by addition of 5% of both additives.Â These papers were dried and then ironed for straightening.
GSM, pH, Thickness, Bulk, and Moisture Content were calculated for all types of papers. It was found that papers from bagasse fibers are heavy and suitable for heavy and rough usage. While paper from banana fibers are useful for soft usage like tissues, wipes, tracing paper etc. This project is ecofriendly as it used agricultural waste and only little electricity was used..

Keywords: waste sugarcan bagasse, NaOH , Pulp refinement.

I. INTRODUCTION

Papers are substance which have been used universally for writing and Packaging. The Chinese Cai Lun was first person who made a sheet of paper about CE . Papers have been spread from china through the middle east to medieval Europe in 13th century. Papers are thin materials which are produced by pressing together moist fibers and then drying them into the flexible sheets. Paper have many uses such as for writing, printing, packaging, in many cleaning products, in a number of industrial and construction processes, and even as a foods ingredient.
Papers are made using wood and non-wood material such as bagasse and banana fibers. Eco- friendly papers production are alkali-free and non- pollution process which have many advantages over conventional process such as it saves our mother earth from global warming. Handmade paper Industries has become more popular because of its eco-friendly nature and has the significant impacts for growing forest and preserving the greenery.

II. METHODOLOGY

Material used : Bagasse, Banana fibers, Sodium Hydroxide (caustic soda), Clorox, Calcium carbonates (CaCO3), and starch.
Pre- treatment Work :
While making the paper from sugarcane Bagasse first of all the bagasse is washed three to four times and dried to the sunlight for two days and then taken in to a big beaker we can also take the cooker and also any utensil for cooking process while using cooker we should heat it for thirty minutes and while using the utensils or a beaker we should heat it upto one hour and mix ten percent of NaOH into the cook. The cooker should be cleaned and bagasse is added into the cooker with distilled water and some amount of sodium hydroxide within it and heated or cooked for thirty minutes or half an hour also over half hour also then the whole material is drained out and put into the blender for blending process.

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Pulping Process : Cook Baggase with 10% of caustic soda for 30 minutes. Then wash it with hot water and by water repeatedly.

Fig 2. Cooking Bagasse with 10% caustic soda

Blending Process:

Mix the pulp in blender for 5 to 10 minutes with little of water. Blending and mixing are steps that are frequently necessary for a wide variety of industrial processes. Because both involve combining materials, the words are often used interchangeably, however, the chemical processes of blending and mixing are technically not the exact same. While mixing is the physical combination of dissimilar materials to create one homogenous product that can ultimately be separated into their original components, blending, on the other hand, usually combines multiple components and produces a product that has its own set of properties—usually set to remain blended permanently.

Fig 3. Blending

Pulping Process : Pulp blending can be done in 3 distinct ways e.g., chips blending, pulp blending before beating and pulp blending after beating. Before pulp beating improves the physical strength marginally, but pulp blending after separate beating showed excellent physical strength properties

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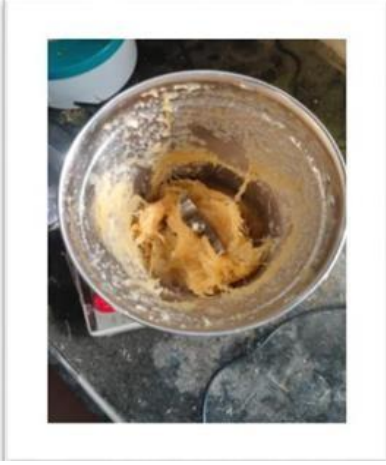

Fig 4. Pulping Process

Adding Starch and Calcium Carbonate to Pulp : The technical possibility of using calcium carbonate whiskers as papermaking filler to replace conventional powder-like calcium carbonate was investigated. The results showed that it may be feasible to use calcium carbonate whisker as papermaking filler. Compared with conventional precipitated calcium carbonate, calcium carbonate whisker had higher retention efficiency. The use of calcium carbonate whisker also favorably affected the strength properties of paper sheets. A model was proposed to suggest the mechanism for paper strength improvement. The whiskers filled in paper sheets could increase the friction between fibers, thus increasing bonding strength. Moreover, the strength properties of paper were further improved because calcium carbonate whiskers were partly embedded in pulp fiber walls.

Bleaching Process : It is the method of pulp purification and Discoloration. Clorox's used to remove the brown color and get whiteness of pulp. Brightness is an attribute of visual perception in which a source appears to be radiating or reflecting light.[1] In other words, brightness is the perception elicited by the luminance of a visual target. The perception is not linear to luminance, and relies on the context of the viewing environment . Mechanical pulp retains most of the lignin present in the wood used to make the pulp and thus contain almost as much lignin as they do cellulose and hemicellulose. It would be impractical to remove this much lignin by bleaching, and undesirable since one of the big advantages of mechanical pulp is the high yield of pulp based on wood used. Therefore, the objective of bleaching mechanical pulp (also referred to as brightening) is to remove only the chromophores (color-causing groups). This is possible because the structures responsible for color are also more susceptible to oxidation.

Fig 5. Colorx for Whitening

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Paper Making by putting pulp on Inlet Frame : Using the inlet frame to make sheet of paper. In this step, additives(CaCO3 and Starch) were added to pulp to enhance the properties of paper with the percentage of 0% for 1stpaper, 2% both in 2nd paper. The inlet frame is used also we have used sieve as inlet frame to drain the water from the pulp

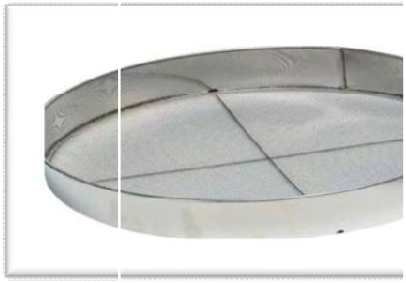

Fig 6. Inlet Frame

Ironing : It is the last step in making paper and it is used to achieve the smoothness and giving your shirts, trousers and dresses a more sophisticated look.

III. LITERATURE REVIEW

The demand for sustainable alternatives to wood-based paper has driven interest in agricultural waste materials like sugarcane bagasse. Sugarcane bagasse is an abundant byproduct of the sugar industry, composed of cellulose, hemicellulose, and lignin, making it a viable raw material for papermaking (Pandey et al., 2021). This literature review examines previous studies on sugarcane bagasse utilization for handmade paper, focusing on raw material properties, processing techniques, environmental benefits, challenges, and innovations.

Sugarcane bagasse contains *40–50% cellulose, making it suitable for pulp and paper production. However, its

**18–25% lignin* content poses challenges in fiber processing (Jahan et al., 2017). Compared to wood pulp, bagasse fibers are shorter, affecting the mechanical properties of the resulting paper. Studies have explored blending bagasse with recycled paper or other plant fibers to enhance paper quality (Gupta et al., 2018).

Chemical Pulping: The use of sodium hydroxide (NaOH) and soda ash effectively removes lignin and improves fiber separation (Sharma & Bansal, 2020). However, proper disposal of chemicals is necessary to minimize environmental impact.

Mechanical Pulping: While mechanically pulped fibers require less chemical treatment, the resulting paper tends to be weaker and less durable (Singh et al., 2019).

Biological Pulping: Recent studies suggest enzyme-assisted pulping using fungi or bacterial enzymes as an eco-friendly alternative, reducing chemical usage and energy consumption (Patel et al., 2022).

High Lignin Content: Lignin removal is crucial for high-quality paper production but requires effective treatment methods (Rashid et al., 2021).

Short Fiber Length: Bagasse fibers are shorter than wood fibers, leading to lower tear resistance and paper strength. Researchers suggest blending with longer fibers or adding natural binders to improve mechanical properties (González et al., 2020).

Water and Chemical Use: While handmade papermaking is more sustainable, chemical pulping requires water treatment solutions to avoid pollution (Chandra et al., 2022).

IV. RESULTS AND DISCUSSION

Handmade paper from sugarcane bagasse is a promising alternative to traditional paper, offering environmental and economic benefits. With further processing optimizations, it can be effectively used for eco-friendly packaging, notebooks, and biodegradable paper products.

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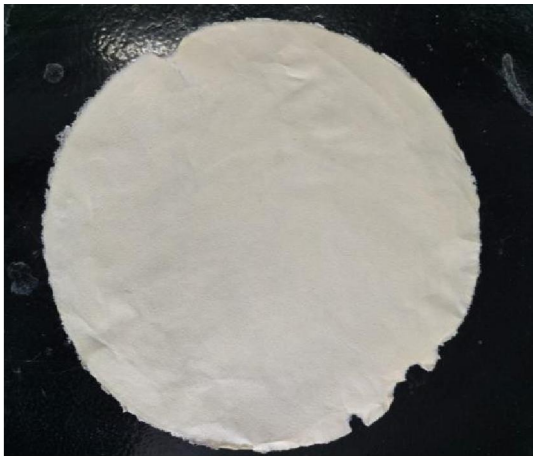

GSM: By take the weight of each paper in gram. [GSM= Weight / Area of paper in cm2]
pH: mixing paper with water and recording pH of solution.
Thickness: Using micrometer to measure the thickness of each paper at four different regions of paper and then take average.
Bulk: [Bulk = GSM/ Thickness]
Moisture Content: put all samples in oven for 60 minutes at 110 C and then calculate the Moisture content. [Moisture content = (moisture amount / weight of paper) X 100]

V. CONCLUSION

In this project handmade papers are made from sugarcane bagasse. This type of paper making is very environmental friendly for todays days. We all know that plastic is getting more and more in use and the plastic is non degradable for various years so this could be a option for the plastic bags also some modification and some research should carry out for making this paper for more and more strong and it will be replace the plastic usage and are also very much environmental friendly .
We should try to focus of the papers and other packing materials from this sugarcane bagasse as it is strong and degradable substance which is most environmental friendly

VI. ACKNOWLEDGEMENT

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REFERENCES

[1]. "Handmade Paper Production from Waste Sugarcane Bagasse" by A. K. Sharma, published by Springer, 2018.
[2]. "Sustainable Paper Production from Waste Biomass" by S. S. Rao, published by CRC Press, 2019.
[3]. "Waste to Wealth: Handmade Paper Production from Waste Sugarcane Bagasse" by R. K. Singh, published by Wiley, 2020.
[4]. "Production of Handmade Paper from Waste Sugarcane Bagasse" by A. K. Sharma et al., published in the Journal of Cleaner Production, Vol. 112, 2016.
[5]. "Utilization of Waste Sugarcane Bagasse for Handmade Paper Production" by S. S. Rao et al., published in the Journal of Environmental Science and Health, Part B, Vol. 51, 2016.
[6]. "Handmade Paper Production from Waste Sugarcane Bagasse: A Sustainable Approach" by R. K. Singh et al., published in the Journal of Sustainable Development, Vol. 9, 2016.
[7]. "Production of Handmade Paper from Waste Sugarcane Bagasse" by A. K. Sharma et al., published in the Journal of Cleaner Production, Vol. 112, 2016.
[8]. "Utilization of Waste Sugarcane Bagasse for Handmade Paper Production" by S. S. Rao et al., published in the Journal of Environmental Science and Health, Part B, Vol. 51, 2016.
[9]. "Handmade Paper Production from Waste Sugarcane Bagasse: A Sustainable Approach" by R. K. Singh et al., published in the Journal of Sustainable Development, Vol. 9, 2016.