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PRODUCTION OF ECO-FRIENDLY RECYCLED HANDMADE PAPER INLAID WITH LEAVES OF PELTOPHORUM PTEROCARPUM, PETALS OF ROSE, BOUGAINVILLEA AND BEET ROOT JUICE

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ABSTRACT:

The trees are generally cut for the fulfilment of paper requirement of the whole world. The paper industry which is the third largest industry is highly responsible for the air & water pollution. Keeping this in mind we made an attempt to produce eco-friendly handmade paper inlaid with leaves of peltophorum pterocarpum, petals of rose, bougainvillea and beet root juice.

The simple procedure is adopted for the preparation of our handmade paper. We collected the waste papers and soaked them in water. The paper pulp was prepared by grinding, which was followed by the addition of leaves of peltophorum pterocarpum, petals of rose, bougainvillea and beet root juice to increase its aesthetic value. This grinded pulp is then subjected to filtration, rolling and drying process which resulted into the formation of handmade paper.

Our handmade paper can be used for painting, preparing greeting cards & calligraphy.

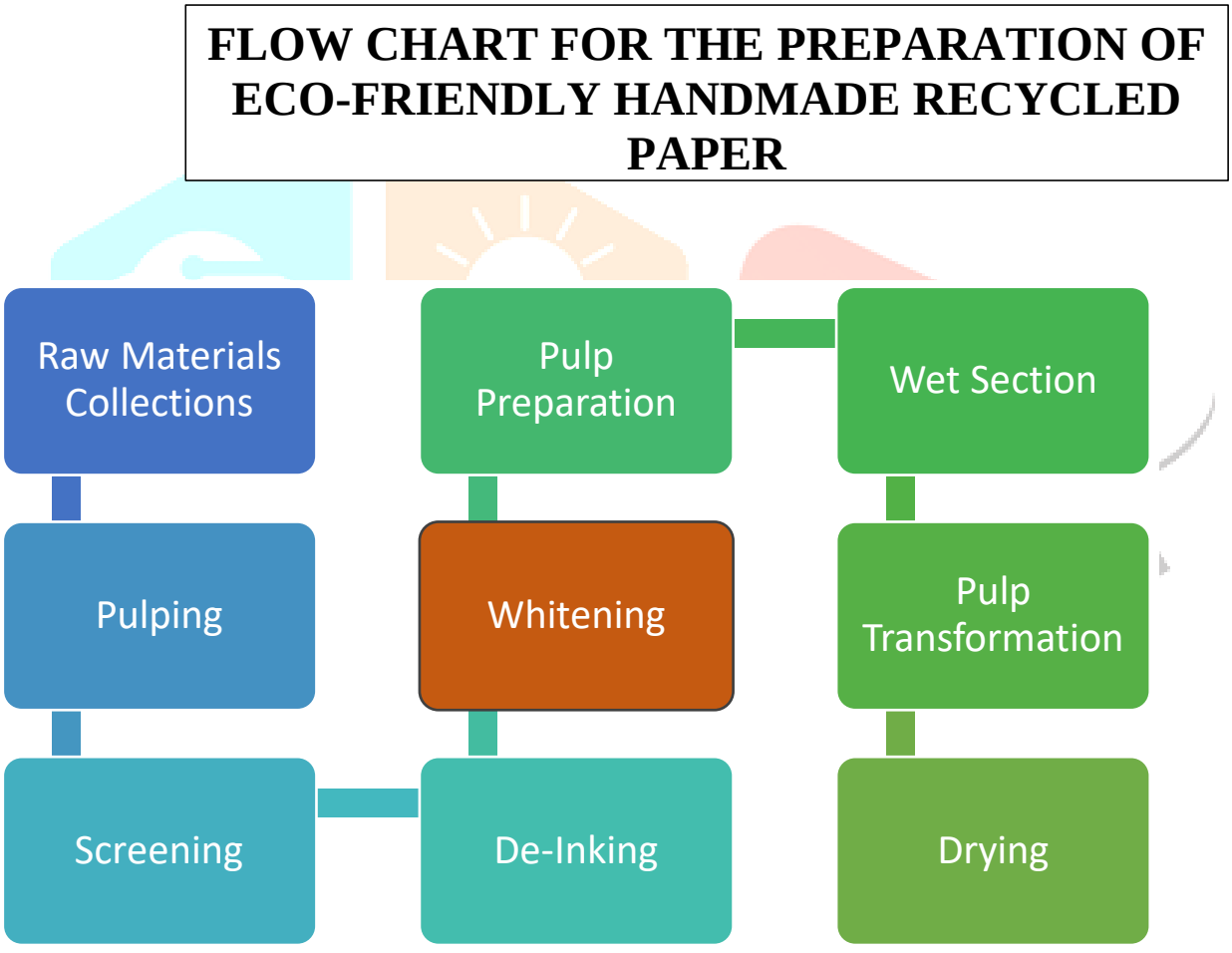
KEYWORDS: waste paper, grinding, pulp preparation, filtration, rolling, drying.

1. INTRODUCTION:

- Paper recycling pertains to the processes of reprocessing waste paper for reuse. Waste papers are either obtained from paper scraps, discarded paper materials, and after consumer use. Examples of the commonly known papers recycled are old books, records, newspapers and magazines. [1] Making paper by hand at home or college can be a pretty simple process. It's also a fantastic way to use up our old books, newspapers, records that we were about to throw in the recycling bin. Instead we can create things of glorious handmade beauty from waste papers. [2] Paper recycling has several benefits both for humans and the earth. Using recycled paper to make new paper reduces the number of trees that are cut down, conserving the natural resources. [3] When it comes to paper communication, recycled paper is the greenest option, it uses less energy, water, and produces lower carbon emissions than the manufacturing of non-recycled paper and at the same time reduces the amount of waste to landfill, as paper can be recycled 4 to 5 times. [4] A report by the

US Environmental Protection Agency states that paper mills are among the worst polluters of any industry in the US.

Recycling causes 35 per cent less water pollution and 74 per cent less air pollution than making new paper. Using paper made from recycled fiber can also benefit companies' bottom lines. In addition to reducing the amount of waste sent to landfills, recycling paper also cuts the production of landfill methane from decomposing waste, a major contributor to climate change. [5] Typically, if we didn't recycle, those papers would merely pile up. Worse, they'll fill up the garbage around and can constitute a nuisance to our environment. For instance, it emits toxic gases such as methane and carbon dioxide, which reduces the quantity of air. The Paper recycling activity can start at school, college, home, office, local community and even at drop off centers. We all need to understand what products can be recycled before staring the recycling process and how to properly prepare them for recycling. A large quantity of paper pulp is produced every year across the globe, as a green initiate. [6]



2. MATERIALS AND METHODS:

- **RAW MATERIALS: -** The main raw material used to manufacture recycled paper is waste papers. We used post-consumer waste papers which means it has been used by the customer for its final use **(Fig.1, 2)**.

It takes approximately 500g of waste papers to produce 375g to produce the equivalent papers.

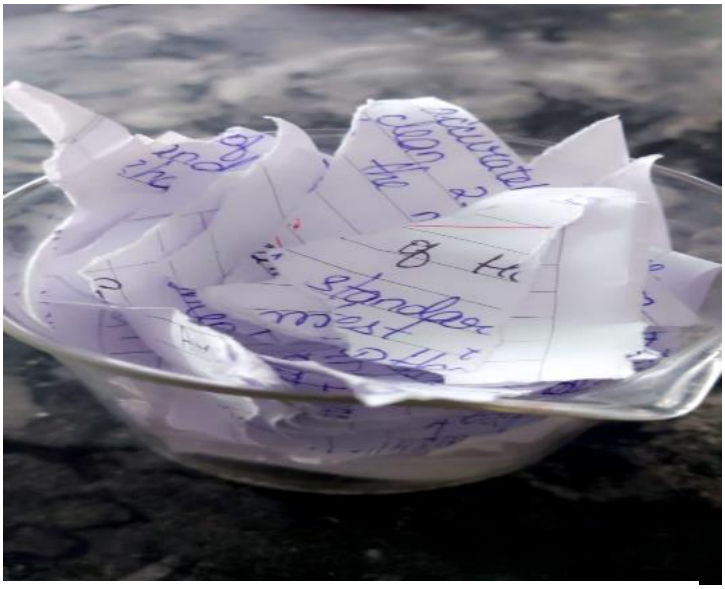


Fig 1. WASTE PAPERS

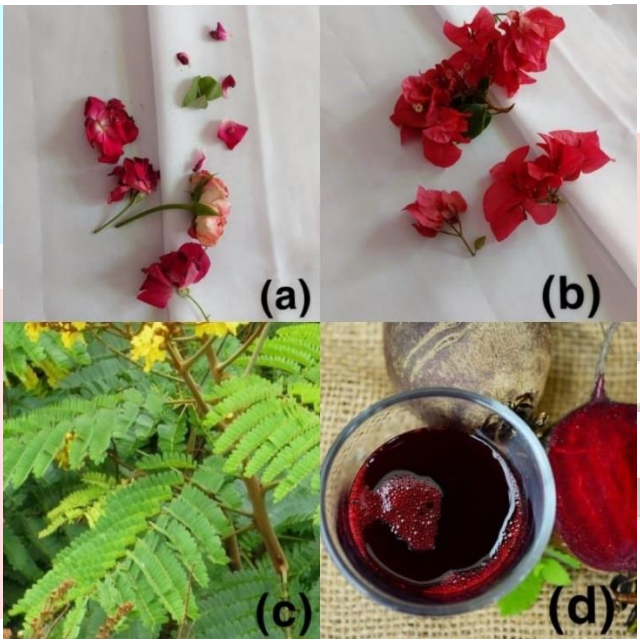


Fig 2 (a) PETALS OF ROSE, (b) BOUGAINVILLEA, (c) LEAVES OF PELTOPHORUM PTEROCARPUM, (d) BEET ROOT JUICE

- **PULPING: -** Sorted waste papers is dispersed in water in the pulped to separate fibers, ink and other components **(Fig 3)**.

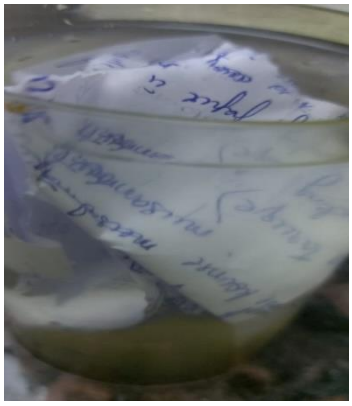


Fig 3. PULPING

- **SCREENING:-** Cyclonic purification allows for complete elimination of all contaminants and non-fibrous materials such as :
  - Plastics.
  - Staples.
  - Dirt's.

  In addition, 99% of ink and glue is removed from the pulp during this process.

- **DE-INKING:-** Ink is removed from the pulp mix through flotation.

- **WHITENING: -** Our recycled pulp is produced without the use of chlorine; a process chlorine free (PCF) method. The whitening process uses bio degradable cleaners. Color is removed from the fibers using sodium hydrosulphate. Hydrogen peroxide is used to brighten the fibers and when disposed of it breaks down into water and oxygen.

- **PULP PREPARATION: -** To prepare a basic pulp. We have placed a handful or two of soaked paper and about 2 cups of water in a blender. Put on the lid and blend the paper pulp for 15-30 seconds, until the pulp has a texture something like oatmeal **(Fig 4)**. The color of the pulp is found to be grayish **(Fig 5)**. Few drops of beet root juice is added to the soaked paper pulp for an interesting fibrous color pigmentation to handmade paper **(Fig 6)**.

Fig 4. BLENDING

Fig 5. RECYCLED PAPER PULP

Fig 6. POUR THE COLOUR PIGMENTATION (BEET ROOT JUICE)

- **WET SECTION: -** The pulp mix is poured from the tub onto a wooden embroidery hoop ring attached with the muslin cloth for filtration **(Fig 7)**. To give paper a nice texture and an aesthetic, the leaves of peltophorum pterocarpum, petals of rose and bougainvillea are sprinkled onto the pulp **(Fig 8)**. The water from the water pulp is drained to form the paper sheet **(Fig 9)**.

Fig 7. SETUP THE WOODEN HOOP RING

Fig 8. CUSTOMISE THE PULP

Fig 9. LIFTING PAPER PULP

- **PREPARATION OF HANDMADE PAPER FROM PULP**: - As the water drains, the pulp becomes a wet paper base. Starting from the middle and working out of the edges, we have rolled the pulp firmly to flatten the paper and drain out more of the water **(Fig 10)**. We have transferred the pulp to the wooden embroidery hoop ring, with the help of muslin cloth **(Fig 11)**.

Fig 10. ROLLING THE PAPER PULP

Fig 11. COUCHING

- **DRYING: -** With one hand at each end, we have picked up the wooden embroidery hoop ring frame holding the piece of finished paper and set it in an airy spot under the sunlight **(Fig 12, 13)**. After a day, we have recovered the eco-friendly recycled handmade paper sheet from the muslin cloth.


Fig 12 & 13. WET PAPER PULP BASE FOR DRYING

3. RESULTS AND DISCUSSIONS:-

The present works carried out, the simple recycling procedure for the preparation of eco-friendly handmade papers inlaid with the leaves of pletoporum pterocrapum, petals of rose, bougainvillea and beet root juice.(**Figure 14, 15**). Our handmade papers can be used for the purpose of notecards, invitations, scrapbooking, calligraphy etc. As the extension of this work we have used our own eco-friendly handmade papers for calligraphy and invitation. (**Figure 16, 17).** We hope this recycling technique which is also energy efficient and will prove to be a gift to nature when it comes to eco-friendliness. No trees are cut, no energy is wasted and only natural materials are used. Therefore handmade paper reduces pollution, saves natural resources, and contributes to a much healthier and more sustainable ecosystem. Even the drying process uses solar energy, so no energy is wasted. Handmade paper is easily the most eco-friendly kind of paper available. Handmade paper has greater tensile, bursting, tearing and double-fold strength compared to conventional paper. The natural bonding properties of raw materials used are higher. The process used to make the paper gives it certain qualities. These include the strength of the paper (how easily it tears), the grain of the paper (whether there is a direction in which the paper naturally wants to fold) and deckle edges (compared to machine cut edges).Recycling paper reduces the demand for trees and so fewer will be planted.


Fig 14 & 15. HANDMADE RECYCLED PAPER INLAID WITH LEAVES OF PELTOPHORUM PTEROCARPUM PETALS OF ROSE AND BOUGAINVILLEA AND BEET ROOT JUICE.

Fig 16 & 17. OUR OWN ECO FRIENDLY RECYCLED HANDMADE PAPER FOR CALLIGRAPHY AND INVITATION/GIFT CARDS.

4. CONCLUSIONS: -

- This study can be contribute to the global environment and national economy by producing the eco-friendly recycled handmade papers.
- Recycling is a process to change materials (waste) into new products to prevent waste of potentially useful materials, reduce air pollution and water pollution by reducing the need for "conventional" waste disposal and lower greenhouse gas emissions as compared to plastic production.
- When considering all of the economic and environmental impacts, the choice on whether or not to recycle truly does depend on an organization's and dedication to preserving the earth we live on.
- In the end, it is right to recycle because of the environmental impact or the savings we will reap, paper recycling needs to be priority in the coming years as prices inflate, landfills fill up and our stockpile of resources deplete.
- **REDUCE, REUSE, RECYCLED.**

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