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A Study on Properties, Characteristics and Applications of Mangifera Indica Fibre

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ABSTRACT:
This study explores the feasibility and potential benefits of utilizing mango fruit waste to produce natural fibre. The idea of investigates various extraction methods, processing techniques, and potential applications of mango fibre. Through experimentation and analysis, this idea aims to develop a sustainable and eco-friendly process for extracting mango fibre, contributing to waste reduction and the development of renewable resources. Mango fibre is known for its high tensile strength, biodegradability, and renewable nature, making it an environmentally friendly alternative to synthetic fibres. Additionally, mango fibre contains beneficial compounds such as antioxidants and dietary fibre, which may have health-promoting effects. Overall, features and properties of mango fibre suggests promising potential for both industrial and nutritional application.

Keywords: Mango fibre, Biodegradability, sustainable, nutritional application.

INTRODUCTION:

Mango fibre, also known as mango peel fibre or mango residue fibre, is a natural fibre extracted from the peel or residue of mango fruits. The scientific name of mango firer is Mangifera Indica. It is gaining attention for its potential applications in various industries such as textiles, papermaking, and bio composite materials. The global demand for sustainable and eco-friendly materials has spurred interest in exploring alternative fibres for papermaking. Mango fibre, derived from mango peels or residue, presents a promising solution due to its abundance,

(fig1: Dried mango seed)

It discussing the current challenges associated with traditional papermaking processes, including the depletion of natural resources, energy consumption, and environmental pollution. It will then highlight the

sustainable attributes of mango fibre, emphasizing its renewable nature and minimal environmental impact. Furthermore, I will delve into the extraction methods for obtaining mango fibre, including mechanical and chemical processes, with a focus on optimizing efficiency and fibre quality.

The properties of mango firer, such as its tensile strength, absorbency, and compatibility with papermaking additives, will be explored to assess its suitability for paper production. It aims and experimental findings regarding the incorporation of mango fibre into papermaking formulations will be presented, showcasing its potential to enhance paper strength, reduce production costs, and contribute to the development of eco-friendly paper products.

Moreover, it will address the economic and environmental implications of integrating mango fibre into the paper industry supply chain, including its impact on waste management, resource conservation,

(fig2: completely Dried mango seed)

PHYSICAL PROPERTIES:

1. **Colour:** Mango fibre can vary in colour, ranging from pale yellow to brownish, depending on factors such as ripeness, processing method, and any treatments applied.
2. **Texture:** Mango fibre typically has a fibrous texture, with strands that can vary in length and thickness. It may feel slightly coarse or rough to the touch.
3. **Strength:** Mango fibre is known for its strength and durability, making it suitable for various applications such as textiles, where it can be used to reinforce fabrics or provide added strength to composite materials.
4. **Flexibility**: Mango fibre exhibits a degree of flexibility, allowing it to be woven or blended with other materials to create fabrics or composites with desired properties
5. **Moisture Absorption:** Mango fibre has ability to absorb moisture, which can affect its texture and properties. Proper drying and storage methods are important to maintain the quality of mango fibre and prevent degradation.
6. **Biodegradability:** Mango fibre is biodegradable, meaning it can break down naturally over time without causing harm to the environment. This makes it an environmentally friendly alternative to synthetic fibres.
7. **Density:** The density of mango fibre can vary depending on factors such as processing method and moisture content. Generally, it has a moderate density, which can contribute to its strength and durability.

CHEMICAL PROPERTIES OF MANGO FIBER:

1. **Cellulose Content**: Mango fibre is primarily composed of cellulose, a polysaccharide that provides strength and structural support to plant cells. The cellulose content of mango fibre contributes to its strength and durability, making it suitable for various applications.
2. **Hemicellulose Content**: Mango fibre also contains hemicellulose, another type of polysaccharide that contributes to the overall composition and properties of the fibre. Hemicellulose can vary in composition and structure, affecting the characteristics of mango fibre such as flexibility and moisture absorption.
3. **Lignin Content:** Lignin is a complex polymer found in plant cell walls that provides rigidity and waterproofing. Mango fibre may contain varying amounts of lignin, which can influence its colour, texture, and resistance to degradation.
4. **Pectin Content**: Pectin is a complex carbohydrate found in the cell walls of fruits, including mangoes. Mango fibre may contain residual pectin, which can affect its ability to absorb water and form gels under certain conditions.
5. **Protein Content:** Mango fibre may contain small amounts of proteins, which can contribute to its nutritional value and functional properties. Proteins in mango fibre may interact with other components to influence its texture, stability, and digestibility.
6. **Ash Content**: Mango fibre may contain mineral residues or ash, which are left behind after the organic matter has been burned off. The ash content of mango fibre can vary depending on factors such as soil composition and processing methods.

Understanding the chemical properties of mango fibre is important for evaluating its suitability for various applications, such as food, textiles, and bio composites. Analysing these properties can help determine the fibre's strength, stability, and compatibility with other materials.

METHODOLOGY:

Harvest Ripe Mangoes

⇩

Wash and Peel Mangoes

⇩

Remove Pulp and Seeds

⇩

Dry Mango Seeds

⇩

Brushing The Seeds

⇩

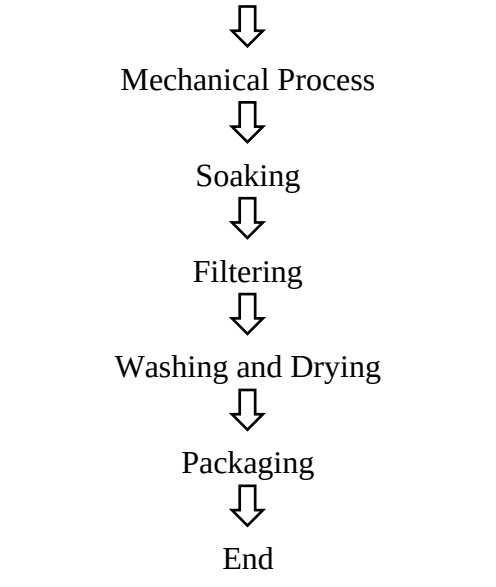
Comb The Hair of The Seed

⇩

Separate Fiber Hair from The Seed

⇩

Extraction Method



(Flowchart of mango fibre extraction)

A. Extracting mango fiber involves several steps:

1. **Collection of Mango Peel or Residue**: Start by collecting mango peels or residue from mango processing units or from leftover fruits.
2. **Cleaning and Washing**: Wash the collected mango peels or residue thoroughly to remove any dirt or contaminants.
3. **Peeling and Cutting**: If using mango peels, peel off the outer skin and cut the inner flesh into smaller pieces. This step may not be necessary if using mango residue.
4. **Soaking:** Soak the mango peels or residue in water for Period of time to soften them. This helps in separating the fibre from the rest of the material.
5. **Mechanical Extraction**: After soaking, the softened mango peels or residue are processed through mechanical extraction methods such as grinding, crushing, or pressing. This helps in separating the fibre from the pulp.
6. **Sieving or Filtering**: Pass the mixture through a sieve or filter to separate the mango fibre from any remaining pulp or solids. This may require multiple passes or different mesh sizes depending on the desired fibre quality.
7. **Washing and Drying**: Wash the extracted mango fibre to remove any remaining impurities or residues. Then, spread it out to dry either under the sun or using mechanical drying methods.
8. **Packaging:** Once dried, the mango fibre is ready for packaging and storage. It can be stored in a dry, cool place until further processing or utilization.

These steps may vary slightly depending on the specific extraction method and intended use of the mango fibre. Additionally, industrial-scale extraction may involve more specialized equipment and processes.

(fig3: overall combing wet mango seed hair)

B. Fiber Refinement:

1. **Sieving or Filtering**: After extraction, the mango fibre mixture may undergo sieving or filtering to separate the fibre from any remaining pulp or solids. This helps in obtaining a more uniform and purified fibre product.
2. **Washing and Drying:** The extracted mango fibre is typically washed to remove impurities and then dried to reduce moisture content. Proper drying is essential to prevent mould growth and ensure the stability of the fibre

C. Application-Specific Processing:

1. **Textile Industry**: Mango fibre intended for textile applications may undergo additional processing steps such as spinning, weaving, or knitting to produce yarns or fabrics. Surface treatments or dyeing processes may also be applied to enhance the performance or aesthetics of the textile materials.
2. **Papermaking**: Mango fibre can be incorporated into papermaking formulations either as a primary fibre source or as a paper additive. The fibre may undergo refining or blending with other fibres to achieve desired paper properties such as strength, absorbency, and printability.
3. **Composite Materials**: Mango fibre can be combined with polymers or other natural fibres to produce composite materials with enhanced mechanical or thermal properties. Processing techniques such as compression moulding, extrusion, or injection moulding may be employed depending on the desired product form and application.

D. Quality Control and Testing:

1. **Quality Control:** Quality assurance measures should be implemented throughout the mango fibre processing chain to ensure consistency and purity of the final product. This may include regular sampling, testing, and adherence to industry standards and specifications.
2. **Performance Evaluation**: The performance of mango fibre-based materials should be evaluated through standardized testing methods to assess properties such as strength, durability, moisture resistance, and biodegradability. This helps in validating the suitability of mango fibre for its intended applications and identifying areas for optimization or improvement.

Keywords: Extracting, Fiber reinforcement, composite materials, Quality control, Quality testing, textile industry, paper making.

(fig4: combed dried hair fibres)

DISCUSSION:

Mango fibre exhibits good tensile strength, making it suitable for applications where durability and resilience are required. Mango fibre is biodegradable, meaning it can naturally decompose over time, reducing environmental impact and waste accumulation.

Mango fibre is derived from mango peels or residue, which are by-products of mango processing. This makes it a renewable and sustainable resource.

Despite its strength, mango fibre is lightweight, making it suitable for applications where weight is a concern, such as in textiles or composite materials. Mango fibre has natural absorbent properties, making it suitable for applications requiring moisture management, such as in textiles or paper product.

Mango peels, from which the fibre is extracted, contain antioxidants such as polyphenols and carotenoids, which may offer health benefits when incorporated into products made from mango fibre.

Mango fibre can be used in a variety of applications, including textiles, papermaking, bio composite materials, and food products, showcasing its versatility and potential across industries.

CONCLUSION:

Mango fibre offers a sustainable and eco-friendly alternative to synthetic fibres, with properties that make it suitable for various applications. Its biodegradability, renewability, and beneficial properties make it a promising material for contributing to sustainable development and environmental conservation efforts. Mango fibre holds significant promise as a renewable and versatile material with diverse applications across industries. The utilization of mango fibre in papermaking represents a sustainable approach towards environmental conservation and circular economy principles.

By harnessing this abundant agricultural by-product, the paper industry can mitigate its ecological footprint while diversifying its raw material sources. This paper presentation aims to inspire further research and innovation in the field of sustainable materials and contribute to the adoption of mango fibre as a viable alternative in the papermaking industry.

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