



# DEVELOPMENT OF BIODEGRADABLE PRODUCT USING NATURAL FIBER

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## 1. ABSTRACT:

One species of flowering plant in the spurge family (Euphorbiaceae) is castor (*Ricinus communis L.*). It started in east Africa and then moved throughout the world's warm temperate, subtropical, and tropical regions. Castor oil is a raw ingredient in this basket. Herbal medicine has grown at an exponential rate in the last few decades. It is applicable to fields such as decorative, industrial, medical, and agriculture. The area of ecological planting technology includes the current invention. It takes medicinal plants to keep people healthy. There are over 7,500 species and 300 genera in the large family Euphorbiaceae. Those are usually the plants that flower. *Ricinus communis* is the plant that is most valuable to preserve for use in traditional medicine.

Key words: *Ricinus communis*, basket, and diversified uses.

## 2. INTRODUCTION:

All around the world, *Ricinus communis*, a tropical plant generally known as castor bean, grows. Native to India, the plant is grown in waste places, untamed areas, and gardens in addition to fields. The small, woody *Ricinus communis* tree can reach a height of six meters. South Africa, Brazil, India, and Russia are the places where it is found. Stems of *Ricinus communis* have antiprotozoal, antitubercular, and anti-diabetic qualities. Both *Ricinus communis* and its name are Latin. Generally referred to as the "castor plant," this small tree with soft wood thrives in a variety of locations. Thirty different nations grow castor. It is true that without nature, human existence is impossible. The three necessities of humans are clothes, food, and shelter. One fundamental need that the world of plants provides for is health. There are several biological resources in the kingdom of plants, including those that have been employed in the healthcare industry. *Ricinus communis* is one of the many natural crude medicines with a broad range of therapeutic applications in traditional medicine. Another benefit of castor is that it resists termites. However, its usage as animal feed is restricted due to the allergen ricin. Gujarat holds a dominant position in the Indian castor

bean industry, accounting for over 82% of the nation's total production and enjoying a monopoly on the global market. Conventional breeding is limited by time, space, and the need to preserve genetic integrity.

### 3. OBJECTIVES

- To reduce the usage of plastic -free packaging.
- To reduce the wastage of wood materials.
- To reduce the land and air pollution by using castor plant.
- To enrich the usage of natural materials for packaging.

### 4. FIBER SELECTION:

"Castor plant fiber" is the term used to describe the fibrous material obtained from the castor plant (*Ricinus communis*). Castor plant fiber is not as well-known or utilized as fibers derived from other plants, such as cotton or flax. Nonetheless, certain plant parts, including the stalks or stems, may be picked for the castor plant's fiber, which is then utilized in a variety of industries.

Definition: *Ricinus communis* fiber is obtained from the stems and stalks of various castor plant sections. Numerous industrial and commercial applications exist for this natural fiber, including the production of textiles, cords, and potentially environmentally friendly goods that are biodegradable.



Fig.1 *Ricinus communis*



Fig.2 *Ricinus communis* stem

#### 4.1 SELECTION OF FINISHING (EXTRACT APPLICATION)

Plant stem fibers may be recovered from non-fibrous material and given new life in the textile industry by using the retting method. *Ricinus communis* stems can also be sliced again to remove the fibers. An overview of the retting procedure for castor plant stems is provided below:

**Gathering:** Harvesting the castor plant's mature stems is the first stage. Frequently, these stems are clipped near the ground to get as much fiber as possible.

**Drying:** To lower moisture content and increase brittleness, harvested stems are left to dry in the shade for a certain amount of time. The length of this period may change based on local customs and weather patterns.

**Bundling:** The stems are typically wrapped into little groupings once they have dried. The stems are easy to handle and move to the retting location thanks to this bundling.

**Immersion:** In a pond, river, or other body of water, the wrapped stems are submerged in water. There are two popular approaches to retting:

**a. Water Retting:** This technique involves completely immersing the stems in water, allowing naturally occurring aquatic microbes, including fungus and bacteria, to decompose the non-fibrous components. Several days to a few weeks may pass during this procedure, depending on the surroundings.

**b. Dew Retting:** In dew retting, the bundled stems are spread on the ground or in fields, and they are left exposed to dew and moisture from the environment. This process can take a longer time, often a few weeks to several months, as it relies on ambient humidity and microbial activity.

**Monitoring:** During the retting process, it is crucial to monitor the condition of the stems regularly. Over-retting can weaken the fibers, while under-retting may leave non-fibrous material attached to the fibers.

**Separation:** Once the retting is complete, the stems are removed from the water or the field. The non-fibrous material, which has now softened due to the microbial action, can be separated more easily from the fibers. This can be done manually or with the help of simple tools or machines.

**Drying:** The extracted fibers are spread out to dry in the sun following separation. Drying aids in removing any last traces of moisture and gets the fibers ready for additional processing.

**Fiber Processing:** Additional processing may be done on the dried castor plant fibers to create ropes, textiles, and other goods. Depending on the intended usage, carding, spinning, and weaving may be required.

The oil-solvent mixture's separation.

The solvent is evaporated to produce pure castor oil.

#### 4.2 RETTING PROCESS:

Retting is a process used to separate the fibers from the non-fibrous material in plant stems, making them suitable for various applications like textile production. The retting process for *Ricinus communis* can vary depending on the specific method used, and there are primarily two methods: water retting and dew retting.

##### **Water Retting:**

- a. **Harvesting:** Castor plant stems are harvested when they are mature, typically cutting them close to the ground to maximize the fiber content.
- b. **Bundling:** After harvesting, the stems are bundled together in manageable groups to facilitate handling and transportation to the retting site.
- c. **Submersion:** The bundled stems are fully submerged in a water source, such as a pond, river, or tank. This submersion allows natural waterborne microorganisms, like bacteria and fungi, to break down the non-fibrous tissues.
- d. **Retting Duration:** The retting process in water typically takes several days to a few weeks, depending on environmental conditions. It's essential to monitor the progress of retting to avoid over-retting or under-retting.
- e. **Separation:** After retting, the stems are removed from the water, and the non-fibrous material that has softened due to microbial activity can be separated from the fibers. This can be done manually or with simple tools.

f. Drying: The extracted fibers are then laid out to dry in the shade, which helps remove any remaining moisture and prepares the fibers for further processing.



Fig.3 Soaking stem

### 4.3 PRODUCT DEVELOPMENT AND DESIGN

The process of developing goods using coiled or wrapped components is known as coiling product design and development. To accomplish a variety of tasks, coiling usually entails wrapping flexible materials into a circle or spiral shape, such as wires, cables, springs, or other materials. While coiling product design and development are quite comparable to regular product development, there are certain particular factors to take into account. The procedure for developing coiling products may look like this:

**Idea Generation:** Just like in any other product development process, it starts with generating ideas for products that involve coiling. These ideas might be driven by the need for efficient energy transfer (as in transformers and inductors), mechanical spring applications, cables, or any other coiled components.

**Market Research:** Understand the specific market demands and applications for coiling products. This includes identifying potential industries or sectors where coiling is needed and the unique challenges or opportunities within those sectors.

**Concept Development:** Develop initial concepts for the coiled product. This may involve designing different types of coils, considering materials, and understanding the potential benefits of the coiling design for a given application.

**Feasibility Analysis:** Evaluate the technical feasibility of coiling the product, including considerations for materials, manufacturing processes, and the performance of the coiled component.

**Design and Prototyping:** Create exact designs for the coiled product, taking into account details like form, size, winding patterns, and composition of the material. Make prototypes so you can test and validate the design.

**Testing and Validation:** Test the coiled component to ensure it meets design specifications and operates as intended. This might involve mechanical testing, electrical testing (for electronics coils), or suitable assessments.

**Iterative Development:** Design changes are performed in reaction to test results, following other techniques of product development, to achieve the necessary levels of performance, robustness, and safety.

**Manufacturing and Production Planning:** Develop a plan for manufacturing the coiled components. This includes determining the most efficient winding methods, quality control processes, and sourcing of materials.

**Quality Control and Standards:** Ensure that the coiled components meet industry standards and any necessary certifications for safety and performance.

**Marketing and Branding:** Create a marketing strategy and branding for the coiled product, emphasizing its unique features and applications.

### COILING METHOD



Fig.4. Step-1



Fig.4.1. Step-2



Fig.4.2. Step-3

### 4.4.PROCESS OF MAKING BASKET:



Fig.5 Stem



Fig.5.1 Peeling



Fig.5.2 Retting



Fig.5.3 Drying



Fig.5.4 Coiling weaving



Fig.5.5 Box

### 5.RESULT AND DISCUSSION

#### 5.1 Determining the Tensile Strength of Plant Fibers

□ The tensile strength of a fiber refers to the maximum load it can carry before breaking.

#### Method:

- □ The fiber should be attached to a clamp stand
- □ Attach a weight on the other end of the plant fiber
- □ Carefully continue to add one weight at a time until the fiber breaks
- □ Record the mass at which the fiber broke
- □ This represents the tensile strength
- □ To increase the accuracy of your results, this process should be repeated with more samples.

Name of the sample	Breaking elongation	% of Tensile strength
fiber	17 %	80 %

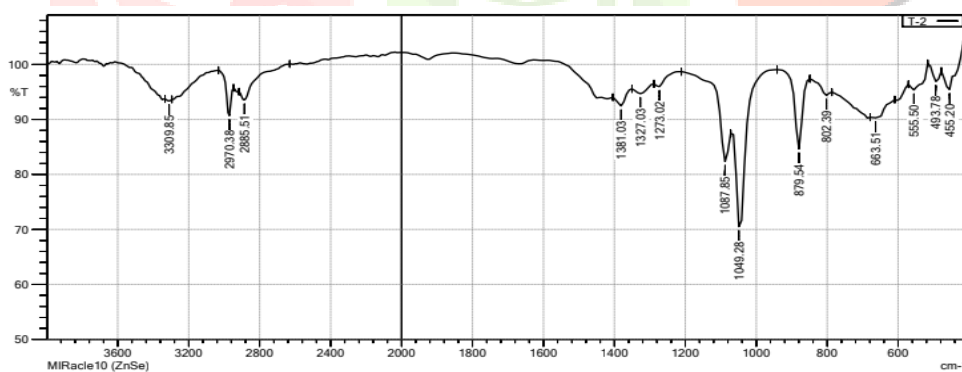
### TENSILE STRENGTH

- Tensile strength is calculated by dividing the highest load a material can withstand during stretching without breaking by the material's initial cross-sectional area.
- The force per unit area is the dimension of tensile strength.
- It gauges how strong the materials are.

### 5.2 FTIR Results:

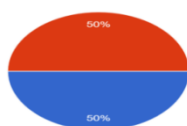
FTIR (Fourier transform infrared spectroscopy) is an instrumental technique used to identify the functional groups present in organic and inorganic compounds by measuring their absorption of infrared radiation over a range of wavelengths.

The given testing samples show 14 Peaks are present. Peaks represent the Active sites or Active components are preset.



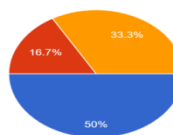
### 5.3 QUANTITATIVE ANNALYSIS

Does organic box is part of Indian culture?  
12 responses



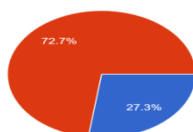
Does organic box is more expensive than commercially available box  
12 responses

● Yes  
● No



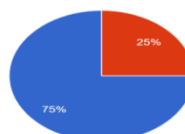
● Yes  
● No  
● Maybe

Do organic box cause pollution?  
11 responses



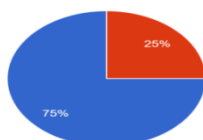
● Yes  
● No

Are you aware about weaving methods of making boxes?  
12 responses



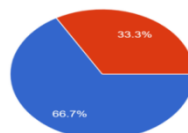
● yes  
● no

Do you know about organic accessories  
12 responses



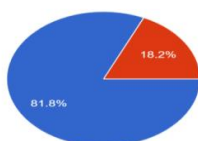
Do you know about biodegradable boxes?  
12 responses

• yes  
• No



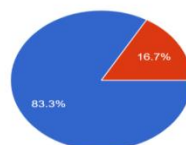
• yes  
• no

Do you think the organic box is useful?  
11 responses



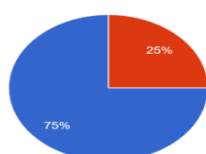
• yes  
• no

Do you like to use organic product  
12 responses



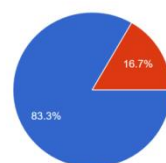
• yes  
• no

Accessories organic box are eco-friendly  
12 responses



• yes  
• no

Natural accessories box is also called as  
12 responses



• organic  
• Inorganic

## 6. BIBLIOGRAPHY:

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7.ANEXURE:



Fig:6 Accessories Box

