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Fiber Extraction from Banana Flower and Characteristics Analysis

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***Abstract*: The aim of this project work is to extract banana fiber from bracts of banana flower. This fiber can be used for making yarn. The cool nature of banana fiber will also improve the wear ability of the garments. In the modern world many of the resources provided by mother nature remain unused properly. Naturally available fiber is extracted from banana plants and this banana fiber is converted into yarn. Then the banana fiber yarn is woven as fabric and the garment is constructed for kids or adults to wear. It is expected that the outcome of this new product will fetch value addition to our export.**

***Keywords*: Fiber extract, Banana fiber, Banana flower fiber.**

1. Introduction

We have great privilege to introduce about our new project "Banana Fiber". The fashion world is constantly seeking and latching on to new material. Banana is the newest thing to hit the textile area. Just like cotton and other textile fiber, banana fiber can also be used for making fabrics. Now banana fabric is made in only a handful of places in Southeast Asia, Banana fibers are extracted from the bracts of banana flower that farmers leave in the garden after a banana flower harvest. The tree stalk and leaves are removed and processed into a pliable fiber. Different layers of the stem yield fibers for specific uses: the outer layer fibers are generally used for making table cloths while the inner layer fibers are used for making fine yarn. Banana fiber is ideal for spinning, mixing with other textile fibers and to make art projects. This fiber has been in use to make rope, cord and textiles. The banana fiber, yarn is marvelous hand spun yarn. It is soft, shiny and available from the nature.

Objectives:

To extract a fiber from BANANA FLOWER. Fiber extraction method Two types Mechanical (boiling) and Chemical. To Analyse the characteristics of extracted fiber. To Analyse the possibility of yarn manufacturing. Harvest the banana flower from banana tree. And peel the flower and bract separately. Bracts are boiled for ease of fiber extraction (Time:40min to 60min). The boiled bracts are taken out and dried for around 1 day to 2 days. The dried bracts are taken to the manual combing process. Fiber is extracted. it can be extracted chemically, by boiling in NaOH solution. Extraction of the fiber for local use (in cordage) or for cottage industries in India has been through manual means. The manual process is adopted in the Philippines and is called stripping. On the plantation site, the plant stems are sheathed, the sheaths flattened, a knife inserted between the outer and middle layer, and a 50-80mm wide strip is separated and pulled off along the length. The strip is called as a tuxy and the separation procedure is called taxiing. All the fibres are removed in tuxies from each sheath. The tuxies are then scraped by pulling them through/ between a wooden block and a serrated knife (400- 2000 serrations/m or no serration) under,

2. Materials and Methods

Fiber is extracted from the leaf sheath or pseudo stem of the banana plant by decortication of the sheath. The pseudo stem is the aerial stem seen above the ground and is formed by closely packed leaf sheaths embedded in the growing tip. Each leaf has a basal leaf sheath forming a part of pseudo stem, petiole and lamina. It can be extracted by hand scraping, by retting, by using raspatory machines; it can be extracted chemically, for example by boiling in NaOH solution. Extraction of the fiber for local use (in cordage) or for cottage industries in India has been through manual means. The manual process is adopted in the Philippines and is called stripping. On the plantation site, the plant stems are desheathed, the sheaths flattened, a knife inserted between the outer and middle layer, and a 50-80mm wide strip is separated and pulled off along the length. The strip is called as a tuxy and the separation procedure is called tuxying. All the fibres are removed in tuxies from each sheath. The tuxies are then scraped by pulling them through/ between a wooden block and a serrated knife (400- 2000 serrations/m or no serration) under considerable pressure. The manual effort, which is considerable, decreases with decreasing serration density. Two methods of taxiing are employed in Philippines. In the first method- Bacnis method, the trunks are pulled apart and the sheath separated according to their position in stalk. They are then flattened and the fibre is stripped from the stem by cutting the pulpy portion and pulling away the tuxy. In second method (loenit), the tuxies are pulled off the stalk from one sheath at a time. In either of these methods tuxies are tied into bundles of 23 to 27kg and brought to the stripping knife for cleaning.

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In this process tuxies are pulled under a knife blade, which is pressed rightly against the tuxy in order to scrape away the plant tissue between the clean fibre is then air dried and made up into bundles for subsequent grading and bailing. In addition to hand stripping, machines are used where the trunks from which the dark outer sheaths have been removed, are cut into sections of 120 to 180 cm in length. The sections are then crushed between rolls and the pulpy tissues are scraped away, one half the length at a time, by two large revolving drums, the rim of which are fitted with scrapping blade which scrape the sheath while it is pressed against a bed plate, oven dried, graded and baled. Though on a very small scale, scraping of these intermediate sheaths is carried out for the recovery of the fibres in tropical countries. However, this process is not employed in India. Dew retting and water retting are the methods most commonly adopted. After the harvesting of the fruits, the tree is cut as near to the ground as possible. The foliage is removed by cutting away. Two or three outer sheaths are removed and rejected. Inserting a knife lengthwise strips of 7.5 cm or so in breath are prepared. These are scraped to yield strands either manually or using a motorized spindle. The fibres contain acidic matter which is removed by hackling. The hackle consists of steel needles mounted on a small board. This reduces the strands into individual fibres. The fibres are then washed and rinsed in clean water and spread out in the shade to dry. The second process to remove the acids is to soak the strands in a well, tank or running water for a few hours. The third process is to soak the strands in dilute alkali or soap solution. The strands are then rinsed in cold water, wrung, rinsed and spread out to dry. When semidry they are hackled and the fibers are spread out to dry in the shade.

A. Materials

Extraction of banana fiber:

The processes for making yarn from banana fibers vary from region to region. Most popular methods among these are these followed in Japan and Nepal.

Japanese Method:

The cultivation of banana for clothing and other household use in Japan dates back to the 13th century, In the Japanese method of making banana fiber, the care is taken right from the stage of plant cultivation. The leaves and shoots of the banana plant are pruned periodically to ensure their softness. The harvested shoots are first boiled in lye to prepare the fibers for making the yarn. These banana shoots give away fibers having varying degrees of softness. This further results in yarns and textiles with differing qualities that can be used for specific purposes. The outermost fibers of the shoots are the coarsest ones. They are therefore, more suitable for making such home furnishings as tablecloths. The softest part is the innermost part that gives soft fibers which are widely used for making kimono and kamishimo, the traditional Japanese apparels. The Banana cloth making process in a lengthy one and all the steps are performed by hand.

Nepalese Method:

In Nepal, the trunk of the banana plant is harvested instead of the shoots. Small pieces of these trunks are put through a softening process for mechanical extraction of the fibers, and then bleaching, and drying. The fiber obtained thus has appearance similar to silk which has become popular as banana silk fiber yarn. This fiber is refined, processed and skeined mostly by the Nepalese women. Only he aged bark or the decaying outer layers of the banana plant are harvested and soaked in water to quicken the natural process. When all the chlorophyll is dissolved, only the cellulose fibers remain. They are extruded into pulp so that they may become suitable for spinning into yarn. The yarn is then hand dyed. They have high textural quality similar to silk and as such employed in making high end rugs. These traditional rugs are woven by hand knotted methods again by the women of Nepal.

Characteristics of Banana Fibre:

Banana fiber is a natural bast fiber. It has its own physical and chemical characteristics and many other properties that make it a fine quality fiber.

- Appearance of banana fiber is similar to that of bamboo fiber and ramie fiber, but its fineness and spin ability is better that the two.
- The chemical composition of banana fiber is cellulose, hemicellulose, and lignin.
- It is highly strong fiber.
- It has smaller elongation.
- It has somewhat shiny appearance depending upon the extraction & spinning process.
- It is light weight.
- It has strong moisture absorption quality. It absorbs as well as releases moisture very fast.
- It is bio-degradable and has no negative effect on environment and thus can be categorized as eco-friendly fiber.
- Its average fineness is 2400Nm.
- It can be spun through almost all the methods of spinning including ring spinning, open end spinning, bast fiber spinning, and semi-worsted spinning among others.

Manufacturing of Banana Yarn:

The whole process begins with the cultivation of the banana plant from ich the fibre is obtained by cutting stems and processing them. The fibre is dye and is finally ready for weaving.

Cultivation:

Leaf's are cut and shoots taken out of the bananas plant two or three times a year to make sure the fibre is soft nature stems are cut and the skin is pleed off. The outer fibre is coarse and is used for tanle cloth. The next layer is used for obi and ties. The next layer of fibre is called kimono.

Fibre extraction:

The most methods of banana fibre extraction are hand stripping and decortications. Hand stripping is process of extracting fibre in which a narrow strip of banana leaf sheath is placed under e serrated knife with pressure. Fiber is then extracted by pulling leaf sheath by hand.

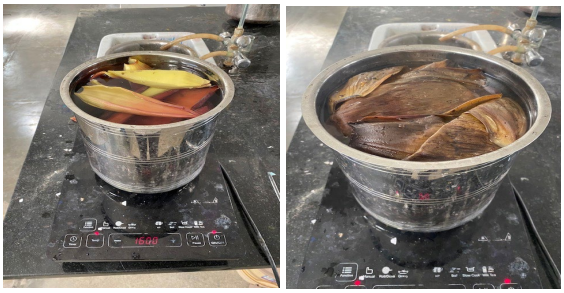

Fig. 1. Boiling bracts

Fig. 2. Drying bracts

Fig. 3. Extracted fiber

Applications:

1) The stronger fibres are ideal for cordages while the weaker white inner fiber is best suited for value added fancy items. They are being produced and exported in India from Kerala. The fibre is suitable for manufacturing strings, ropes, cords, cables and ship building thread. It can also make sacks and packing fabrics as well as mats and rugs. Due to high cellulose and low lignin content, its use in the paper industry (tissue, filters, specialty nonwoven, document, printing, surgical and hygienic applications, coffee bags, meat casings, etc.) have been reported.
2) Banana Fiber can be used as fibre to manufacture fabrics. It is being used for making bags, table mats, ropes and twines. It can be blended with cotton or viscose fibre to produce blended fabric. Since Banana fibre is fully plant origin natural product, it has very good compatibility with other natural fibres like cotton, Coir, Pineapple fibres and Jute in blending.
3) Banana fibre can also be dyed easily like other natural fibres and cloth made from it can also be dyed and printed like cotton cloth. It has good strength and has silk like luster. It can partly replace cotton fibre and hence we can estimate potential for it on the line of estimating demand for cotton fibre. It may be noted that good quality Banana fibre is having strength and luster like silk and in the Philippines various garments are already manufactured from Banana fibres. Apart from it, Philippines is exporting huge quantity of ready-made garments like shirts, kimonos, gowns, night wears etc.
4) The banana fibres were reported to be elegant and highly versatile. As they do not res have been used in the manufacture of dress materials. The fineness of texture depends on the quality of the fibre used. the material has a beautiful sheen and is used for making wedding gowns and barongs.
5) Hand-extracted fibers have been used to produce handbags, wall hangings, table mats and other fancy articles. The fiber can be powdered and different colors of fiber obtained using natural dyes, which can be made into beautiful pictures. Portraits drawn and filled with colorful banana fiber chips have become popular in the handicraft industry in Mizoram, India, and have good potential in the export market. Thus, this fiber is having very good potential. It can be blended with other natural fiber or synthetic fibers without any problem to produce large varieties of. garments from this fiber.
6) However, the inherent drawback of banana fibre is its poor quality and higher irregularity, owing to the multi-cellular nature of the fibres. The individual cells are cemented with lignin and hemi-cellulose and thus form a composite fibre. Banana fibre is classified as medium quality fibre and performs very well in combination with other fibres for making fine articles like handicrafts, currency, etc.

3. Conclusion

In this project, we have produced yarn from bracts of banana flower. The yarn made with banana fiber fabric give a rich fascinating effect. The yarn features on giving fashionable styles. The styles feature and panel introduced on garments are the new development to fashion trend. It is expected that this type of yarn will get much popularity among the consumers in the days to come. There is also a scope that innovations in styles in banana fiber fabrics can be done in future.

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