

Banana: Eco friendly fibre used for household articles

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Received: 22.06.2017; Revised: 15.11.2017; Accepted: 29.11.2017

■ **ABSTRACT** : Like agriculture, textiles have been a fundamental part of human life since the dawn of civilization. In India, a growing shortage of natural fibre producers led the researchers to develop new environmental friendly textile and its products. Some eco-friendly fibre fashions are Bamboo, Banana, Aloe Vera, Coir, Corn, Jute, Pine Apple etc. Banana Fibre is more in production in our country and used for many purposes like as household items, dress, ropes etc. Banana is a fast growing and high yielding plant. India is the largest producer of banana next to mango. Banana is essentially hot climate plants. Now-a-day, it is also gaining importance as a source of fibres. Banana has important place in our mythology. They have more lignified and rougher surface fibers than cotton and kapok and soft fibers such as flax, ramie, jute and hemp. The principal constituents of banana fibre are cellulose intermingled with hemi-cellulose and lignin. Banana as natural fibre made from bast has been used in Southeast Asian countries but most of these fibres were too thick to be used in textiles. Being a rich source of natural fibres, the pseudostem can be profitably utilized for numerous applications and preparation of various products. Application of banana fibre for manufacturing textiles is a new concept in India. Banana fibre can be easily blended with cotton or other synthetic fibres to produce blended fabric and textiles. Currently, it is mainly used by cottage industry in Southern India. Banana fibre has the potential to partially replace the consumption of cotton and jute fibre in India. Banana fibre also finds use in high quality security/ currency paper, packing cloth for agriculture produce, ships towing ropes, wet drilling cables and others. Our banana fibre supplier is the first one in the world who is able to produce finer textile fibres.

■ **KEY WORDS**: Banana, Fibre, Eco- friendly, Natural fibre

■ **HOW TO CITE THIS PAPER** : Saini, Neelam and Sharma, Bharti (2017). Banana: Eco friendly fibre used for household articles. *Asian J. Home Sci.*, 12 (2) : 642-646, DOI: 10.15740/HAS/AJHS/12.2/642-646.

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Natural fibres are significantly elongated substances produced by plants and animals that can be spun into filaments, yarns and ropes. Woven, knitted, matted or bonded are techniques to form fabrics that are essential for clothing. Like agriculture, textiles have been a fundamental part of human life since the dawn of civilization. In India, a growing shortage of natural fibre producers led the researchers to develop

new environmental friendly textile and its products. Natural fibres are at the heart of an eco-fashion movement that seeks to create garments that are sustainable at every stage of their life cycle, from production to disposal. Natural fibres have intrinsic properties such as mechanical strength, low weight and healthier to the wearer that has made them particularly attractive. Now-a-days environmental issues are

becoming the major factors during the selection of consumer goods. Renewable resources are gaining popularity among the people due to their positive effects on agriculture, environment and economy. Natural fibres being biodegradable are now considered as solemn option to synthetic fibres for use in various fields. Some eco-friendly fashion fibres are Bamboo, Banana, Aloe Vera, Coir, Corn, Jute, Pine Apple etc. Banana Fibre is more in production in our country and used for many purposes like as household items, dress, ropes etc.

Banana is a fast growing and high yielding plant. India is the largest producer of banana next to mango. It is cultivated in over 120 countries throughout the tropical and subtropical regions of the world. India is the largest producer of banana with 18% share in total global production of banana in 2012. (<http://vikaspedia.in/agriculture/crop-production/package-of-practices/fruits>) It is cultivated in the tropical areas that are about 1, 86,000 hectares of land and the fibre yield is around 7.5 lakh tones per annum. In India, banana is cultivated on 5.65 lakh ha area and the leading major banana growing states are Maharashtra (0.54 lakh ha), Gujarat (0.49 lakh ha), Tamil Nadu (0.82 lakh ha), Andhra Pradesh (0.56 lakh ha), Karnataka (0.42 lakh ha) and Kerala (0.59 lakh ha). After the fruit production, the trunk of the banana plant *i.e.*: the pseudostem is thrown as agricultural waste to a great extent. These pseudostems are effectively utilized in production of the banana fibres as, annually; about 1.5 million tons of dry banana fibres can be produced from the outer sheath of pseudostem. Banana fibre is classified as a hard fibre, based on the fact that it includes strands of whole vascular bundles, including xylem, phloem and true fibres. They have more lignified and rougher surface fibres than cotton and kapok and soft fibres such as flax, ramie, jute and hemp. The principal constituents of banana fibre are cellulose (also called cellulose-1) intermingled with hemi-cellulose (polysaccharides) and lignin.

Application of banana fibre for manufacturing textiles is a new concept in India. Banana fibre can be easily blended with cotton or other synthetic fibres to produce blended fabric and textiles. Currently, it is mainly used by cottage industry in Southern India. Banana fibre has the potential to partially replace the consumption of cotton and jute fibre in India. Banana fibre also finds use in high quality security/ currency paper, packing cloth for agriculture produce, ships towing ropes, wet drilling

cables and others. (<http://textilelearner.blogspot.in/2014/01/properties-of-banana-fiber.html>).

Constituent of banana fibre :

According to the National Standard Method (GB5889-86), the constituent of banana fibre are:

Fibre	Cellulose	Hemi cellulose	Pectin	Lignin	Water soluble materials	Fat and wax	Ash
Banana	50-60%	25-30%	3-5%	12-18%	2-3%	3-5%	1-1.5%

Characteristics and properties of banana fibre :

- It is a multiple celled structure.
- Banana fibre has high strength, small elongation, good luster, good drape, very cool, light weight, strong moisture absorption, fast moisture absorption and release, easy degradation as well as environmental protection etc. (Kamath, 1996).

Fig. 1 and 2 show the water-absorption and water-release ability of banana and some other comparing fibres.

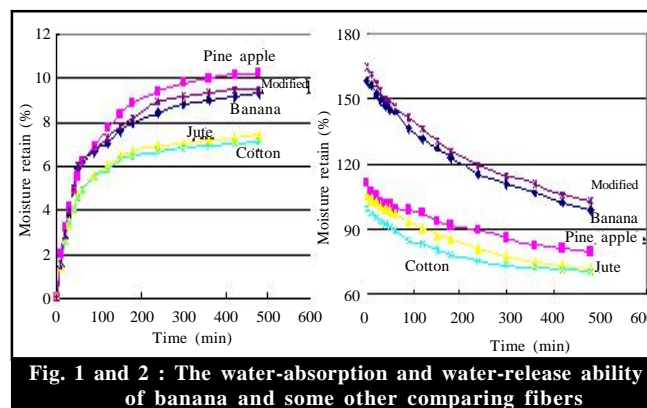


Fig. 1 and 2 : The water-absorption and water-release ability of banana and some other comparing fibers

- Appearance of banana fibre is similar to that of bamboo fibre and ramie fibre, but its fineness and spin ability is better than the two.
- It has somewhat shiny appearance depending upon the extraction and spinning process.
- Banana fibre is a new textile fibre. It is greener, shinier, and thinner.
- Banana fibre fabric is very thin, lustrous and glossy but still has some flexibility.
- Banana fibre cloths are very nobleness, fashion, health and environment-friendly.
- Banana fibre is equal to Manila hemp. This fibre

is alkali proof and had good receptivity for dyes. (Blumoke, 2014)

Two types of extraction methods

Manual method (banana fibre extraction process):

The plants are cut down as soon as the fruits are harvested.

The trunk is peeled.

Brown-green skin is thrown away retaining the cleaner or white portion which will be processed into knotted fibres.

To extract the fibre, the pseudostem is cut at the bottom and its sheaths are removed, as each series of leaf sheaths produces different grades of fibres.

The fibres are extracted through hand extraction machine composed of either serrated or non serrated knives.

The peel is clamped between the wood plank and knife and hand-pulled through, removing the non-fibrous material.

The extracted fibres are sun-dried which whitens the fibre. Once dried, the fibres are ready for knotting.

A bunch of fibres are mounted or clamped on a stick to facilitate segregation. Each fibre is separated according to fibre sizes and grouped accordingly.

To knot the fibre, each fibre is separated and knotted to the end of another fibre manually.

The separation and knotting is repeated until bunches of unknotted fibres are finished to form a long continuous strand.

This fibre can now be used for making various products.

Innovation in extraction process of banana fibre:

– The manual extraction method of banana fibres was tedious, time consuming, and caused damage to the fibre. Consequently, this type of technique cannot be recommended for industrial application. So to overcome this problem a machine is developed is called Raspador.

– The essentially hand driven process of extracting banana fibre is now set to change with the invention of the Banana Fibre Separator Machine.

Advantages of the machine over manual process:

- Reduces drudgery.
- Fifty times increase in fibre production compared to manual process.

- User friendly and economic.
- Less maintenance cost and safe to operate.
- Clean work atmosphere.
- 30 kg of fibre production per day where as only 3-10kg from manual process.
- High quality fibres can be produced in terms of length, softness, strength.
- Training to operate can be given in 30 minutes. So, even unskilled worker can learn and operate without any difficulty.
- A good substitute for manual extraction of Banana fibre.
- Fibre can be extracted in all types of banana pseudostems, leaf stalks and flower stalks.
- Necessary spare parts are easily available in open market.

Applications of banana fibre :

Banana fibre is little known till today. With the increasing environmental awareness and growing importance of eco-friendly fabrics, banana fibre has also been recognized for all its good qualities and now its application is increasing. The banana fibre according to very high authorities, is not only suitable for manufacturing strings, ropes, cords, cables and ship building thread, but can also be used to make sacks, packing fabrics as well as mats, rugs, high quality security/currency paper, packing cloth for agriculture produce, wet drilling cables etc. But now Banana fibre is also used to make different articles of apparels and home furnishings:



Rugs made from banana yarn fibres are also very popular world over. Apparels made from banana fibre denote aristocratic status in some countries. These fibres are used in Europe for making socks. Papers made from banana fibres have good market in international countries. These papers are chemical free and possess eco friendly qualities, with longevity of 700 years.

Composite made up of banana fibre :

Polypropylene reinforced with banana fibre is used by automobile companies for making under floor protection panels in luxurious cars like Mercedes. Banana fibre reinforced with polyester used for increase strength of fabric. The banana fibre composed with glass fibre used for improving tensile strength, flexural and properties of fabric.

Polymer matrix composite contains the various natural fibres as the reinforcement phase is successfully fabricated. The polymer banana reinforced natural composites is the best natural composites among the various combination. It can be used for manufacturing of automotive seat shells among the other natural fibre combinations (Ramesh, 2013).

Combining the properties of two different materials, cheaper manufacturing cost, versatility etc., makes them useful in various fields of engineering, high performance applications such as leisure and sporting goods, shipping industries, aerospace etc. Hence it was concluded that the composites stand the most wanted technology in the fast growing current trend (Pujari *et al.*, 2014).

Banana fibres is used as:

- A Natural Sorbent
- A base material for bioremediation and recycling
- A natural water purifier
- A base material for the paper and pulp industry
- A rawmaterial in handicrafts and textiles
- Banana fibre: a licence to print money.

Banana fibre is elegant and highly versatile. They were not easily crumpled; these fibres were used in the manufacturing of dress materials. The fineness of texture was found to depend on the quality of fibres used. When it was used in layers and flourlike, the fibre made beautiful dresses. Banana fibre dyed from its natural beige to bright colours was used to make blouses and outfits with plenty of ruffles and laces. Napkins and placemats have also been made (Mishra and Goel, 1999).

Present status of banana fibres :

India is the world's largest producer of banana. However the use of banana fibre in the textile industry and for other purposes is a relatively new concept in India. Philippines and Japan are the major banana fibre producing countries for large scale manufacturing of textile items made from banana fibre. Philippines also exporting huge quantity of readymade garments

manufactured from banana fibre to Japan, Singapore, Taiwan and all Far East Asian countries. In current world scenario, the banana fibre is being extensively used as a blending material in textile industry. The export of fibre will earn considerable foreign exchange to our country. It is estimated that 70 full-grown banana trunks gives 1 kilogram of dry banana fibre. About 37 kg (average weight) of stem yields about 1 kg of good quality fibre. Demand for textile and readymade garment is continuously increasing in India.

Economic importance of banana fibres :

In India, banana fibre is even made into paper. Ash of dried peels from both bananas and plantains is used for dyeing and making soap. Various parts of the banana plant are medicinal, and used to treat anything from dysentery to burns and insect bites. These plants also contain natural antibiotics and fungicides and used as animal feed and fertilizer. The technology of banana fibre produced has reach international advanced level, the banana fabrics and banana garments developed attracted great interest to home and overseas customers.

Employment :

Domestic industry overcome unemployment problems. Women play a vital role to increase their family income. The banana fibre industry provide employment to millions of people, largely small scale farmers and processors. Income from the industry contribute significantly to the income and food security of the poor farmers and workers in fibre industries (Frison and Sharrock, 1999). It will enhance the interest to the self help group and entrepreneurs. The raw material is freely available and an industry based on banana fibre increase the rural employment opportunities and help to alleviate poverty. Products made from banana fibre would have a good export market, particularly in view of its biodegradable nature.

Environment friendly :

Banana fibre is natural fibre which is environment friendly than synthetic fibres both in terms of production and their disposal. Unlike synthetic fibres which are largely produced from crude oil, a non-renewable source of energy, banana fibres is made of renewable resources. It is carbon neutral; they absorb the same amount of carbon dioxide that they produce. Also, the wastes

produced during processing of these fibres are mainly organic wastes and residues that can be further processed. Banana fibres are completely bio-degradable and play a key role in the emerging green economy.

Mohiuddin *et al.* (2014) found that the products manufactured from banana fibre or other parts of banana tree will survive in market with a high competition. Addition of values to the banana bio-products will improve its quality and hence will enhance its acceptability. Addition of other natural composites will reinforce the fibre for better strength and quality. Banana fruits and its plants as a whole were a good source of bio-chemicals. Thus, bio-pharmaceutical industries can collect bio-chemicals from backyard industry and can save foreign remittance of Bangladesh. It seems that this information will help to the farmers, entrepreneurs.

Advantage of banana fibres :

The main advantage of banana fibre is that it is unlike many other natural fibres, banana fibres are frequently available, very cheap and have a good thermal insulation value and many desirable properties like strength, lustre etc. (<http://www.li-fei.com/banana.htm>)

Drawback of banana fibre :

- The inherent drawback of banana fibre is higher irregularity, 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.

Conclusion :

Although banana is one of the important fruit crop, its identity as fibre crop is still not established in the rural sector of India. The fibre from banana is a high in quality and its fibre character and chemical composition

reveals that it has a very high potentiality to be established as fibre yielding crop. Every year India loses crores of rupees due to lack of awareness as well as unavailability of the proper technology for extraction of fibre. It is obvious that over use of synthetics has raised tremendous concern about our environment. Only natural fibres can show new hope for the future.

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