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Go Green -Eco Home textiles Product with Agro Waste Banana Pseudostem

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ABSTRACT

Transforming banana pseudo stems, an agricultural waste that poses significant disposal challenges, into a valuable product can offer both economic and environmental benefits. By reducing pollution and greenhouse gas emissions, this process helps the environment while also creating a biodegradable product. Utilizing this waste to develop textile products not only adds value but also generates additional income. Keeping in view the above, the study focused on extracting fibers from banana pseudostems, analyzing their composition, and evaluating the physical properties of the extracted fibers. The goal was to explore the potential of converting these fibers into yarn using hand-spun techniques. As a result, the yarns were utilized to create products like mats, trivet and fruit basket. A range of products comprising of yarn, rope, hand-made mats, cushion and eco home textiles products were developed. Utilization of a waste like banana pseudo stem to manufacture home furnishings products.Hence, at the end of crop season, after harvest of banana fruits, the pseudo-stem which is considered to be an agricultural waste can provide additional income to the farmers, if the pre-processing of fibres are done at the farm level.

Keywords : Agro waste, Banana pseudo stems fibre, Banana yarn products

INTRODUCTION

The utilization of less explored fibre, expansion of green, eco-friendly and aesthetical interiors and its awareness has increased the demand of innovative products for healthier environment. Banana pseudo-stem has been known as an implicit cellulose source, though generally discarded as agricultural waste in numerous countries (Doshi and Karolia, 2017). With improved transportation and communication, highly localized skills and arts connected with textile manufacture spread to other countries and were adapted to local needs and capabilities. New fibre plants were also discovered and their use explored. In the 18th and 19th centuries, the Industrial Revolution encouraged the further invention of machines for use in processing various natural fibres, resulting in a tremendous upsurge in fibre production. A variety of synthetic fibres having specific desirable properties began to penetrate and dominate markets previously monopolized by natural fibres. The constant threat of deteriorating situation of our environment with the utilization of synthetic fibers, natural fibers are gaining importance. Which has also directed and raised the demand for scientist and researchers to explore newer natural fibers, better yielding process, eco-friendly production and processing method as well as modification in fiber to fabric properties for utility products. With an ongoing process of improvements at all the stages fiber to fabric, it has shown positive changes in the total production. But due to the low cost of the fiber and lesser man power and time needed to produce bulk quantity these synthetic fibers are ruling the market. However,

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such fibres are hazardous for our environment (Mohapatra *et al.,* 2010).

The main aim of the study is to utilize the structure of minor fibers and to expand its functional as well as aesthetical usage for niche product for a niche market. Banana cellulosic minor fiber were selected.Banana fibre Also known as musa fibre, it is one of the strongest natural fibres. This biodegradable natural fibre from the bark of the banana plant.Today, banana fibre is used all over world for multiple purposes. Commercial value of the fibre has increased over the years. Transforming the waste into a usable fabric and other products is a great achievement. The use of banana stems as a source of fibre declined after other convenient fibres such as cotton and silk became popular. But in recent years the commercial value of banana fibre has increased and it is used all over the world for multiple purpose (Mohiuddin *et al*., 2014).

The Synthetic fibres that are used are mostly obtained by means of chemical processes which are non-biodegradable and are dangerous to the environment. The present scenario is to go with an alternative for such synthetic fibres that is the Banana fibres. These banana fibres are biodegradable, eco-friendly, odourless and are chemically inert. Banana Fibres are highly heat resistive material, water resistance, fire resistance; good tensile strength and also they are grease proof (Rahamaththulla *et al.,* 2018). Some researchers have successfully demonstrated the use of banana pseudo-stem and leaves for extraction of fibers on a small scale. The pseudostemfiber is used for making several value added products (Subagyo and Chafidz, 2018).

Banana pseudo-stem is a by-product of banana plant which has a potential for providing profitable products. Banana pseudostem is an agro waste in plantain cultivation. So there is a great possibility of utilizing banana pseudo-stem in the textiles and other industries thereby providing an additional income for both small scale and large scale farmers. So it will be a great opportunity for researchers in future. At the same time, the problem of waste management can also be solved and provides a new scope for the efficient utilization of banana pseudostem (Sanjeeda *et al.,* 2014).

METHODOLOGY

Extraction of Banana pseudostems Fibres:

Banana pseudostems collected from the farmer, were cut into two halves and sheaths are manually removed for processing. The sheaths were then fed into banana fibre extractor for separating fibres from sheath. Thus separated fibres were washed with water and dried in sunlight. These fibres were combed using a steel comb and separated into single fibres. Extracted long fibres are used to process textile purpose.

Collection of banana | Extractor machine for separating (3) | Bananafibers pseudostems fibres from sheath

Fig. 1 : Extraction of fibres from Banana pseudostems

Physical analysis of the fibers:

The extracted Banana pseudostemsfibres were analysed physical properties using standard test methods. The assessment of various properties of extracted Banana pseudostems fibres was done at different stages of extraction to establish a relation between various parameters of extraction process and physical properties of fibres. The various properties evaluated were fibre length,fineness, bundle strength, elongation at break, moisture content. Standard methods were followed to evaluate the properties.

Spinning of Banana pseudostemsfibres:

The extracted Banana pseudostemsfibers were spun using hand spinning techniques. Banana pseudostemsyarns was spun by the spinner and women of self-help group, Aadhar, a non-governmental organization in district Amethi, uttar Pradesh.

Product Development:

Banana pseudo stemsyarns were used to make home furnishing product.

RESULTS AND DISCUSSION

Physical Analysis of Extracted Banana Pseudostems Fibres:

After extraction of fibres from Banana pseudostems, the composition of fibres was determined and their physico properties were analysed. The Banana pseudostems fibres being ligno-cellulosic in nature primarily contain cellulose, hemicelluloses and lignin; and small amount of

wax and ash. Some of the physical properties of the extracted Banana pseudostems fibres studied included length, fineness, bundle strength, elongation at break, moisture content and regain and absorbency (Table 1).

Table 1 : Physical Properties of the Extracted Banana Pseudostems Fibres

Sr. No.	Physical Properties	Value for Banana pseudo stems Fibres
1.	Length	97.94cm
2.	Fineness	157.59 Denier
3.	Bundle Strength	42 (g/tex)
4.	Elongation at break	19.4 %
5.	Moisture Regain	10.63%

Manufacturing of Yarn:

Yarns were spun by Banana pseudostems fibres. Motorised wheels can greatly improve the efficiency banana yarn spinning but yarns were formed unevenness in yarn length. So hand spinning technique was finalized to prepare eco home furnishing products like coaster and fruit basket, by using Banana pseudostems yarn.

Product Development:

After understanding the basic properties of the extracted fiber, it was used to create eco-friendly home textile products

Product 1 : Banana yarn Coaster

Product 2 : Banana Yarn Fruit Basket

Evaluation of products of agro waste banana yarn:

Market evaluation of the constructed eco home textiles products were conducted at exhibition organized by NABARD project at district, Amethi, Uttar Pradesh in February 2024. It was a platform to obtain opinion from the respondents of professors, researcher, people from textile expert elite group persons, handicraft industry and others.

All the respondents approved that all products were suitable for home furnishing and can be used for some interior home decoration. Also they stated that these products were commercially viable. 30% 15% 23% 9% 15% 8% Teaching Staff, Research Scholars, elite group persons, textile expert, handicraft industry and others. Various scores were obtained after taking preference of the respondents regarding the eco home textiles products made from agro waste Banana pseudostemsyarn. Thus application of Banana pseudostemsfibres for eco home textiles products could be undertaken commercially at small scale startup (Fig. 2).

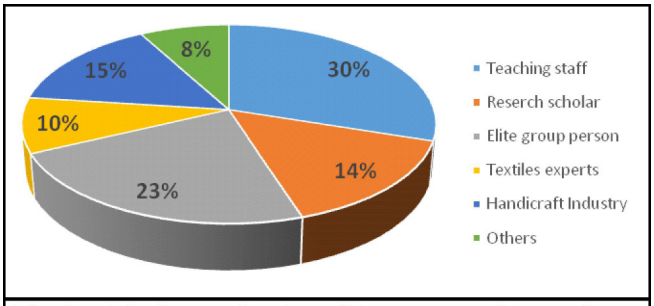

Fig. 2 : Market evaluation of Banana pseudostemshome textiles products

Conclusion:

Rapid urbanization has an adverse impact on natural resources and pollution level in our country. This alarming situation has created consciousness in the consumers to consume eco-friendly products made out of the right combination and structure of natural fibers. A banana fiberswhich have good length, bundle strength and moisture regain and are cost effective will have high demand in the coming years. Such revolutionary trends emerging, have expanded the opportunities to explore the unexplored fibers for home textiles applications. The main aim of the study is to utilize the structure of minor fibers and to expand its functional as well as aesthetical usage for niche product for a niche market. This, draws attention to design and assemble tools/instruments, which can be easily installed in rural areas nearer to the cultivation areas of natural fibers. This will help farmers to cultivate more fiber and produce more textile product to fulfil the rising demand in the market.

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