

Agrowaste Fibers as Sustainable Alternative to Cotton

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ABSTRACT

This article indicates the potential of natural cellulosic fibers obtained from agro-waste for the development of textile and allied products. Due to environmental constraint the cotton fiber is being replaced by many other natural fibers as they exhibit inherent multifunctional properties which are more sustainable. Since cotton is an important part of textile and allied industries because of its protagonist nature, many fibers need to be blended with cotton to develop God quality yarns and fabrics. Keeping the importance and demand for natural cellulosic fibers into consideration, industries need to find ways to make cotton more sustainable and appropriate application of other agro waste fibers for consumer and environment in coming future.

INTRODUCTION

The traditional Indian & western apparels are important part of sustainable development goals due to their construction and versatility. The SDG's (6, 3, 12) are indirectly related to the type of garments constructed and worn in ancient times. Few of them are still relevant in today's era. For instance, *Dhoti & Saree* are two examples of sustainable zero waste garments

as they are developed on loom in rectangular shape with meters of length and can be worn as soon as they are removed or collected from the loom. No stitching or cutting is required for converting them into a garment. Another important feature of these fabrics is that these fabrics can be worn by any age group and can be stylized as per the current style or fashion. Another zero or minimum waste garment is

Salwar. The cutting and stitching of this garment leaves minimum waste and provides the flexibility and comfort to the wearer in terms of any change in body dimensions especially from torso. Similarly, the Kimono which is one of the traditional costumes of Japanese culture is cut and stitch into a rectangular piece, leaves zero waste. Majority of the garments were traditionally made with the help of natural fibers especially cotton. With more focus on the sustainable goals, cotton and its substitute fibers are now part of the textile industry.

Cotton & its application

It is a natural fiber, grows well in several climates, can be converted into fabrics which are washable, breathable, absorbent and strong. It is versatile fiber, used for many different products, from clothes to towels, from jeans to jersey, have its application in many sectors such as medical, hospitality, etc. as shown in Figure 1. Studies have shown that 100% cotton is one of the most breathable and absorbent with the ability to absorb heat & perspiration (Wu 2015) and thus used for baby wipes, medical cotton balls, sanitary napkins, gauze, towels (Bong ,2016). Unlike other fibers, cotton doesn't get weak when comes in contact with water. The molecular structure of cotton (which contains hydrogen bonds) makes the fiber/yarn/fabric/ stronger when its wet, thus exhibiting durability and reusability. This property plays an important role in home textiles and hospitality industry where cleaning of towels, napkins, curtains, and bed sheets are done on regular basis and dimensional stability, strength and aesthetic needs to be retained for better customer satisfaction (Dochia *et al.*,2012).

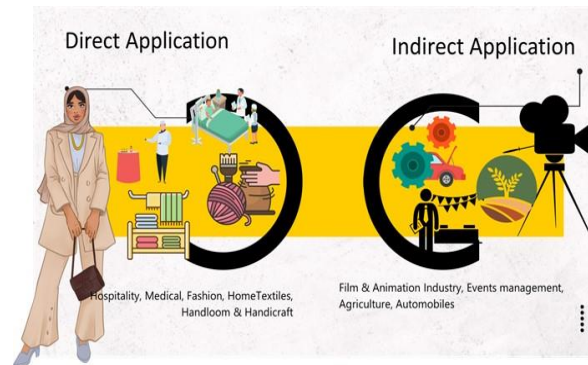




Figure 1: Direct and Indirect application of textiles (cotton)

NEED FOR COTTON SUBSTITUTES

With each industrialization, a shift in technology; innovation in raw material; as well as increased disposal of textile is seen. More purchasing power of consumer and new marketing strategies of brands have led to increased pre and post-consumer waste along with environmental pollution (Ütebay *et al.*, 2020). The studies have shown the amount of water and chemicals utilized in developing a pair of jeans or dyeing few meters of cotton fabrics have huge amount of effect on society. Apart from this, at agricultural front, cotton is considered as thirsty crop, its production leads to soil erosion and use of pesticides and insecticides are also reported. With such records the textile industry is considered as one of the most polluting industry and cotton as one of the most polluting fibers. To convert negative effects into positive effects the textile industry has researched and amalgamated the use of other natural fibers especially the agro waste. The fibers which have shown their potential as textile material are Lotus fiber, Banana fiber (Khan *et al.*, 2022). Each one of the same are discussed below in table 1

Table 1: Agro waste fibers

Name of the fiber	Obtained from	Picture
Lotus (Nelumbo nucifera)	Fibers are distributed in the stem and covered with pectin, wax and some lignin.	

Banana (Musa balbisiana)	Fibers are obtained from the bark of the waste tree and no chemical is used in the collection.	
Pineapple	Fibers are collected from leaves of the plant and are dried and converted into yarns	

These fibers exhibit some important sustainable properties like limits soil erosion and improves the fertility of the soil; less use of water; byproduct of agricultural production; growth of the plants is achieved without any pesticides, or insecticides; medicinal properties; high absorbency. Such properties have increased their use in textile industries especially for luxury products.

STILL WHY COTTON

Inspite being one of the environmental pollutant, cotton is still an important part of textile industry, fashion industry, society as a whole. The few reasons for the same are:

1. **Alternatives are still in infancy stage:** To convert agro waste fibers special consideration need to be made in case of machinery involved to develop a required quality of fiber, yarn and fabric. Also, there is less possibility of diversified products and properties of agro waste fibers are less known to the world as compared to cotton.
2. **Recyclability:** Cotton has the potential to be recycled, as Tanghan Sanvou Chemicals Fiber Co. Ltd has reported the success they have achieved in producing viscose staple fiber made from 50% post-consumer recycled cotton textiles.
3. **Blended yarn:** To convert agro waste into textile products, amalgamation with cotton is important. Pineapple & Cotton when blended results in better mechanical

properties as suggested by jalil *et al.*, 2021.

4. **Protagonist:** Cotton is the most profitable non-food crop in the world. Its production provides income for more than 250 million people worldwide and employs almost 7% of all labor in developing countries. Approximately half of all textiles are made of cotton and is one of the first choice of the consumers.

CONCLUSION

With population explosion around the globe, it is evident that the amount of agro waste obtained is not sufficient. Still many advantages are related to the use of fibers obtained from agrowaste such as versatility; possibility of experimentation; new designer products; environmental safety; substitute for cotton. Products made by these fibers have their market potential in through luxury brands where the buyers are willing to pay for expensive fashion and textile products. Industries and designers should provide the transparency in the supply chain so that consumers are aware of the safe environmental process of such products. The future is of handmade and safe products which clearly explain that cotton need to be made sustainable and agro waste fibers should be scientifically tested and improved to be part of a textile mass market.

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