Sustainable Fibers and Fabrics used in Home Textiles

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Abstract— Interior textiles such as net curtains, curtains, furnishing fabrics, textiles for upholstery and table linen all make a significant contribution to a feel-good atmosphere in the home. There is a variety of eco-friendly and sustainable fibers which are being used for home textiles. Fibers such as coir, jute, sea weeds, bamboo, hemp etc. are being discussed in relation to its application in home textiles. The paper discusses the application ecofriendly textiles for seating, window textiles, bed linen, wall coverings and many more.
Key words: Home textiles, Eco-friendly, Sustainable

I. INTRODUCTION

Fabrics play an important role in controlling the environment of a home. The fabrics being the prime contributors provide texture, colour and character. Fabric is the interior designer's pharmacy. It protects the interior colour from fading and furnishing from deterioration by sunlight. It protects from sun glare and lends protection from night blackness at evening and from too early sun in the morning. Fabrics lend privacy to any degree that is needed. It shields people from draughts or heat and reduces heat loss in winter. It can make summer room cooler and reduce an air conditioning load in the summer. Fabric increases livability and work ability of a small place, reduce noise, make music and even speech richer and more resonant of all acoustic material. Fabrics used for home textiles must have properties such as, good light fastness, good resistance to seam slippage, good resistance to pilling, good resistance to snagging, stain repellency, good fastness to sponging, flame retardency, and appearance retention.

II. CONVENTIONAL FIBERS IN HOME TEXTILES

Natural fibers, like cotton, wool, linen, etc., are dominant in the home textiles sector. In recent days, some of the man-made fibers are include polyester, rayon, nylon, polypropylene, Teflon, recron, acryclic etc. Due to the qualities like strength, warmth, abrasion resistance and resistance to months and mildew, polyester dominates the carpet and curtain segments. The share of cotton and man-made fibers in the total fiber consumed in production of home textiles account for around 38% and 37%, respectively (1). About 6% of home textiles are made of wool and animal hairs. Flax accounted for only 0.1% of all fibers consumed in producing home textiles. Information of around 20% of the fiber usage was unidentifiable as their general use was either not classified or remained unspecified in the fiber categories. Blends of natural and synthetic fibers have also attracted attention of home textile manufacturers to enhance the fabric performance.

III. APPLICATION OF NEW AND SUSTAINABLE FIBERS IN HOME TEXTILES

Environmental threats like global warming and climate change are accelerating the cause and awareness of new eco-friendly fibers. Even though such fibers have not attained the commercial success despite its existence in the market for some time, they have contributed immensely to the concept of sustainability and unique ornamentation. The possibility of application of some environment-friendly fibers such as solar protection fiber, coir, jute, water lily fiber, silk, milk fiber, wood fibers, sea weed fibers, soybean fiber, bamboo fiber, and hemp in different home textile products is of interest to the consumers.

A. Solar Protection Fiber:

The fiber is of botanic origin, made from the natural raw material wood and is, therefore, fully biodegradable. The fiber company Lenzing has developed the new fiber with solar protection on a TENCEL basis. The new fiber is effective due to permanent pigment integration. It provides home textile items a long-term protection from solar radiation. A sunscreen level of up to 110 SPF can be reached in this fiber (2). The fiber is the perfect eco-friendly alternative to polyester fibers and conventionally finished fabrics with solar protection.

B. Golden Natural Fibers (Coir and Jute):

Coir is a versatile natural fiber extracted from mesocarp tissue or husk of the coconut fruit. It is traditionally been used in doormats, mattresses and other upholstery products. Pads of curled down coir fiber are made by needle felting and shaped and cut to fill mattresses. A major proportion of brown coir pads are sprayed with rubber latex, which bonds the fibers together to make rubberized coir, which is used as upholstery padding. Coir, being an organic product, is biodegradable and eco-friendly. This is a major factor for its popularity, when compared to its modern competitors like PVC and U foam and synthetic products used in the home textile industry.

Jute is the cheapest and strongest amongst all natural fibers with many inherent properties like luster, high tensile strength, low extensibility, high breathability, moderate heat and fire resistance. It is biodegradable and eco-friendly and the expired fibers can be recycled more than once. Advantages of jute include good insulating and anti-static properties, as well as having low thermal conductivity and moderate moisture regain. Jute has been extensively used in the manufacture of carpet backing and mats (3).

C. Water Lily Fiber:

Water lily fibers are favorable towards use in curtains, upholstery, table runners and table napkins (4). Not much work has been reported about the characterization of this natural fiber and its application has not been explored on commercial scale in home textiles. However, such fiber holds promise as a future eco-friendly fiber to be used in home textile products.

D. Silk:

Mulberry filature silk is not the immediate choice for home textiles. Dupions and matka silks in mulberry variety are the chief preferences for furnishings. While matka is a hand spun variety produced from silk waste but using such yarn in both warp and weft a thicker variety of fabric is produced. Dupion is the silk yarn that is produced by the reeling of double cocoons. Although the yarn has many defects, they are used for the construction of novelty fabrics (5). An array of non-mulberry silks is also left unexplored in home textile sector. Tassar and Eri are the two major varieties of non-mulberry silks most suited for home furnishings. Tassar is a wild variety of silk and different types of yarn such as thigh reeled, machine reeled, tram, and organize are produced out of this non-mulberry silk (6). However, the filament of the cocoons in eri silk is neither continuing like mulberry silk nor it is even or uniform in nature. It is available in white and brick red colour.

E. Milk Fiber:

Milk fiber from cow's milk has attracted attention in recent years. Milk is first dewatered and then skimmed. New bio-engineering technique is then applied to make a protein spinning fluid. This fluid is suitable for wet spinning process through which the final high grade textile fiber is made. Milk fiber regulates air quality when mixed with cotton or silk. It also provides comfort, durability and elegance making it perfect for home furnishings (7). Milk fibers are soft, brilliant, anti-bacterial, absorbent and humectant. The milk protein contains a natural lubricant that keeps the skin moisturized and smooth and the absorbing power of the fiber takes dampness away from the body, stabilizing its temperature. The fiber has great potential for household and spa towels, bathrobes, bed linen and bedspreads.

F. Wood fibers:

Wood fibers from cultivated timber are harvested according to ecological criteria and the yarn produced is not only extremely smooth but also wears well in hot or cool climates. It has the coziness of silk, the feel of cashmere and the freshness of linen. The fact that it absorbs water so readily and then releases the dampness into the air makes it useful as light, silken toweling.

G. Sea Weed Fibers:

Sea Cell is a sustainable technical fiber made from cellulose consisting of renewable raw materials like sea weed and releases vitamins and minerals to the skin, especially when in contact with wet skin. It is used as a wellness bathrobe with additional advantages. The fiber also has an anti-bacterial effect (because of silver), ideal for bed, table/kitchen and bath linen.

H. Soybean Fiber:

The new soybean protein fiber was invented recently and is soft, smooth and light. It has cashmere feel but is smoother. The moisture absorption of soybean fiber is similar to that of cotton, but its ventilation is superior. It also has a silky luster with perfect drape and elegance. The anti-ultraviolet property of soybean fiber is better than cotton, viscose and silk. The amino acid in the fiber can activate the collagen protein in the skin and resist tickling and evaporation from the skin. It is ideal for use in beds and baths sector.

I. Bamboo Fiber:

Bamboo fiber is a regenerated cellulosic fiber produced from bamboo. Starchy pulp is produced from bamboo stems and leaves through a process of alkaline hydrolysis and multi-phase bleaching. Further chemical processes produce bamboo fiber. It is softer than cotton, with a texture similar to a blend of cashmere and silk (8). The cross-section of the fiber is filled with various micro-gaps and micro-holes; it has much better moisture absorption and ventilation. Moisture absorbency is twice than that of cotton with extraordinary soil release. A characteristic of bamboo fiber is such that it absorbs moisture due to micro-gaps and static electricity is hard to be generated. Bamboo fiber does not contain free electron and thus it is antistatic, so it fits very well next to the human skin but do not cling to it. It flows lightly over the body. Bamboo fiber towel has excellent natural functions. It is both anti-bacterial and deodorizing in nature. Bamboo can thrive naturally without the use of pesticides as it is seldom eaten by pests or infected by pathogen. Scientists have found that bamboo contains a unique anti - bacteria and bacteriostatic bio-agent named 'bamboo kun.' This substance is maintained in the finished bamboo fabric as it is bound tightly to the bamboo cellulose molecule. Bacteria propagate rapidly in cotton and other fibers obtained from wood pulp, forming bad smell and even cause early degradation of the fiber in some cases but it is killed almost 75% after 24 hours in bamboo fiber. Product of bamboo fiber is eco-friendly and bio-degradable (9). Due to its anti-bacterial property, the bamboo fiber has wide prospects in the field of hygiene home textile items such as mattresses, sanitary towel and table napkins. It is also most preferred fiber for decorating products like curtain, television cover, sofa slipcover and also for bathroom products like towels and bathrobes used in spas and hotels, as well as among the household consumers.

J. Application of Hemp Fiber:

The hemp is a bast fiber obtained from the plant Cannabis Sativa. The fiber conducts heat, dyes well, resists mildew, blocks ultraviolet light and has inherent anti-bacterial properties. The fiber is coarse-like coir and mainly used for table and floor products. It has not become the choice of conventional manufacturers of home textiles. Hemp fiber can be used to produce home textile items like coasters, table mats, runners, floor mats and other furnishings.

K. Application of Cork Fiber:

The precious and versatile vegetable tissue known as cork is the outer bark of the cork oak tree. It is a unique biological material with superior qualities. Cork fiber is very light, yet impermeable to liquids and gases, elastic and compressible, an excellent insulator, fireproof, and resistant to abrasion. It is completely natural, renewable, and recyclable. Villani Leonello, Italy is a pioneer company in using cork as a fabric. Cork fabric is made of laminated natural cork coupled on textile. This laminated cork may be coupled on viscose/ polyester fabric for furnishing and upholstery applications. Some of the unique features of natural cork laminated products are innovative texture, eco-friendly, wear resistance, low degradation to acid attacks, almost immune to micro-organisms and shows a slow fire combustion process. Cork fiber is also used for wall

covering by the use of a laminated natural cork coupled on nonwoven fabric (11).

Recently consumers worldwide are becoming aware of natural fibers and slowly but steadily the trend is shifting to natural products. The new ecofriendly fibers have paved the way to stay ahead in competition where the demand of organic and natural fiber products surpasses the conventional fibers. These fibers are far less damaging to people and the environment than conventional cotton and petroleum based synthetics. It therefore continues to support R&D efforts that are close to nature and push for the increasing greening of technologies.

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