

Development of diversified product using waste cotton and wool fibres

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Received: 30.12.2015; Accepted: 29.05.2016

■ **ABSTRACT** : Cotton is a cellulosic fibre obtained from plants and wool is also fibre which obtained from animal hair. A diversified product refers to the produce the large variety of manufactured products from raw material such as waste cotton rags and wool fibres. Cotton and wool waste is worthless and also pollutes the environment. Waste cotton rags and wool fibres can use in developing diversified products. The diversified products made by waste cotton and wool are decorative and functional in nature. Decorative products include photo frame, greeting cards, flower pots, lamp lighting, flowers, mask, wall hanging, while functional articles includes book holder, guest book, tea coaster, pen holder etc. present study mainly focused on the pre consumer waste, post-consumer waste, waste clothes management, how to develop the different diversified products by using waste cotton and wool pieces, benefits of these products to consumers and environment. The present study is more relevant and beneficial because now-a-days cotton industry discharges different types of waste across the state and country which can be manage by developing decorative and functional diversified products in econ friendly manner. Present study suggests an innovative way of waste clothes management which helps in converting the waste material into different useful and decorative products using waste cotton rags and wool fibres.

■ **KEY WORDS**: Diversified products, Pre consumer waste, Wool fibre, Decorative articles

■ **HOW TO CITE THIS PAPER** : Roy, Reena, Dashora, Shikha and Babel, Sudha (2016). Development of diversified product using waste cotton and wool fibres. *Asian J. Home Sci.*, **11** (1) : 276-280, DOI: 10.15740/HAS/AJHS/11.1/276-280.

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Cotton fibre is a natural seed hair fibre, a soft, fluffy staple fibre that grows in a boll, or protective case, around the seeds of cotton plants of the genus *gossypium* family of *Malvaceae*. Cotton is considered as “white gold” native to the tropical and subtropical regions of the world and cultivated in India for more than five thousand years. The cotton fibre is most often spun into thread and used to make a soft,

breathable textile, which is the most widely used natural fibre cloth in clothing of day to day life and occasionally also CCI (2014). Cotton fibre length is measured and reported as the upper half mean length to accuracy of one hundredth of an inch and fibre strength is measured by breaking the fibres held between clamp jaws (IBEF, 2015). It is measured in grams per tax and a tax unit is equal to the weight in grams of 1000 meters of fibre.

India is the second largest producer and exporter of cotton in the world. Most people think only about sheep wool while other animals also produce fine protein fibre and various animals such as camels, goats, and rabbits produce hair that is also classified as wool. In scientific terms; wool is considered to be a protein called *keratin*. It is a nitrogen containing fibre. Its length usually ranges from 1.5 to 15 inches (3.8 to 38 cm) depending on the breed of sheep. Each piece is made up of three essential components: the cuticle, the cortex and the medulla (www.madehow.com). Wool are the most commonly used animal fibre. The fibre is obtained from the soft, hairy covering of sheep and sometimes goats. Under the microscope, the wool fibre looks like a long cylinder with scales on it. The fibre is very curly and springy. Cloth made from wool includes cashmere, camel's hair, alpaca, covert cloth, flannel, gabardine, mohair, serge, tweed and worsted. Wool is an important commodity on sheep farms and ranches. Producing of high quality wool and achieving the associated financial benefits should be every sheep producer's goal. To realize this potential, one must be familiar with the primary factors affecting wool value. Wool fibre diameter wool is sorted at ware houses or other concentration points into grades based on the diameter of the fibre, which has a significant effect on the wool's ultimate use. Finer wool (smaller diameter) is used in fine woolen cloth, while the coarser wools (larger diameter) are used in carpets. World wool production has continued downward, falling in 2008, from about 3 per cent to 1.16 million tons. Approximately world wool production is 1.3 million tons per year. India has the 3rd largest sheep population country in the world having 6.40 crores sheep producing 43.30 million kg of raw wool. Out of this about 85 per cent is carpet grade wool, 5 per cent apparel grade and remaining 10 per cent coarser grade wool for making rough Kambals (Klunder *et al.*, 2005). Average annual yield per sheep in India is 0.9 kg. against the world average of 2.4 kg. A small quantity of specialty fibre is obtained from Pashmina goats and Angora rabbits (www.texmin.nic.in).

What is waste and types of waste?

Waste and wastes are unwanted or unusable materials. Waste is any substance which is discarded after primary use, or it is worthless, defective and of no use (www.wikipedia.org). Waste, or rubbish, trash, junk,

garbage, depending on the type of material or the regional terminology, is an unwanted or undesired material or substance. It may consist of the unwanted materials left over from a manufacturing process (industrial, commercial, mining or agricultural operations) or from community and household activities. The material may be discarded or accumulated, stored, or treated (physically, chemically, or biologically), prior to being discarded or recycled. It is also used to describe something we use inefficiently or inappropriately (www.fullcycle.co).

Types of waste :

Municipal solid waste :

It is generated from households, offices, hotels, shops, schools and other institutions. The major components are food waste, paper, plastic, rags, metal and glass, although demolition and construction debris is often included in collected waste, as are small quantities of hazardous waste, such as electric light bulbs, batteries, automotive parts and discarded medicines and chemicals (Hunter, 2002 and Hayavadana *et al.*, 2003).

Industrial solid waste:

Industrial waste is the waste produced by industrial activity which includes any material that is rendered useless during a manufacturing process such as that of factories, mills, and mining operations. It has existed since the start of the industrial revolution. This range would include paper, packaging materials, waste from food processing, oils, solvents, resins, paints and sludges, glass, ceramics, stones, metals, plastics, rubber, leather, wood, cloth, straw, abrasives etc. (Hunter, 2002 and Hayavadana *et al.*, 2002).

Agricultural waste and residue :

Expanding agricultural production has naturally resulted in increased quantities of livestock waste, agricultural crop residues and agro-industrial by-products. An estimate of annual production of agricultural waste and residues in some selected countries in the region (ESCAP, 1997).

Hazardous waste:

With rapid development in agriculture, industry, commerce, hospital and healthcare facilities, hazardous

waste emerged. Most hazardous waste is the by-product of a broad spectrum of industrial, agricultural and manufacturing processes, nuclear establishments, hospitals and health-care facilities. Primarily, high-volume generators of industrial hazardous waste are the chemical, petrochemical, petroleum, metals, wood treatment, pulp and paper, leather, textiles and energy production plants (www.unescap.org).

Pre-consumer waste:

Pre-consumer textile waste is the leftovers or by-products from textile-, fibre- or cotton industries. Volume of recycling pre-consumer textiles is 75 per cent; this means that every year 750 000 tons of this waste is reused as a raw materials. It is used in automotive, furniture, home furnishings, mattress, coarse yarn, paper and other industries. Pre-consumer textile waste consists of two by-product materials they are natural and synthetic from the textile, fibre and cotton industries. Each year 750,000 tons of this waste is recycled into raw materials for the automotive, furniture, mattress, coarse yarn, home furnishings, paper and other industries. Approximately 75 per cent of the pre-consumer textile waste is recycled (Youjiang Wang, 2006 and CTR, 2015).

Post-consumer waste:

Post-consumer textile waste is the waste of fleece, flannel, corduroy, cotton, nylon, denim, wool, and linen, which have already passed through the consumer market and are recycled and re-constituted into a product for the consumer market once again. (www.hamk.fi/arkisto/portal).

Process of developing diversified products :

Developing products using cotton waste :

Select waste cotton fabric and then cut it in small pieces, now it is called cotton fibres. Then we mash it with soil and waste newspaper and water. This process takes almost 5-6 days in completing this. After few days, by using this mixture we prepare many type of functional and decorative article such as photo frame, greeting cards, flower pots, lamp lighting, flowers, mask, wall hanging, book holder, guest book, tea coaster, pen holder. This whole process is used for every time to make a new product from cotton rags. Bhati (2010) in the study on "Development of bonded fabric using non-biodegradable waste for developing consumer products"

developed fabrics of 200-300 GSM and developed value added articles like suitcase cover, computer cover, baby set, fridge cover, table mats and other utility articles. All the developed articles were very useful and appreciated by the entire sample household. Agrawal *et al.* (2004) and Paul *et al.* (2005) conducted a study on product development using agro-based fibre: *Girardinia Heterophylla* developed different utility articles and handicrafts like folder, coaster, shopping bag, lampshade, shoulder bag, pencil pouch, paper and handicraft items for various textile and non-textile application. The paper developed was much stronger than ordinary paper. Rawat (2007) in a study on "An exploratory study on product development using waste hyacinth" developed handmade sheets from pulp of water hyacinth using pure water hyacinth and cotton rags in 1:1 ratio and then developed value added articles with developed handmade sheets *viz.*, bandhwar, telephone diary, book mark carry bag, clip board, envelop, file folder, lamp shade, invitation card, multiple purpose box, photo frame etc. after evaluation by respondents telephone diary secured first rank, followed by clipboard and photo frame. All articles ranged between 70 to 80 per cent. The developed products were highly appreciated in terms of utility and marketability. These results are similar as obtained by Lodha (2013).

Developing products using wool waste:

Select waste wool fabric and then cut it in small pieces, which called wool fibres then we mash it with soil, water and waste newspaper. This process takes almost 5-6 days' time to complete. Now, using this mixture we prepare several types of functional and decorative articles such as photo frame, greeting cards, flower pots, lamp lighting, flowers, mask, wall hanging, book holder, guest book, tea coaster, pen holder. This whole process is used for every time to make a new product from waste wool fibres. Swami (2014) in a study on development of diversified products using Chokla wool developed products lower waist belt, upper back supporter, knee pad, ear muffs, wrist belt and chest warmer pad and assessed the suitability using five point preference rating scale. All products were highly appreciated by all respondents for their uniqueness and usefulness. Goudeau (2012) also conducted a study on an unexplored direction in solid waste reduction: household textiles and clothing recycling. The study

demonstrated that consumer education positively influenced attitudes towards recycling. The preferred disposal option and throwing in the trash became the least desirable option.

Benefits of product developed from cotton and wool waste :

Diversifying cotton and wool waste into new products can provide an effective path to fast growth and waste management, as well as more products may sell to existing customers or establish new markets but it is vital to weigh up the risks as well as the opportunities (Mahale *et al.*, 2004). Adding new products to existing one can significantly enhance ability to grow rapidly (Sodha, 2006 and Gupta, 2009). In these circumstances, following are the few benefits of developing products from the waste of cotton and wool fibres.

- Developed products are eco- friendly and biodegradable which will be helps to protect the environment for long time.
- Development of different products can be utilized for decoration and utilization purpose.
- Development products are cost effective for both manufacturers and consumers.
- Development of diversified products from waste cotton and wool is a waste management process which is biodegradable and eco-friendly.

Conclusion and suggestions :

Pre consumer waste and post-consumer waste are major raw material for the development of diversified product from cotton waste. Pre-consumer waste includes the material that discarded before it was ready for consumer use, while the post-consumer produced by the end consumer after uses. It has served its intended purpose, passed through the hands of a final consumer and has been discarded for disposal or recovery. Based on the above discussion it can conclude that development of diversified products from reusable cotton and wool waste would provide entrepreneurial opportunities to those who have a new idea for making new products through the use of different waste fabrics/yarns. These diversified products are consumer beneficial, eco-friendly and cost effective and this is also an innovative idea in product development to reduce the wastage by developing this types different functional and decorative products. These products are biodegradable which is not

hazardous to environment due to easy decomposition because these are made from natural fibres, wastage newspaper, soil and water. Cost of these decorative products is comparatively lower than the product which is made by major natural fibres using machinery in clothing industry. The present study is more relevant and beneficial because now-a-days cotton industry discharges different types of waste across the state and country which can be manage by developing decorative and functional diversified products in eco-friendly manner. Present study suggests an innovative way of waste clothes management which helps in converting the waste material into different useful and decorative products using waste cotton rags and wool fibres.

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