Value Addition to Mesta Fibres Through Wet Processing

RK Dhanalaxmi[1], JV Vastrad[*2], M Pujari[3] and HB Babalad[4]
[1,2] Textile and Apparel Designing, RHSc College
[3]DKTE'S Textile and Engineering Institute, Ichalkaranji
[4]Institute of Organic Farming, UAS, Dharwad 580005

Abstract

Mesta variety AS73 CP 560 grown in Institute of Organic Farming, University of Agricultural Sciences, Dharwad was selected for the study. Fibres were extracted from stalks harvested at two different stages of plant growth using urea treatment and different steeping methods. Scoured, bleached and dyed mesta fibres were assessed for quality *viz.*, length, fineness, strength and elongation. Results found that length of the fibres have gradually reduced on wet processing treatment such as scouring, scouring+bleaching, scouring+bleaching+dyeing, on subjecting such fibres to chemicals and higher temperature tends to break these nodes and thereby reduce the fibre length. A successive decrease in the fibre diameter was observed on wet processing treatment, because pretreatment leading to a larger removal of impurities from the fibre. Due to the coarser characteristics of fibre there is hardly influenced of fibre strength on scouring, but scouring+bleaching and scouring+bleaching+dyeing had adversed effect on the fibre strength. Similarly, a successive decrease in the fibre elongation was noticed on wet processing treatment, fibres break at certain point at higher load that creates extension in fibre structure.

Key words: Mesta fibre, Extraction, Wet processing, Physical parameters

Introduction

India being a tropical country is blessed with plenty of renewable resources obtained from the plant kingdom. These can be easily contributed into the textile manufacturing and end uses system. Textiles served only functional purposes as either for the human body or for packaging of things at the early stages of human civilization. But the present day requirements of textile materials are many, such as fashion, comfort and eco-friendliness in use as well as production.

Natural fibres and fabrics are gradually gaining importance as consumers are perpetually looking for biodegradable and eco-friendly textiles to preserve their natural environment, flora and fauna. Apart from cotton, India has a large variety of other cellulosic fibre obtain from the bark or stem portion of a plant such as jute, ramie, abacca, hemp, kenaf and mesta etc.

Mesta is commonly grown in every farmer's field either as a subsidiary vegetable crop and stands next in importance to jute contributing seven per cent by kenaf and five per cent by roselle Das et al. (2010). At present mesta is grown in an area more than 26 lakh bales. Mesta is a common word used for both *Hibiscus cannabinus* and *H.sabdariffa* belongs to family Malvaceae, is known as *Roselle, Java jute, Thai jute, Tengrapat, Lalambadi, Chukair, Yerragogu, Palechi* and *Pundi* etc Mahadevan et al. (2009).

H.sabdariffa is species mainly grown for its fibre purpose. Apart from the traditional uses of bast fibre for packaging and ropes, it is now used in manufacturing apparel, upholstery and value added accessories. In many process techniques and end-use characteristics, surface wettablity of textile and technical fibres is a key factor. Indian textile industry has now become sufficiently aware of ecological standards and has initiated efforts for the production of eco-friendly textiles. The wet processing of mesta, i.e. scouring, bleaching, dyeing etc., has therefore occupied an important position in the modern industry. In scouring, bleaching and dyeing, the wetting process affects the parameters and finally the characteristics of material. Therefore, present study was conducted to assess the physical parameters of mesta fibre for utilization of value added product.

Corresponding author: jyotivastrad@gmail.com

Materials and Method

Selection of sample

Mesta species Hibiscus sabdariffa variety AS73, CP 560 grown in University of Agricultural Sciences, Dharwad, Karnataka was selected for the study.

Fibre extraction

(a) Treatment: Completely dried and rippled stalks were sprayed with 2 per cent urea solution. The stalks were then bundled for retting.

(b) Steeping methods: Two methods of steeping i.e., Horizontal and Vertical+Horizontal were followed for the study.

Dyes and Chemicals

Caustic soda (NaOH), Turkey red oil, soap oil, Hydrogen peroxide, Sodium silicate and Teepol were used. Dyes such as Napthol dyes (ASBS + ASTR), base (Scarlet RC), Salt, Hydrochloric acid, Sodium nitrate, Aluminium sulphate, were used for dyeing mesta fibres.

Scouring

couring of mesta fibres was carried out in conventional non corrosive steel vats. The fibres were treated in the scouring liquor for 12 hours with the temperature between 40 to 50°C. Samples were stirred every half an hour for proper and even scouring. Then the fibre was rinsed twice thoroughly in cold water and shade dried completely.

Bleaching

Scoured mesta fibres were bleached, in a closed vessel for 60 minutes at 100°C with Hydrogen peroxide (2%), Sodium silicate (1.5%), Turkey red oil (0.5%) in 2 to 3 litres of water, the material-to-liquor ratio was maintained at 1:30. After bleaching, the fibre samples were washed thoroughly twice with cold water and were finally dried in air

Dyeing

Treatment (napthol bath)

The scoured and bleached mesta fibre were soaked in water for 10 min, squeezed properly and deeped in the napthol bath. Care was taken to move the fibre up and down in the bath for even dye uptake. Fibre was treated in this bath for 20 mins.

Treament (base)

The fibre were squeezed properly and then treated in the base bath (developing bath) for 20 mins. The fibres were properly moved in the base bath to accelerate optimum and even dyeing.

After treatment

The dyed fibres were squeezed out and deeped in sufficient amount of plain water to remove the excess amount of dye molecule from the surface of the fibre that are unabsorbed. Then fibres were squeezed and dried in shades.

Physical parameters of mesta fibre

Physical characteristics of mesta fibre such as length, fineness, strength and elongation were assessed.

Results and discussion

It is observed from the Table 1. that, the length of mesta fibre without any wet processing treatment (control) was higher than scoured fibre, followed by scoured+bleached fibre and scoured+bleached+dyed fibre. During chemical treatment and washing, the fibres breaks and were separated, thus yielding shorter length than the control fibre. It is therefore revealed that there is a successive reduction on length of mesta fibre.

Table 1: Physical parameters of mesta fibre

Treatment	Fibre parameter			
	Length (cm)	Fineness (tex)	Strength (gf/tex)	Elongation (mm)
Control	106.00	4.428	137.56	0.79
Scoured	97.83	3.048	133.31	0.71
Scoured+bleached	93.16	3.020	71.28	0.44
Scoured+bleached+dyed	90.50	2.627	35.31	0.31

On observing the fineness, scoured+bleached+dyed mesta fibre was finer than scoured+bleached fibre followed by scoured and control fibre respectively. On wet processing treatment, the pectinacious substance present in the fibre was removed. Bleaching agents, acids and alkalis in dyes react more vigorously on the fibre, leading to the removal of impurities and colouring matter from the fibre resulting in maximum reduction in the linear density, hence the finer fibre.

However, among all the treatment control fibre was found to be stronger than scoured followed by scoured+bleached fibre and scoured+bleached+dyed fibre, because control fibre contains impurities, pectin, lignin and gums that enhances the fibre diameter, therefore exhibit stronger fibre. This implies that the strength of mesta fibres without any wet processing treatment was highly significant. Similar results were observed in the study conducted by Iyer et al. (1995) wherein tenacity of fibres was predictable with reasonable accuracy of known cellulosic content and microfibrillar angle. Fathima et al. (2006) stated that long fibre cell shows higher strength because short fibre cells have many weak points at cementing region of fibre cells forming fibres strands, but in fibre filament having long fibre cells there are few weak points at the time of tension caused by the breaking load. Thus, longer fibres showed higher tenacity.

On the other hand, the maximum elongation of mesta fibre was observed without any wet processing treatment whereas the minimum elongation was found in scoured+bleached+dyed fibre. Untreated fibre are stronger and coarser, such fibres break at certain point at higher load that creates extension in fibre structure. Thus physical parameter of mesta fibre such as length, strength and elongation have gradually reduced on scouring, scouring + bleaching and scouring+bleaching+dyeing treatments. Fibre becomes more finer after wet processing treatment because the impurity, lignin, gum contains on fibre were removed. It is also imperative that the chemical used, boiling time, temperature during scouring+bleaching process has adversely effected on fibre parameter than scouring+bleaching+dyeing followed by scouring.

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