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Studies on the Physical Properties of Jute-Cotton Blended Curtain and 100% Cotton Curtain

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Abstract: A study on the physical properties of jute:cotton blended curtain (60:40, 50:50 and 40:60) and 100% cotton curtain is performed in this work. Among the three types of blended curtains it is observed that weight/sq. m of 50:50 blended curtain is nearer to the weight/sq. m of 100% cotton curtain. The warp wise strength of blended curtain is very nearer to the 100% cotton curtain before washing. After washing the strength of blended curtain decreased a less than the 100% cotton curtain. The bending length of 50:50 blended curtain is also satisfactory and comparable to 100% cotton curtain after single washing.

Key words: Physical properties, curtain, blend, strength, bending length, abrasion resistance

INTRODUCTION

Jute is a lignocellulosic bast fiber. It is hard and harsh due to the presence of lignin. Due to its harshness it is difficult to produce apparel and other fancy fabric to use in our day to day life. Limited work has been done to remove the hardness of the jute fiber (Bell, 1968; Sudnik, 1961). It's not easy to turn the jute as soft as cotton but can take to an acceptable level to blend with cotton (Whytlaw, 1952; Booth, 1979). It is very difficult to produce fine yarn from the jute using conventional jute or cotton processing system (Barella, 1957; Zurek *et al.*, 1979). Several efforts are being taken to produce fine yarn from jute by machine modification. But in that case yarn properties were beyond the acceptable limits (Hunter, 1952). It is only possible to produce fine fabric with fine yarn. From the previous works it is seen that jute is only used as traditional goods like gunny bag, sacks, Hessians, CBC etc. Jute is also used as a household products viz. Carpet, curtain, mat etc. in a very small scale (CCU *et al.*, 1960; Anonymous, 1974). Due to limited use of jute, the production/cultivation is going to decrease day by day. To increase the production/cultivation of jute, its diversified uses has to be increased day by day (Murphy, 1955). Upgraded products like curtain, sofa cover, bed sheet, bed cover etc. have to be produced from the jute to enhance its utility in the society. Considering all the properties jute and jute goods, jute blended curtain has an immediate possibilities to increase the diversified

use of jute. Hence 10^s yarns of different blend ratios are selected to produce the curtain fabrics. On the other hand 100% cotton curtain will be more costly than the blended curtain or other fabrics. If the properties of blended fabrics are closer to the 100% cotton fabrics then its demand will be increased for general people of the society. Hence the use of jute in textile sector will be enhanced tremendously. Therefore, the present work has been taken to find out whether the jute based curtain is acceptable or comparable to 100% cotton curtain or not.

MATERIALS AND METHODS

The jute-cotton blended yarns of 10^s count (60:40, 50:50 and 40:60) were collected from Jute and Textile Product Development Centre (JTPDC) of Bangladesh Jute Research Institute (BJRI) in February, 2006. The warp yarns are properly sized with the starch to increase the strength of yarn. The hairiness of the yarns was also minimized by the sizing materials. Due to proper sizing the warp yarn breakage reduced to a minimum level during weaving by the friction of the yarn. The weft yarns were used in unsized stage because of less tension and friction imposed on weaving. A normal power loom is used for the production of blended curtain. The fabrics were produced in standard condition of humidity and temperature. As the blended curtain has to be compared with the 100% cotton curtain fabric, the blended fabrics were finished in a commercially processed finishing Mill named Phoenix

Textile Mills Ltd., Tejgaon, Dhaka, Bangladesh in April, 2006. Almost similar to blended curtain fabric, 100% cotton curtain fabrics were collected from the market. The properties of the two different types of curtain fabrics were tested in the Testing and Standardization Department of Bangladesh Jute Research Institute (BJRI), Dhaka, Bangladesh in May, 2006. All the tests were performed in the Standard atmospheric condition i.e., 20±2°C and 65±2% R.H. The tests results are shown in the tabulated form.

RESULTS AND DISCUSSION

From the Table 1 it is observed that all the properties of 50:50 jute/cotton blended yarn are better than the properties of other two blended yarns. The irregularity of 50:50 jute/cotton blended yarn has improved a lot than the 60:40 jute/cotton blended yarn. The other important properties is the C.S.P. (Count Strength Product) value of the yarn, which is also far better than the 60:40 jute/cotton blended yarn. Even, for higher proportion of cotton in the blend i.e., for 40:60/jute:cotton blended yarn, the irregularities and C.S.P. values are lower than that of the 50:50/jute:cotton blended yarn. As the others previous process are the same for each type of blended yarns, so the properties of 50:50/jute:cotton has improved due to the balance blend ratio of jute and cotton i.e., equal

portion of jute and cotton in the blend. Due to better properties of 50:50/jute:cotton blended yarn; the produced curtain of same blended yarn also exhibits good properties which have explained in Table 2.

In the Table 2 it is observed that weight/sq. m of blended curtain has decreased a lot after washing. In the case of two types of 100% cotton curtain fabric, it is seen that weight sq. m⁻¹ of 100% cotton (Tk.60 m⁻¹) before and after washing was 162 and 155.2 g. This weight is lower than the weight of each type of blended fabric. On the other hand weight of 100% cotton curtain (Tk.95 m⁻¹) before and after washing is 252 and 248 g. This weight is higher than the weight of another type of 100% cotton curtain fabric. It is also seen that the weight of costly 100% cotton curtain fabric was higher than the weight of another three types of blended curtain fabrics. So there was a loss of weight after washing for each type of curtain fabric (either blended or 100% cotton).

Curtain is a decorative fabric. It must be washable after certain used. Again higher weight curtain is preferable to lower weight curtain. The weight of curtain depends on the material and the thickness/construction of the curtain fabric (Vanghaluwe, 1995). The weight also depends on the starch used on the yarn during sizing of the warp yarn. From the result of blended curtain fabrics, it is seen that the weight of 50:50/jute:cotton blended curtain fabric was higher than the 40:60/jute:cotton blended curtain fabric and lower than the 60:40/jute:cotton curtain fabric. But the loss of weight for 50:50/jute:cotton curtain fabric is minimum and lower than the other two types of blended curtain fabric. The weight of 50:50/jute:cotton curtain fabric was higher than the weight of 100% cotton curtain (Tk.60 m⁻¹) fabric and lower but comparable to the weight of 100% cotton curtain (Tk.95 m⁻¹) fabric. Higher amount of starch is used during sizing the warp yarn of jute-cotton blended fabric than that of the weaving of cotton fabric. That is why, the loss

Table 1: Physical properties of 10^s blended yarn of curtain fabric

Properties	Blend ratio (Jute:Cotton)		
	60:40	50:50	40:60
Thick places (km ⁻¹)	308	247	287
Thin places (km ⁻¹)	105	75	90
CV (%)	19	18	18
Hairiness (km ⁻¹)	296	258	260
Twist/inch (TPI)	15	15	15
Strength (lb)	138	149	148
CSP	1380	1490	1480

Table 2: Physical properties of jute-cotton blended curtain fabric and 100% cotton curtain fabric

Observations	Blended curtain fabric (Blend ratio = Jute:Cotton)			100% cotton curtain fabric (price in BD taka)	
	40:60	50:50	60:40	Tk.60 m ⁻¹	Tk.95 m ⁻¹
Warp Count (Ne)	10 ^s	10 ^s	10 ^s	32 ^s	40 ^s
Weft Count (Ne)	10 ^s	10 ^s	10 ^s	10 ^s	10 ^s
Ends/inch	36	34	32	64	58
Picks/inch	17	16	15	35	32
Weight/sq.m before wash	256g	240g	210g	162g	252g
Weight/sq.m after wash	205.2g	215.5g	190g	155.2g	248g
Warp wise Tensile strength before wash	60.2kgf	68 kgf	62.1 kgf	51 kgf	88.4 kgf
Warp wise Tensile strength after wash	59.6kgf	62.2 kgf	53.6 kgf	48.3 kgf	84.1 kgf
Weft wise Tensile strength before wash	60.4kgf	66.7 kgf	56.9 kgf	44.6 kgf	73.1 kgf
Weft wise Tensile strength after wash	51.3kgf	58.6 kgf	48.1 kgf	41.1 kgf	68.2 kgf
Bending length before wash	2.8cm	2.5cm	2.4cm	2.3cm	2.5cm
Bending length after wash	2.6cm	2.1cm	2.2cm	2.1cm	2.2cm
Abrasion resistance	Very good	Very good	Good	Very good	Excellent

of weight is minimal for both types of 100% cotton curtain fabric and maximum for each type of blended curtain fabrics. So, the effects of washing on weight for 100% cotton fabric is minimum than that of the blended curtain fabrics.

From the table, it is seen that warp-wise strength has also decreased after washing for all blended curtain. For two types of 100% cotton curtain, it is observed that the strength of 100% cotton curtain fabric (Tk.95 m⁻¹) was higher than the other 100% cotton curtain fabric and other three different types of blended curtain fabric.

Strength of the curtain is not as important as weight of the curtain. But curtain has to be washed after certain use. So, loss of strength after washing is a considerable factor for curtain. Here 50:50/jute:cotton blended curtain fabric shows the higher strength than that of the other two types of blended curtain fabric. Even after washing, the loss of strength is minimal. The strength of 50:50/jute:cotton blended fabric was also higher than the strength of 100% cotton curtain fabric (Tk.60 m⁻¹). This has been possible due to higher weight/sq. yd (high thickness) of 50:50/jute:cotton blended fabric than the 100% cotton fabric (Tk.60 m⁻¹).

CV% (Coefficient of Variation%): By expressing the standard deviation as a percentage of mean, CV% is obtained.

TPI (Twist Per Inch): The number of turns per unit length in the yarn expressed as TPI. The spiral disposition of the components of a yarn, which is usually the result of relative rotation of the extremities of the yarn.

CSP (Count Strength Product): It indicates the quality of the yarn in terms of strength. Higher the CSP value, better the quality of the yarn. CSP is determined by multiplication of yarn count in cotton system (Nec) and a lea (skein of 120 yards yarn), strength in pound.

Count: A number indicating the mass per unit length or the length per unit mass of a yarn. It indicates the coarseness or fineness of a yarn. Cotton count system (Nec) is determined by the number of hanks (length of 840 yards) present in a definite weight i.e., 1 pound of yarn.

Tensile strength: The maximum force applied on a yarn or fabric to break in its weakest point is called Tensile strength. It is expressed as l bf or kgf.

Ends/inch: It indicates the warp density of the fabric. It is determined by the number of warp threads/inch present in the woven cloth.

Picks/inch: It indicates the weft density of the fabric. It is determined by the number of weft threads/inch present in the woven cloth.

Bending length: This is the length of fabric that will bend under its own weight to a definite extent. It is a measure of the stiffness that determines draping quality.

Abrasion: Abrasion is just one aspect of wear and is the rubbing away of the component fibers and yarns of the fabric.

From the Table 2 it is also seen that for each blended curtain fabric the loss of strength were almost the same after washing. But the losses of strength for each type of 100% cotton curtain fabric were similar to each other.

Generally warp-wise strength of the fabric is higher than the weft-wise strength (Booth, 1979). Because the twist of warp yarn is higher than the twist of weft yarn. Hence, higher the twist higher the strength and vice versa. But the twist should be optimum. For this reason the weft-wise strength of each type of fabric is lower than the warp-wise strength. The strength of 50:50/jute:cotton blended curtain was higher than the strength of 100% cotton curtain (Tk.60 m⁻¹) but closer to the strength of 100% cotton curtain (Tk.95 m⁻¹). Among the three types of blended curtain fabrics the bending length of 60:40/jute:cotton blended fabric was higher than that of the other two types of blended curtain fabric. On the other hand, the bending length of 100% cotton curtain fabric (Tk.95 m⁻¹) was higher than that of the lower price cotton curtain fabric. But the loss of bending length after washing of higher price cotton fabric was also higher than the lower price cotton curtain fabric.

Bending length is one of the important criteria for the curtain. It depends on the stiffness of the fabric. Higher the stiffness of the fabric higher the bending length. The stiffness also depends on the weight/thickness of the fabric. Thick fabric is stiffer than the thin fabric. The stiffness is also related to the softness and hardness of the fabric (Winks, 1966). So curtain of lower bending length is better feeling than that of the higher bending length. From the results of three blended curtain fabric 60:40/jute:cotton blended fabric was stiffer than the other two types of blended fabrics. 50:50/jute:cotton blended curtain fabric was comparable to the 40:60/jute:cotton blended curtain and other two types of cotton curtain fabrics. The bending length of lower price cotton curtain was lower than the 50:50/jute:cotton curtain fabric. Hence 50:50/jute:cotton blended curtain has shown the similar bending length of 100% cotton curtain fabric (Tk.95 m⁻¹).

It is seen that washing has a positive impact on the bending length of the fabrics. On the basis of bending length, 50:50/jute:cotton blended curtain is usable instead of 100% cotton curtain fabrics.

Considering all the properties of blended curtain fabrics and 100% cotton curtain fabrics, 50:50/jute:cotton blended curtain fabric is parallel to the 100% medium quality cotton curtain fabric and better than the 100% low quality cotton curtain fabric. Due to balance blend ratio (50:50/jute:cotton) the properties of the yarn has increased than the other two blended yarns. Warp-wise strength of fabric is higher than the weft-wise strength due to higher strength of warp yarn. By analyzing all the properties and price of the curtains, 50:50/jute:cotton blended curtain shows by far the best properties than the other blended and 100% cotton curtains.

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