

COMPARATIVE STUDY ON THE PROPERTIES OF DENIM FABRICS PRODUCED WITH BLENDED ROTOR SPUN YARN AND 100% COTTON YARN

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ABSTRACT

An assessment on the properties of blended (50: 50 / jute: cotton) denim fabric has been made in terms of different treatments. The results have been compared with those of the properties of 100% cotton denim fabric. It is observed that the properties of blended denim fabric is very similar and comparable to that of the 100% cotton denim fabric at the end use stage that is at the final treatment stage.

Key words: Rotor spun yarn, blended yarn, denim fabrics, abrasion resistance, blending length.

INTRODUCTION

Jute is a lingo cellulose bast fibre. The presence of cellulose is lower than that of the cotton. On the other hand hemi cellulose is present in the jute. Due to the presence of hemi cellulose and lignin, it is more stiff and yellowish in colour than cotton. But it is the cheapest commercial fiber. Jute is mainly used in manufacturing packing and coarse fabric such as Hessian, carpet, carpet backing cloth and sacking etc. It is now needful to find out alternative uses of jute for retaining the economic viability of jute industry and thereby supporting million of people who live on it. Jute fiber conventionally is not being used in producing textile products as it has some shortcomings in regard to feel, stiffness, drape, coarseness, wash ability and abrasion. The stiffness or hardness of the fabric has great impact on its bending length or drape co-efficient (Bell, 1968.). However, the properties of jute can be improved considerably by blending with other natural fibers (Zurek *et al.*, 1979.). Many works have been performed for the particular drape property of jute (Winks, 1966; Hunter, 1952; Whytlaw, 1952). But limited works have been done in the development of the various properties of the blended fabric (Vanghaluwe, 1958). Cheaper products for various end uses can be produced by blending jute with other natural fibre in a suitable proportion. These products have the prospect of wider uses and likely to come popular industrial product. The bending length of the fabric is a length at which fabric will bend under its own weight to a definite extent (Booth,1996). It is a measure of the stiffness that determines draping quality. Higher the stiffness higher the bending length (B.S. Hand book, 1974.). On the other hand, assessment of abrasion damage is determined in terms of appearance against a unabrabbed specimen, which causes loss in weight, loss in strength and change of luster (Chu *et al.*, 1960).

In this paper an attempt is made to find out whether the blended denim fabric is suitable and comparable to the 100% cotton denim fabric.

MATERIALS AND METHODS

The blended fabric used in this experiment was jute and cotton. Jute was collected from the district of Narayanganj, Bangladesh. The raw jute was then stapled in to 1.5 inch by the circular cutting m/c. Then the jute was softened with chemicals in the chemical treatment plant in Jute and Textile Product Development Centre (JTPDC). Then the chemically treated jute was washed in normal water. After proper washing it was dried in the sun. Then the chemically treated dry and soft jute was opened clearly by the opening m /c. Thus it was ready for blending with cotton. The cotton was collected from the Cotton Development Board. Afterwards the cotton and jute were blended in the Blow room section as per required blend ratio (50: 50). Then 10^s yarn was prepared from the blended fiber. Afterwards the denim fabric is produced from the Bengal Indigo Ltd, Tongi, Dhaka, Bangladesh. The denim fabric is treated with different types of chemicals and enzymes. Denim fabric of 100% cotton was collected from the Bengal Indigo Ltd. Tongi, Dhaka Bangladesh. Lastly the physical properties of both the fabrics were tested in the testing department of Bangladesh Jute Research Institute (BJRI) and testing department of Bengal Indigo Ltd, Tongi, Dhaka Bangladesh. The blending length, a measure of stiffness associated with handle was determined by the Shirley stiffness tests. The strength of the fabric was determined by the Tensile strength tester of Good Brand Co. Ltd. All the tests were performed in the standard testing atmosphere i.e. 65 ±2% R.H and 20± 2°C.

Table 1. The effects of various treatments on the properties of blended (50 : 50 / Jute : Cotton) denim fabric.

Treatments	Wt./Sq. yd in gm	Warp wise strength in kgf	Weft wise strength in kgf	Abrasion resistance	Blending length in cm
Grey fabric	355.3	141.31	139.62	Excellent	4.9
Desized fabric	345.4	132.33	81.39	Excellent	4.1
Enzyme and stone wash	341.5	136.11	67.64	Excellent	3.7
Enzyme, stone wash & bleach	334.8	120.9	47.65	Excellent	2.9
Enzyme, stone wash, bleach and softening	333	98.30	46.30	Excellent	2.5

Table 2 . The effects of various treatments on the properties of 100% cotton denim fabric.

Treatments	Wt./ Sq. yd in gm	Warp wise strength in kgf	Weft wise strength in kgf	Abrasion resistance	Blending length in cm
Grey fabric	346.2	142.2	139.3	Excellent	4
Desized fabric	344.6	134.6	116.2	Excellent	3.3
Enzyme and stone wash	341.8	133.2	102.2	Excellent	3.4
Enzyme, stone wash & bleach	332.3	125.7	100	Excellent	2.6
Enzyme, stone wash, bleach and softening	330.8	106.6	95.6	Excellent	2

Table 3. The effects of various treatments on the properties of denim fabric from blended yarn (jute : cotton, 50 : 50) and 100% cotton yarn.

Treatments	Observations	Blended fabric Jute: Cotton 50:50	100% cotton fabric
Grey fabric	Warp count	20 ^s	20 ^s
	Weft count	10 ^s	10 ^s
	End /inch	41	48
	Pick/inch	25	30
Grey fabric (simple wash)	Wt/Sq.yd in gm	355.3 gm	346.2 gm
	Warp wise strength	141.31 kgf	142.2 kgf
	Weft wise strength	137.62 kgf	139.3 kgf
	Abrasion resistance	Excellent	Very Excellent
	Blending length	4.2 cm	4 cm
Desized fabric (simple wash)	Wt/Sq.yd in gm	345.4 gm	344.6 gm
	Warp wise strength	132.33 kgf	134.6 kgf
	Weft wise strength	81.39 kgf	106.2 kgf
	Abrasion resistance	Excellent	Excellent
	Blending length	3.8 cm	3.3 cm
Enzyme and stone wash	Wt/Sq.yd in gm	341.5 gm	341.8 gm
	Warp wise strength	136.11 kgf	137.2 kgf
	Weft wise strength	88.64 kgf	102.2 kgf
	Abrasion resistance	Excellent	Excellent
	Blending length	3.7 cm	3.4 cm
Enzyme, stone wash and bleach (15% H ₂ O ₂)	Wt/Sq.yd in gm	334.8 gm	332.3 gm
	Warp wise strength	120.99 kgf	125.7 kgf
	Weft wise strength	87.65 kgf	95.6 kgf
	Abrasion resistance	Excellent	Excellent
	Blending length	2.8 cm	2.6 cm
Enzyme, stone wash, bleach and softening (15 g/l basosoft)	Wt/Sq.yd in gm	333 gm	332 gm
	Warp wise strength	102.30 kgf	106.6 kgf
	Weft wise strength	98.2 kgf	100.4 kgf
	Abrasion resistance	Excellent	Excellent
	Blending length	2.1 cm	2 cm

RESULTS AND DISCUSSION

From the test results of blended denim (Table- 1), it is seen that wt / sq yard is gradually decreasing after several treatments. The warp wise strength is nearer to weft wise strength in gray stage. But after subsequent treatments the weft wise strength decrease more than the warp wise strength. It is also seen that the blending length is decreasing after subsequent treatments. For 100% denim fabric all the properties have decreased after subsequent treatments (Table- 2). But in case of bending length of warp wise and weft wise direction shows very nearer results. The abrasion resistance for both blended denim fabric and 100% cotton fabric is excellent. From the combined table- III, it is seen from the test results that from simple wash the properties of both the fabric is nearer to each other. After desizing weft wise strength of blended denim is lower than the 100% cotton denim fabric. But all the other properties were nearer to each other. In case of enzyme, stone wash and bleach, strength of blended denim did not reduce much more than the previous one. In the last treatment (treatment-6) it is seen that all the properties of blended denim fabric is closer to the 100% cotton denim fabric.

Blended denim fabric (50: 50) at different treatment stages have shown results, which are near to those of the 100% cotton denim fabric. The use of the jute in case of denim is a new idea of the scientist. We have tried to use as much as jute with cotton to produce blended yarn for denim fabric. The property of the blended denim fabric has been taken nearer to the properties of 100% cotton denim fabric through subsequent treatments.

We expect that the properties of blended denim fabric will be the same as 100% cotton denim fabric. It is our achievement to use maximum amount of jute in denim and to see how long the properties of blended denim fabric can be taken to the 100% cotton fabric. In order to achieve the goal, we have seen from the test result that in the final treatment the properties of blended denim fabric is very nearer to the properties of 100% cotton denim fabric. So it is our success to take this new blended denim fabric to the industrial sector.

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