International Journal of Frontline
Research and Reviews
Journal homepage: https://frontlinejournals.com/ijfrr/
ISSN: 2945-4867 (Online)

(RESEARCH ARTICLE)

Check for updates

Research and analysis of sustainability of jute and cotton blends fabrics

Neaz Morshed [1], Zakaria Ahmed [2,*], Ashraful Alam [3], Taslima Rahman [3], Pulak Talukder [2] and Mehedi Zahan Pulok [4]

[1] *Department of Yarn and Fabrics Production, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[2] *Mechanical Processing Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[3] *Department of Microbiology, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[4] *Machinery Development And Maintenance Department, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*

International Journal of Frontline Research and Reviews, 2022, 01(02), 001–005

Publication history: Received on 18 September 2022; revised on 06 November2022; accepted on 09 November 2022

Article DOI: https://doi.org/10.56355/ijfrr.2022.1.2.0021

Abstract

The study emphasis on development of jute-cotton blended products and its sustainability. The jute cotton blends products not only reduces the excessive demand of cotton but also jute cotton blends products are eco-friendly which helps to reduce dependency of synthetic products that's are harmful for environment. In this study jute cotton blended yarn is collected from jute product diversified center from BJRI then jute cotton blended yarn is transferred to weaving and knitting department to turn this yarn to woven and knit jute cotton blend fabrics. After that different physical property was measured to analysis the sustainability of these jute cotton blended products. It's identified that jute cotton blend fabric has great impact to replace the excessive demand of cotton and the products quality of jute cotton blend fabrics is so good to make impact on market.

Keywords: Jute-cotton; Yarn; Fabrics; Sustainability

1 Introduction

Jute is a valuable fiber which is the cash crop and abundance in Bangladesh and India. The traditional use of jute fiber is to make hessian clothes, ropes, shopping bags and floor mats, etc. (Rahman et al 2008). Though jute is a cellulose fiber, it has as like property as cotton. So it is possible to blend jute fiber with cotton fiber to make jute cotton blended yarn. Blending is a long practiced method and being diversified depending on expanding demand of local and global markets of apparel, home textiles and technical textiles. Jute-Cotton blend is one of the possible options to reduce the dependability on the cotton. Shilpa et al. (2007) reported blending jute with cotton fiber is an acceptable way of jute diversification by which value added products can be produced. Hence, the techniques of softening and blending could upgrade the quality of jute and thus, form a new class of jute-based fabrics having an expanding market. Salam et al. (2007) identified the blending of cotton to develop drape properties, comfortability, durability and many other properties of the fabric products. It's an effective attempt to blend jute fiber with cotton would be a break-through in the field of textile. Jute fiber conventionally is not used for producing wearable textile products as it has some shortcoming in regard to feel, stiffness, drape, coarseness, wash ability and abrasion. Pan et al (1999) described jute as a lignocellulosicbast fiber, which possesses hard and harsh qualities also make it difficult to produce apparel and other fancy fabrics to use in our day to day life. It is obtained from the bark of the jute plant containing three main categories of chemical compounds namely cellulose (58~63%), hemi-cellulose (20~24%) and lignin (12~15%) where the units of cellulose are surrounded and cemented together by lignin and hemi-cellulose. Jute has several advantages like lustrous golden appearance, high tenacity, high moisture regain, bio-degradability and other good properties; also the fiber can cut into staples of suitable length for blending with other fibers. Now a day's demand of diversified product is

*Corresponding author: Zakaria Ahmed; Email: zakariaahmed70@gmail.com
Mechanical Processing Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.

increasing. Jute-cotton blend fabrics can meet the demand of diversified products. Therefore, jute could be blended with cotton. The product obtained after blending jute and cotton would be sustainable in textile sector. The goal of the present study is to make sustainable fabric from jute-cotton blended yarn and test properties of this fabric which would surely strength our economy by cutting a part of the cost incurred for importing cotton and enhancing the value addition due to locally produced cheaper jute as a raw material.

2 Material and methods

In this study we used jute-cotton blend of different ratios while spun in rotor system and ring system. In rotor system 15:85, 35:65, 45:55 jute cotton fiber proportions was used to spun yarn. Firstly jute and cotton fiber was mixed with different proportion then mixed fiber passed through blow room. In blow room lap was formed. Then lap was transferred to carding where the card sliver was found. Then carded sliver was transferred to 1st drawing chamber and 2nd drawing chamber. Draw sliver was produced there. Draw sliver then transferred to rotor spinning where rotor spun yarn of jute-cotton was produced. For ring spun yarn we used same ratios of jute cotton as like as rotor spun yarn. In ring spun yarn jute cotton fiber passed through blow room, carding, drawing, simplex and ring frame machine. Simplex was used to make roving and roving was passed through ring frame to produced jute cotton blended yarn (**Fig. 1**). The tenacity, breaking elongation%, unevenness, thick and thin places, neps were identified for these rotor and ring spun yarns in the testing and standardization lab of BJRI.

Jute cotton blended yarn spun from Rotor and Ring spinning were then transferred to weaving department of Bangladesh jute research institute. The 3/1 twill wove fabric sample was prepared in Rapier loom using 45:50 jute-cotton blended yarn 30 Ne in warp and 20 Ne in weft. The ends/inch was 98 and picks/inch was 54. The fabric sample was dyed with reactive dye. The 2/1 twill woven fabric was also prepared in similar type of loom using 35:65 jute-cotton blended yarn 20 Ne in warp and 15 Ne in weft direction. The ends/inch was 70 and Picks/inch was 45. The warp yarn of the fabric sample was dyed with basic dyes. When fabrics from jute cotton blended yarn were made from rapier loom. The woven fabrics ware undergone different physical testing to measure its sustainability. Bundle strength test, elongation test, rubbing fastness test, wash fastness test were done to evaluate value of sustainability of these fabrics.

3 Results and discussion

Jute cotton blends yarn undergone tenacity test which indicates the required strength of yarn which was done by Shirley strength tester, Breaking elongation was done by elongator which help to measure elongation at break, thick and thin place and also evenness were measured by uster tester which helps to sort the yarn and count was measured by micronaire value (Table 1) (Kalyanaraman and Ramakrishnan 1995). Comparison on the properties of Jute-cotton blended yarn Ring spun and Rotor spun showing the increment of jute percentages. The comparison on Tenacity (cN/Tex), Breaking elongation (%) and Unevenness of jute cotton blended yarn which indicate that with the increment of jute percentages tenacity decreases, elongation and unevenness increases (Table 2). It is assumed that 15: 85 jute-cotton blended yarns were better as compared to 35:65 and 45:50 blends. It also gave result for 15:85 ratio of jute cotton blend thick place and thin place and neps % were less than other ratio of blends. It also revealed that jute cotton blends fabrics can be produced from these yarn bcz these yarn has all the property to make sustainable product. The yarn property of cotton is so much similar to jute cotton blend yarn (Debnath et al 2007). When fabrics were made different physical property was evaluated. The twill weave structure was chosen for fabric construction from jute-cotton blended fiber, it was seen that each fabric was woven with maintaining optimum spacing in the intersection of the yarns. The variations in the number of threads per unit length of fabric is in correspondence to the yarn count Ne, but the cover factors for both warp and weft and their resulting effect on the fabric was maintained almost identical. The fabric sample1 was prepared with Jute-cotton blended yarn with ratio 45:50, 3/1 twill structured, warp yarn count was 30 Ne and weft yarn count was 20 Ne, total no. of warp yarn and weft yarn per inch were 98 and 54 respectively, the cover factor was 24.85 and weight per unit area was 212 g/m^2. The fabric sample 2 was prepared with Jute-cotton blended yarn with ratio 35:65, 2/1 twill structured, warp yarn count was 20 and weft yarn count was 15, total no. of warp yarn and weft yarn per inch were 70 and 45, respectively, the cover factor was 24.50 and weight per unit area was 252 g/m^2 which has similarity found by Prathibadevi and Moses (2013). Strength was evaluated by strength tester (Table 3) where the breaking forces of sample 1 and sample 2 were 675.863 and 865.593 Newton, respectively at 18.338 and 24.653 mm elongation. The elongation percentages were 7.492 and 15.302 for sample 1 and sample 2, respectively. It was found that dyes stained on the fibers of the multifiber fabric show the rating was almost same for both the fabrics (Table 4) where the sample 1 was dyed with reactive dye and the warp yarn of the sample 2 was dyed with basic dyes. The staining on the diacetate, cotton, nylon, polyester, acrylic, wool for sample A and B was found in good rating value 3 to 4. Whereas, the dry rubbing fastness of sample 1 was better than sample 2 with the value 4 and 2-3, respectively, but the wet rubbing fastness was also for sample 1 was better than sample 2 (Table 5).

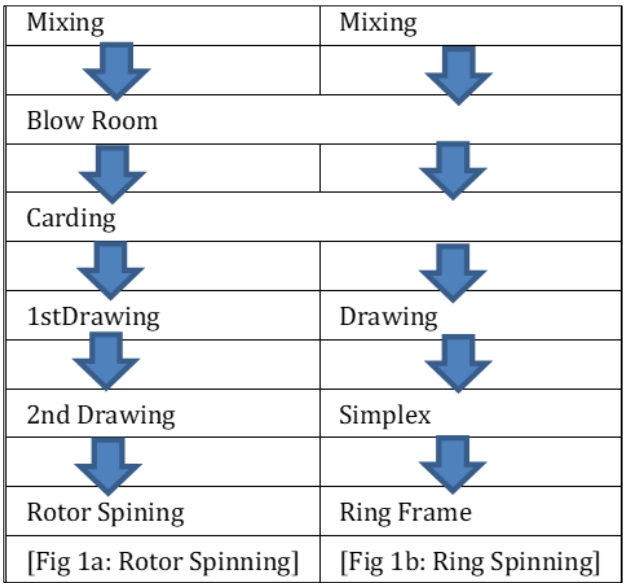

Figure 1 Flow diagram of Jute and Cotton Blends Spinning-(a) Rotor (b) Ring.

Table 1 The properties of jute-cotton yarns in different spinning techniques

Jute cotton ratio	Tenacity	Breaking elongation	Thick places	Thin places	Unevenness	Neps%	Spinning
15:85	8.5	6.25	211	110	16.20	405	Rotor
35:65	8.9	6.3	320	185	15.53	556	
45:55	9.1	6.7	556	130	16.30	465	
15:85	8.7	5.5	410	335	15.50	613	Ring
35:65	8.3	5.7	460	380	15.70	778	
45:55	8.6	6.0	780	467	16.10	635	

Table 2 Different physical properties of jute-cotton blended fabrics

Sample	Weight (g/m^2)	Yarn blends ratio	Fabric design	Yarn count	Thread per inch	Cover factor
1	212	45:55	3/1	Warp 30 ne	Ends 98 Picks 54	24.85
				Weft 20 ne		
2	252	35:65	2/1	Warp 20 ne	Ends 70 Picks 45	24.50
				Weft 15 ne		

Table 3 The strength of jute-cotton blended fabrics

Sample	Breaking force	Elongation at break	Elongeation %	Breaking strength	Tensile strength
1	675.863	18.338	7.492	675.863	6.8
2	865.593	24.653	15.302	865.593	8.7

Table 4 Wash Fastness of jute-cotton blended fabrics

Multi-fiber	Sample 1	Sample 2
Di-acetate	3	3
Cotton	4	3-4
Nylon	4	4
Polyester	3	3-4
Acrylic	3	4
Wool	4	3

Table 5 Rubbing Fastness of jute-cotton blended fabrics

Rubbing	Sample 1	Sample 2
Dry Rubbing	3	2
	3-4	2-3
	3-4	3
Wet Rubbing	2	2
	3	2-3
	2-3	2

4 Conclusion

This study will add a new dimension for developing diversified product because of the cheap abundance of jute fibers and more costly and non-available cotton fibers. Moreover, cotton-jute blending in the modified form and the fabrics made from the blended yarns may be used as Denim/Jeans products and in making curtains, bed covers, furnishing fabrics etc. The jute-cotton blended fabric with different proportion of jute and cotton fiber, which was used in present study, will help in characterizing weave design, yarn count, fabric density and cover factor, weight per unit area (g/m^2), fabric strength, dyeing performances such as wash and rubbing fastness, reflectance and color strength. The study reveals that, the characteristics of blended yarn fabric can be used as fully cotton fabric which may reduce the dependability on importable cotton fiber. Therefore, it may be concluded that, not only depending on the cotton fiber, but also jute-cotton blending may reduce the dependability on 100% cotton yarn and the use of fabrics made from Jute-Cotton blended yarns would surely strengthen our economy by cutting a part of the cost incurred for importing cotton and enhancing the value addition due to locally produced cheaper jute as a raw material which can be an opportunity to integrate the blended yarn into the production of jute cotton denim and other heavy fabrics also.

Compliance with ethical standards

Acknowledgments

Authors thank their colleagues from Bangladesh Jute Research Institute for sharing their pearls of wisdom with us during the course of this research.

Disclosure of conflict of interest

All authors declare that they have no competing interests.

References

[1] Pan NC, Day A and Mahalanabis KK (1999) Chemical Composition of Jute and its Estimation; Man-made Textiles in India, 9: 467–473.

[2] Shilpa P, Charankar V, Gupta M and Bhanuben MN (2007) Growing importance of Cotton blends in apparel market, Journal of the Textile Association, 201-210.

[3] Debnath S, Sengupta S and Singh US (2007) Properties of Jute and Hollow-polyester Blended Bulked Yarn, J Institution of Engineers (I). 87(1): 11-15.

[4] Prathibadevi RR and Moses JJ (2013) Effect of jute proportion on the color strength value of Jute/Cotton union fabric, Inter J Engi Res, 2(4): 294-299.

[5] Rahman MR, Huque MM, Islam MN and Hasan M (2008) Comp. Part- A. 39:1739-1747.

[6] Salam MA, Farouqui FI and Mondal MIH (2007) A Study on Sulphonated Jute-cotton Blended Yarn and Fabrics and their Characteristics, Bangladesh J. Sci. Ind. Res. 42(3): 281-286.

[7] Kalyanaraman AR and Ramakrishnan N (1995) Measurement of Blend Proportion in Jute–Cotton Yarn with the assistance of a High Volume Tester. The Journal of The Textile Institute, 86(4): 704-705.