

# Development of Environment-Friendly Jute Cotton Lightweight Blended Fabric and Its End Uses

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**ABSTRACT:** Blended fabrics are becoming favoured by the young new generation due to environmental concepts. This paper presents the development of 50% jute and 50% cotton blended yarn fabrics through handloom weaving system. Physio-mechanical properties of the blended light fabrics were investigated such as GSM, Picks/inch, Ends/inch, yarn count, tensile strength, shrinkage, and FTIR, etc. In this study, FTIR was applied on developed blended fabrics. The results showed a very good prospect of this developed blended light fabrics for diversified products. Shrinkage and strength along with other properties of the blended fabrics reflect that it is nearer to 100% cotton fabrics. Again it shows that lengthwise strength and shrinkage of blended fabrics are higher than cotton fabrics because of the different characteristics of these two cellulosic fibre jute and cotton. The blended fabric from them will have unique characteristics, appearance, and other many new peculiar types which could be used for development and diversification.

**KEYWORDS:** Blended fabric, Jute fibre, FTIR, Physical properties,

## I. INTRODUCTION

Nowadays, to create yarn, blending is the process of mixing fibers with various sources, lengths, or thicknesses [1]. When pricey fibers are combined with less expensive ones, desirable qualities like strength or durability are imparted, costs are reduced, or unique textural effects are achieved [2]. Blended yarn is the term used for yarn created from these fibers [3]. Blended fabric is a type of fabric manufactured from blended yarn.

Bangladesh is a major producer of jute (*Corchorus Olitorious-L*), a commercial bast fiber crop. It is one of the most affordable natural fibres and is second only to Cotton in the amount of product [4]. This is widely used as industrial raw material for the production of jute goods [5]. Due to the inroad of polyethylene, the use of jute and jute goods has been decreased. As an absolutely environment-friendly source, jute seems to have been regaining its importance. The world is no more ready to see ecological imbalance due to the use of synthetic substances. Yarns made from all jute are coarse and stiff due to the presence of lignin and non-cellulosic materials [6,7]. In the cotton spinning system, fibers are required to be of a certain staple length, due to these limitations. Normal jute fibers were not found suitable in the cotton spinning system. But Jute cotton blended fibers can play a significant role for making diversified products for today's needs can be developed [8]. Jute is being used as a packaging material for a long time. The market of traditional jute products like sacking, hessian, CBC etc is being shrunk day by day. So, for the survival of jute, it has become imperative to develop new jute products [9,10]. There is an urgent need to find truly diversified end-uses for jute. One way of diversification is the blending of jute with cotton and the production of appropriate fabrics from such blends. They are therefore more suitable for making such as shopping bags fabrics, home textiles (Bed covers, Sofa covers, Table cloth, Curtain cloth), etc [11]. A huge quantity of shopping bags is a need in our daily life. It will open up a new horizon of diversified jute products. Limited works had been done for the improvement of the particular property of the blended fabric. This experiment was

conducted during 2013-2015 at the Applied Chemistry and Chemical Engineering Department of Dhaka University, Centre for Advanced Research in Sciences (CARS), University of Dhaka, and Jute and Textile Product Development Centre, Bangladesh Jute Research Institute, Dhaka. Appropriate products made from jute and cotton blends are in great demand both in our country as well as abroad. In the last three years, we have done a considerable amount of developmental work and now established that 12s 50/50: jute/cotton blended fabric on handloom machine is commercially viable. The present work was undertaken to study the comparative physical properties of blended fabric and 100% cotton fabric. This paper mainly concerned with the maximum percentage of jute cotton blended yarn is used as blended fabric and its end products to find out the user-friendly products and compare to 100 % cotton fabric through mechanical and chemical treatment.

## II. MATERIALS AND METHODS

50% jute and 50% cotton blended 12s yarn

is prepared for the experiment purpose of blended fabrics & products. The yarn was collected from the jute and textile product development center, BJRI, Manik Mia Avenue, Dhaka-1207. Diversified jute cotton blended fabrics were produced on a handloom weaving machine with specific requirements like curtain cloth, home textile, lightweight net fabric, etc.

**Woven blended fabric:** The fabrics which are produced by two sets of yarn by interlacing are called woven blended fabric. The name of the two sets of yarn is warp yarn and weft yarn. After making raw blended fabrics, it is finished with hard and soft as the requirement of end-use. Then compared FTIR is tested of 50% jute & 50% cotton blended fabric and 100% cotton fabric. Properties of the blended fabrics were determined by the standard testing method. The compared test results were tabulated and shown below (Table.1). The physical properties of jute cotton blended fabric and 100% cotton fabric is given below. The physical properties of jute cotton blended fabric and 100% cotton fabric is given below.

Table 1. Properties of blended fabric and 100% cotton fabric

Properties	Blended fabric	100% cotton fabric
Materials	50% Jute & 50% Cotton blended fabric	100% cotton fabric
Type of weave	plane	plane
Weight Gram per Square Meter	115gm	105gm
No of thread per inch	Warp : 40 Weft : 32	Warp : 40 Weft : 32
Lengthwise tensile strength	39	34
Finishing width	105 cm	105cm
Yarn count	12 <sup>s</sup>	12 <sup>s</sup>
Fabric surface feeling	Harsh	Smooth

## III. RESULTS AND DISCUSSION

Compared FTIR data of blended fabric and 100% cotton fabric were studied using Fourier Transformation Infrared Spectroscopy

### IR Spectra of Jute blended fabric:

The characteristic features of the infrared (IR) spectra of jute blended fabrics are due to its lignin and hemicelluloses constituents. The IR Spectra of Jute blended fabrics were taken with good resolution and are shown in the Figure 1. peak assignments are given in table: 4. The H-bonded O-H stretching causes the broad band

between 3750 and 3285  $\text{cm}^{-1}$ . The OH is presented in the cellulose and hemicelluloses of the Jute fabric. The usual glucose linkage in the cellulose is characterized through the C-H Stretching around the 2910 band and 1323  $\text{cm}^{-1}$ . The linkage vibration is also observed at 777  $\text{cm}^{-1}$ . The asymmetric C-H deformation presented in methyl and methylene groups is observed by the 1431  $\text{cm}^{-1}$  band. The aromatic skeleton of lignin is observed at 1400  $\text{cm}^{-1}$ . The peak at 1323  $\text{cm}^{-1}$  is attributed to the aromatic ring breathing with C-O stretching in syringe units of lignin.

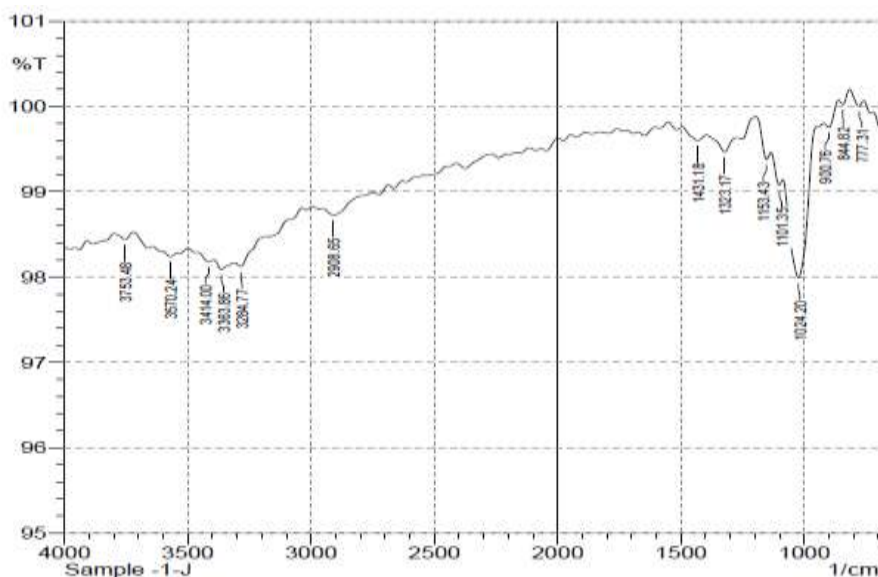


Figure 1. IR Spectra of jute cotton blended fabric

Table 2. IR Spectra report of jute cotton blended fabric

	Peak	Intensit	Corr. In	Base (H	Base (L	Area	Corr. Ar
1	777.31	100.003	0.108	815.89	758.02	-0.0183	0.0153
2	844.82	100.023	0.0966	862.18	815.89	-0.0171	0.0103
3	900.76	99.7536	0.143	921.97	862.18	0.0366	0.02
4	1024.2	97.9909	1.4409	1087.85	950.91	0.797	0.471
5	1101.35	99.0794	0.1543	1134.14	1087.85	0.1588	0.0176
6	1153.43	99.3778	0.2143	1195.87	1134.14	0.1127	0.0242
7	1323.17	99.4639	0.1805	1396.46	1274.95	0.225	0.0386
8	1431.18	99.5964	0.0998	1494.83	1396.46	0.1476	0.0236
9	2908.65	98.7248	0.12	2953.02	2792.93	0.8241	0.0398
10	3284.77	98.1225	0.1074	3311.78	3178.69	0.9912	0.0129
11	3363.86	98.0859	0.1034	3392.79	3311.78	0.662	0.0174
12	3414	98.177	0.0521	3458.37	3392.79	0.5123	0.0078
13	3570.24	98.2376	0.0516	3608.81	3541.31	0.512	0.0066
14	3753.48	98.4419	0.077	3797.84	3720.69	0.5133	0.0128

**IR Spectra of 100% cotton fabric:**

The character feature of the informed (IR) spectra of 100% cotton fabrics is due to its cellulose constituent. The IR Spectra of 100% cotton fabrics were taken with good resolution and are shown in the figure 2 peak assignments are given in table 3. The H-bounded-H stretching causes the

board band between 3950-3760  $\text{cm}^{-1}$ . The O-H is present in the cellulose of cotton fabric. The usual glucose linkage in the cellulose is characterized through the C-H stretching around the 2877-2890  $\text{cm}^{-1}$ . The linkage vibration is also observed at 767  $\text{cm}^{-1}$ .

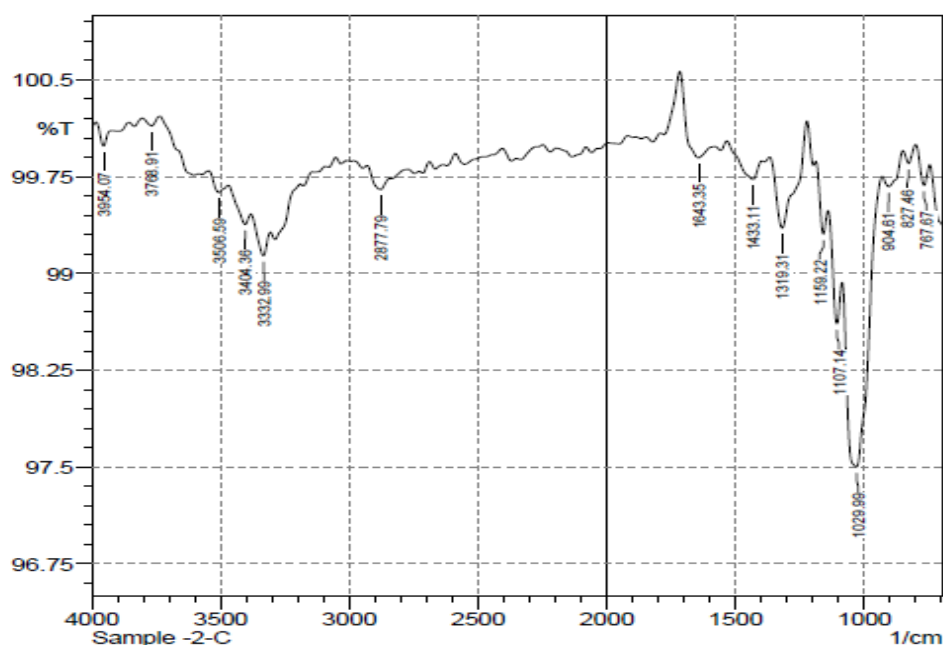


Figure 2. IR Spectra of 100% cotton fabric

Table 3. IR Spectra of 100% cotton fabric

	Peak	Intensit	Corr. In	Base (H	Base (L	Area	Corr. Ar
1	767.67	99.6817	0.222	800.46	746.45	0.0451	0.0285
2	827.46	99.8515	0.1223	850.61	800.46	0.0182	0.0129
3	904.61	99.6724	0.1426	929.69	850.61	0.0865	0.0355
4	1029.99	97.5007	1.7236	1085.92	929.69	1.0995	0.6502
5	1107.14	98.6091	0.532	1141.86	1085.92	0.254	0.0608
6	1159.22	99.3038	0.3258	1188.15	1141.86	0.0974	0.0325
7	1319.31	99.3505	0.6449	1367.53	1222.87	0.2119	0.2381
8	1433.11	99.7288	0.1843	1533.41	1396.46	0.0929	0.0627
9	1643.35	99.896	0.3573	1716.65	1579.7	-0.0189	0.1435
10	2877.79	99.6491	0.1282	2929.87	2841.15	0.1117	0.0292
11	3332.99	99.1361	0.234	3381.21	3305.99	0.2392	0.0393
12	3404.36	99.3792	0.1389	3469.94	3381.21	0.1928	0.0271
13	3506.59	99.6263	0.109	3547.09	3469.94	0.1063	0.0184
14	3768.91	100.143	0.0673	3803.63	3736.12	-0.0516	0.0101
15	3954.07	99.9874	0.1546	3983.01	3921.28	-0.0195	0.018

#### IV. CONCLUSION

Shrinkage and strength along with other properties of the above-blended fabrics reflect that it is nearer to 100% cotton fabrics. Again it shows that lengthwise strength and shrinkage of blended fabrics are higher than cotton fabrics because of the different characteristics of these two cellulosic fibre jute and cotton. The blended fabric from them will have unique characteristics, appearance, and other many new peculiar types which could be used for development and diversification.(1,2,3). Jute and cotton blended fabrics products are newly developed products. It is quite a promising field to improve the market demand for jute. The harsh feel of the surface of the blended fabric is the limitation of these fabrics and other properties are almost

shown similarly. blended fabrics could be used as end products. Home textile, curtain cloths, lightweight net fabrics, and shopping bags could be made by these fabrics. The method developed seems to be workable. Further study may be undertaken for more optimization of the blended fabrics forming process.

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