

**Research Article**

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Production of Coir-Jute Blended Yarn: A Comparative Study on the Performance of Jute and Coir-Jute Blended Yarn

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The demand for environmentally friendly fiber is increasing day by day. Jute is a source of eco-friendly fiber, but years to come, it will be more expensive as the production of jute is decreasing because of the availability of synthetic fiber at low cost. Coir fibers obtained from the husk of the coconut are highly available in the coastal area of Bangladesh, which is a good source of environmental friendly fiber. There is a large demand of jute products all over the world. If we utilize the coir fiber by blending it with jute, it can be a good solution to meet the demand. A method has been developed to produce coir-jute blended yarn and compare the property of blended yarn with 100% jute yarn. Coir fiber was treated with NaOH to achieve softer coir fiber. Coir fiber was blended with jute fiber at the proportion of 50:50 to produce yarn of 16lbs having quality ratio more than 121% and an acceptable range of co-efficient of variation of strength.

Keywords: Blended yarn; Coir fiber; Eco-friendly; Jute fiber**Introduction**

Blended fiber means unique fiber with unique characteristics. When two or more fibers mixed, a new fiber found with a new signature, which is called blended fiber. Generally, fiber is blended to gain a specific nature of a required product. That is why Coir and Jute fiber blended in this research. Coir fiber obtained from the husk of the Coconut [1]. Here, Husk means the outer shell of coconut [2]. Coconut is a palm plant and it is found in the humid tropical region as like Coastal areas [3]. Asia and East Africa are mainly farming the Coconut plant extensively [4]. Coir fiber has some physical properties such as it is 6-8 inches in length, the diameter is 0.1-1.5mm, density is 1.40, tenacity is 10.0, breaking elongation is 30%, and moisture at 65% RH is 10.50% [5]. Coir fiber has a wide range of applications. For instance, motorcycle helmet, cement, plaster, house construction, slope stabilization, wall paneling system, slabs, concrete [6]. Moreover, it has some general uses i.e. ropes, mattresses, floor mats, vehicle seats, brushes, brooms, furniture, etc. [6,7].

On the other hand, Jute is a lengthy vegetable fiber which is very mild [8]. Jute fiber can be spun into coarse and farm threads [8]. It is one of the cheapest natural bast fiber, and its source of origin is Corchorus plants and that is why its scientific name is Corchorus Capsularis [9]. It is available in Asian region but nowadays, some other regions are also cultivating Jute. Few countries are farming jute enormously & they are Bangladesh, India, China, Thailand, Nepal, Indonesia, Brazil [10,11]. Cultivation of Jute depends on some climatic factors such as temperature, humidity, rainfall etc. and Jute has a contribution to the national economy in some country [12]. Jute fiber also has some physical properties such as its length is 1.5-4mm, the diameter is 0.015-0.020mm, Strength is 3-4 gm/den, elongation is 1.7% at the break, Moisture regain is 13.75% [13]. Jute product is important both for human being and environment as it is biodegradable, eco-friendly and non-toxic [14]. Jute is a versatile fiber, and there is a plethora of applications of jute fiber such as sacking, foot wears, bags and soft luggage, tablecloth,

bed cover, cushion cover, napkins, sofa cover, blankets, floor cover, ornaments, etc. [15].

Here, this research mainly shows the performance of Jute and a comparative study on the performance of coir-jute blended yarn.

Materials and Methods

Materials

- Raw coconut fiber
- Jute fiber procured from KFD jute mill.
- Sodium Hydroxide
- Acetic acid

Methods



Figure 1: Coir fiber.

Softening of coir fiber: Raw coir fiber was immersed in a solution of NaOH and wetting agent in KFD jute mill in 1:25 material to liquor ratio and heated for 1 hour at 100°C. After softening the coir fiber washed with warm water and neutralized with 5% (w/w) acetic acid solution. After neutralization, the coir fiber was washed with normal water and dried in air (Figures 1&2).



Figure 2: Jute fiber.

Batching of jute: Jute fiber was batched with 24% emulsion used in jute processing and kept in a pile for 72 hrs (Figures 3&4).



Figure 3: Jute emulsion process.



Figure 4: Jute piling.

Preparation of blended yarn: The soft coir fiber and jute fibers blended in the following sequence:

- Soften coir fiber and jute fiber mixed by hand in 50:50 and then passed through breaker card to remove dust and other impurities and to form sliver rolls.
- The sliver rolls then fed to finisher card which make the sliver more uniform, parallel and regular in length and weight.
- The sliver rolls then passed through the first, second & third drawing frame to reduce the sliver width and thickness.
- The sliver rolls then carried out in the spinning frame to produce the blended yarn of 16lbs/spy.

Preparation of jute yarn: The jute yarn made by the following sequence:

- The batched jute fiber passed through breaker card to remove dust and other impurities and to form sliver rolls.
- The sliver rolls then fed to finisher card which make the sliver more uniform, parallel and regular in length and weight.
- The sliver rolls then passed through the first, second & third drawing frame to reduce the sliver width and thickness.
- The sliver rolls then carried out in the spinning frame to produce the jute yarn of 16lbs/spy (Figure 5).



Figure 5: Coir-jute blended yarn.

Results and Discussion

Table 1: Properties of coir-jute blended yarn.

Properties of the Yarn	Value
Count of the yarn	16lbs/spy
Tensile strength	19.45lbs
Quality ratio	121.56%
Coefficient of variation of strength	12.13%
Twist per inch	3.2

Properties of the blended yarn determined by standard testing methods. The results discussed below (Tables 1&2):

Table 2: Properties of jute yarn.

Properties of the Yarn	Value
Count of the yarn	16lbs/spy
Tensile strength	15.19lbs
Quality ratio	107.27%
Coefficient of variation of strength	14.18
Twist per inch	3.2

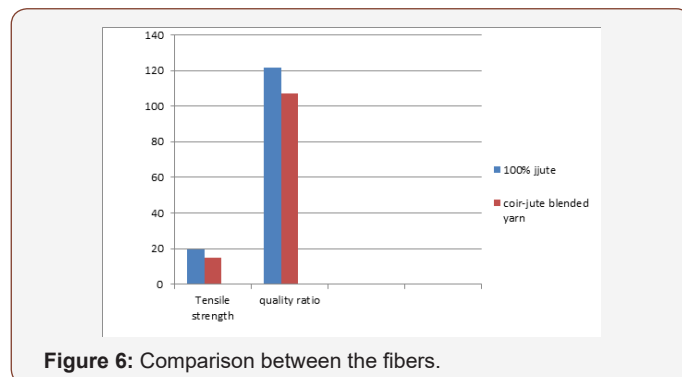


Figure 6: Comparison between the fibers.

From the figure 6, it is seen that the property of coir-jute blended yarn is better than 100% jute yarn. The Quality ratio, Tensile strength, CV% of the strength of the coir-jute blended yarn is better than 100% jute yarn.

Conclusion

The properties of blended yarn of coir fiber and jute fiber in the ratio of 50:50 show that it is possible to produce 16lbs /spy in 50:50 proportions by jute spinning system. Tensile strength of the yarn was 19.75lbs, coefficient of variation of the strength was 12.13% and the quality ratio was 121.56%, which are within an acceptable range. The coefficient of variation of the strength 12.13% indicates uniformity of the blended yarn. From the above discussion, the method of developing blended yarn seems to be effective.

Author Contributions

This project work has been done under the supervision of M.R.K. with the help of T.I. Moreover, R.S. and P.B. have done the

specimen fabrication, characterization, testing, data analysis, and presentation part with the help of A.I.D. and S.M. All authors read and finally approved the manuscript.

Conflicts of interest

The authors declare that they have no competing interests.

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