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DEVELOP BLENDED YARN AND EVALUATE THEIR PROPERTIES

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ABSTRACT

This resulted in the production of three distinct varieties of yarn in the ring frame, with two counts available for each. The draw frame was used for the blending process. The parameters and settings were optimized during processing. Traditional handlooms were used to create textiles. The cloth was purchased at the market, and it was 100% wool. Fabrics were chosen after careful consideration of their physical features, including those of mixed yarn, blended wool, and 100% wool. Metal complex dye was used during the dying process. After then, the new clothing for working women was designed, constructed, and approved.

KEYWORDS: Behaviour Elastic Friction Mechanics Twist Blended yarn

INTRODUCTION

Mixing is a method used to compensate for the shortcomings of a single fiber. The process of blending fibers that maximizes desirable characteristics while dampening undesirable ones. In addition, it reduces costs throughout the production of cloth. One example is yarn made from a combination of jute and cotton (Bhardwaj et al., 2012). A suitable method of jute diversification that might lead to the production of value-added goods is to combine it with cotton fiber. Advantages of jute fibers include their great toughness, excellent qualities, and shiny golden look. A new category of jute-based textiles with a growing domestic and international market may be created via the use of mixing and softening processes.

Fabrics are often blended to improve their performance and appearance. Blending is the process of combining two or more fiber masses to create a new fiber with properties that are an average of those of the original fibers. Although blending has been around for quite some time, the textile industry has just lately begun to take notice.

LITERATURE REVIEW

Haque, Md.Mahbubul & Maruf, Nadim. (2016). This article compares the characteristics of 100% cotton yarn with those of 50/50 and 20/80 cotton-polyester mixed yarns. Here, the ring frame spun both 30 Ne and 40 Ne counts of three distinct yarn types (100 percent cotton, 50/50 cotton/polyester blends, and 20/80 cotton/polyester blends). The draw frame was used for the blending process. Spindle speed and twist multiplier were two factors that were optimized throughout processing. The results of the research reveal that 50/50 and 20/80 mixed yarns may be spun at a greater pace and with a lower twist multiplier in a ring frame compared to 100% cotton yarn. It is feasible to spin 20/80 blended yarns at a faster spindle speed

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while using a lower twist multiplier than 50/50 mixed yarns. The U%, or the amount of irregularity in the sliver/yarn, was shown to decrease across the board with increasing polyester percentages. The percentage of polyester in the yarns was also shown to have an effect on the number of yarn flaws (IPI). 50/50 and 20/80 mixed yarns both outperformed 100% cotton in terms of strength, with the latter outperforming the former.

Asghar Ali (2014) Manufacturers of spinning equipment say that yarn made using the Intimate blending method and automated metering devices is more uniform in both the longitudinal and transverse directions than that made using the Creel blending method. This thesis sets out to examine and contrast the quality and tensile qualities of yarns manufactured with various counts using both mixing strategies. Twist Tornic code is a semi-automated equipment used to measure the yarn's twist. Polyester/cotton blends may be evaluated using the solubility test technique. Results show that Intimate mixed yarn is superior than other types of yarn.

Dr. Nishi Dubey (2011), This research was conducted with the final goal in mind of making a fabric out of a combination of oak tasar and wool. The investigation's broad goals informed the development of the technical program of the work. Therefore, it was decided to conduct experiments to learn more about the two fibers' profiles, optimize the blends used to create yarns, develop fabrics from the yarns spun with the optimal blend proportion, test the fabrics' properties, look into potential applications, and calculate the associated costs.

Neelam Saini (2020) Reusing existing materials allows for the creation of new items that have improved properties. Additionally, researchers were compelled by dwindling natural resources to develop novel synthetic items by recycling existing ones using cutting-edge technology. The physical qualities of yarns and textiles woven from recycled wool, acrylic, and polyester fibers and fabrics were compared with those of yarns and fabrics woven from virgin fibers and fabrics. Fabrics' tensile strength, elongation, and bending length were measured, as were the physical qualities of the yarns used to make them. Recycled yarns and textiles were found to have physical attributes that were on par with those of fresh yarns and fabrics. Recycled yarns and textiles were just as strong as the controls. Hence, woollen garments with desirable qualities like smooth texture, attractiveness, etc. may be made from recycled yarns and fabrics.

ANM Ahmed Ullah (2016) Bangladesh's jute manufacturing industry dates back to the country's colonial era. It is challenging to construct clothing and other fancy materials out of jute because of its rough and abrasive properties as a lignocellulosic bast fiber. To lessen the need for cotton, a jute-cotton hybrid is one possibility. The purpose of this study is to define the properties of the Jute-cotton mix. In this study, 2/1 and 3/1 twill textiles were woven from a Jute-cotton mixed yarn at 50:50 and 30:70 proportions, respectively.

STRUCTURE AND TENSILE PROPERTIES OF YARN: STUDIES WITH JUTE BLENDED YARNS

By the examination of test findings, the goal of this study was to gain insight into the structure and tensile behavior of jute blended yarns, namely jute/cotton and

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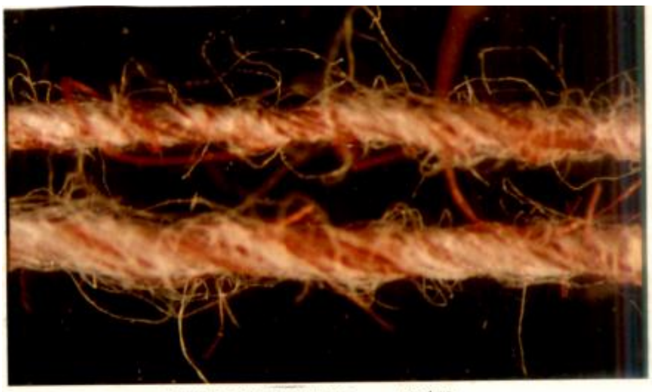
jute/viscose yarns. The tensile behavior of blended yarns is expected to be affected by both jute and the other fiber in the blend, in addition to the influence of yarn structure, as stated before, in contrast to findings found with viscose yarns.

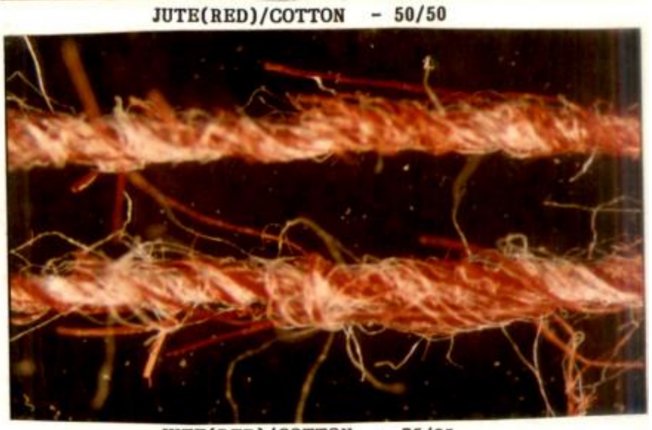
YARN STRUCTURE

Using an optical microscope, yarns made from a combination of rotor- and friction-spun jute were analyzed for their structural characteristics. The pictures show that:

At various blend percentages, the rotor-spun jute blended yarns have a structure similar to a typical t • rotor-spun yarn, whereas the friction-spun jute blended yarn progressively changes from having a typical friction-spun yarn structure to having a structure with decreased fiber helix angle dispersion.



JUTE(RED)/COTTON - 50/50



JUTE(RED)/COTTON - 75/25

FIG 1 LONGITUDINAL VIEWS OF JUTE-COTTON BLENDED YARNS SPUN ON ROTOR SPINNING SYSTEM

YARN TENSILE PROPERTIES

The initial modulus, breaking * extension, and tensile strength of jute-blended yams are summarized in Tables 1, 2, and 3. Yarn toughness decreased with increasing jute percentage in rotor-spun jute/cotton and jute/viscose mixes. When more jute fibers are introduced into the blended yarn, the breaking lengths of the component fibers are more likely to be randomly distributed. Friction-spun mixed yarns may have a lower tenacity and a smaller reduction in tenacity with increasing jute% because of the greater dispersion in fiber orientation and reduced compactness. In terms of fiber

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properties, it is not anticipated that this would significantly alter the tensile parameters at rupture of blended yarns.

TABLE-1 Tenacity of Jute Blended Yarns

Material	Blend Ratio	Tenacity (CN/Tex) Rotor-spun Yarn	Friction-spun Yarn
Jute/ Viscose	25/75	7.1	3.1
	50/50	6.0	3.3
	75/25	5.5	2.6
Jute/ Cotton	25/75	10.7	2.8
	50/50	6.1	2.5
	75/25	4.9	2.2

TABLE- 2 Breaking Extension of Jute Blended Yams

Material	Blend Ratio	Breaking Extension (%) Rotor-spun Yarn	Friction-spun Yarn
Jute/ Viscose	25/75	8.3	11.0
	50/50	3.6	10.5
	75/25	2.8	10.3
Jute/ Cotton	25/75	10.6	23.3
	50/50	6.6	22.9
	75/25	3.1	14.4

TABLE- 3 Tensile Characteristics of Blended Yarns at Small Strain

Material	Blend Ratio	Initial Modulus (N/Tex) Rotor-spun Yarn	Friction-spun Yarn
Jute/ Viscose	25/75	2.1	1.0
	50/50	2.5	1.1
	75/25	3.0	1.0
Jute/ Cotton	25/75	1.4	0.9
	50/50	1.4	0.9
	75/25	2.3	0.9

The breaking extension of rotor and friction-spun jute/cotton and jute/viscose blended yarns was found to decrease with increasing jute percentage, as was the case with tensile strength. Since the breaking extension of blended yarns has reduced, the percentage of jute fibers, which are less elastic, has increased. Although friction-spun blended yarns were not as dense as rotor-spun yarns, their breaking extension was much higher. The initial modulus of rotor-spun blended yarns increased with increasing amounts of high modulus jute fiber compared to the initial modulus of friction-spun blended yarns. As friction yarns tend to have a less dense yarn structure, we may infer that the fibre tensile qualities are less likely to have an impact on the yarn's final properties. Rotor yarns have a greater initial modulus compared to friction yarns because of their improved fiber cohesion, particularly at the core.

PHYSICAL PROPERTIES OF BLENDED YARNS

The major characteristics of yarn are its count, twist, strength, and evenness. These characteristics affect the overall quality of the cloth and its practicality.

Yarn Count

One quantitative representation of yarn fineness is its "yarn count." The yarn count may be calculated in two ways: directly and indirectly. Yarn count determines the fabric's density, weight, and set (fabric count).

Table 4 Count of blended yarns

Sample ID	Yarn count (Nm)
WPA	2/48
WPP	2/64
WNP	2/72

Table 4 show that the yarn count for WPA is 2/48, for WPP it is 2/64, and for WNP it is 2/72. WNP yarn has the finest yarn count, followed by WPP and WPA. The inability of angora fiber to be spun effectively is largely to blame. Ammayappan also reports a similar finding (2014). He said that the difficulties in spinning angora fibre meant that it was unsuitable for the mainstream garment market.

Yarn Twist

Yarn gets twisted when it is bent around a curve. The yarn is strengthened by the twist because it ties the fibers together. The twist in the yarn is what holds it together. Yarn's performance, product, and pricing are all impacted by the twist count.

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Table 5 Amount of twist in blended yarns

Sample ID	Twist (tpi)
WPA	11.1
WPP	10.8
WNP	14.6

There are 11.1 twists per inch in the WPA yarn, 10.8 in the WPP yarn, and 14.8 in the WNP yarn. WNP yarn has the most twist, followed by WPA and WPP. As compared to WNP yarn, the twist factor of WPA and WPP blended yarns is lower, making them ideal for usage in women's clothing textiles. According to Patil, Singh, Kolte, and Dabero (2017), the number of twists used in yarn manufacturing has a significant impact on the yarn's qualities.

Yarn Strength

Yarn breaks mostly due to the yarn's strength. It's connected to traits like tenacity and lengthening. Yarn breakage may be minimized with the use of its tensile strength and elongation. Read on for more on the durability of mixed yarns.

Table 6 Strength properties of blended yarns

Sample ID	Tenacity (gm/Tex)	Elongation (%)
WPA	8.08	17.01
WPP	7.24	11.68
WNP	10.2	21.85

Tenacity data for WPA, WPP, and WNP yarns are shown in table 6 with values of 8.08, 7.24, and 10.2g/Tex for each type. Most durable of the three types of yarn tested was WNP yarn, followed by WPA and WPP. The increased twist of the yarn is mostly to blame for this. Tenacity improves with a higher twist factor in yarn, as Tyagi, Goyal, and Chattopadhyay (2013) described in detail.

WPA, WPP, and WNP yarns have respective break elongations of 17.0, 11.7, and 21.9%. Due mostly to the greater extension of nylon compared to polyester, WNP yarn is reported to have the maximum elongation at break, followed by WPA and WPP yarns.

Yarn Evenness

The final fabric's look is affected by the yarn's evenness, which is the variance in mass per unit length. The fineness of the yarn is correlated with its evenness. U%, thick spots, thin spots, and neps concentration are used to describe it.

Table 7 Evenness of blended yarns

Sample ID	U%	Thin places	Thick places	Neps content
WPA	14.2	120	150	430
WPP	14.1	20	70	1000
WNP	17	200	200	1480

WPA yarns have a U% of 14.2, WPP yarns are 14.1, and WNP yarns are 17%. The coarser yarn used in WPP and WPA makes them more common than WNP yarn. The number of fibers per unit area in the yarn's cross section is a major factor in its evenness (Samantha, 2014). As compared to WPP (64) and WNP (72) yarns, WPA (48Nm) yarn is coarser. U% of WNP yarn increases as yarn count decreases because there are fewer fibers per unit area (72Nm). WPP yarn is finer than WPA yarn, yet equal values of yarn evenness have been reported.

CONCLUSION

We conclude that the compactness of the yarn, the orientation of the fibers, the mobility/segmental rearrangement of the fibers, and the compatibility of the tensile characteristics of jute and its blend partner, cotton or viscose, all play a role in the small and large deformation behaviour, visco-elastic behaviour, and elastic recovery of rotor- and friction-spun jute blended yarns.

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