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Influence of blend ratio in the properties of bamboo and silk woven fabrics

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Abstract- Blending different types of fibres is a widely practiced means of enhancing the performance and the aesthetic qualities of a fabric. Blended yarns from natural and man-made fibres have the particular advantage of successfully combining the good properties of both fibre components, such as comfort of wear with easy care properties. These advantages also permit an increased variety of products to be made, and yield a stronger marketing advantage. Fiber blending can achieve quality products that cannot be realized using one fiber type alone, and it can also reduce the cost by substituting a less expensive fiber for a more costly one. So, the study was conducted to blend silk and regenerated bamboo to produce value added products with the objectives -To blend Bamboo fibre with silk, to construct fabric of plain weave using blended yarn and to produce value added products from the woven fabrics. The bamboo and silk fibre was blend in carding and drawing stage and yarn were produced in three different ratios 20:80, 50:50 and 80:20.These yarns were further weaved in plain weave and the functional properties of the fabrics produced were evaluated .It was found that the woven blended bamboo mulberry fabrics can successfully use for producing value added products.

Index Terms- Regenerated bamboo, Silk, Blending, Carding, Drawing.

I. Introduction

Clothing is one among the most important three basic needs in every human life. It protects our body from various climates and gives us a good appearance. Clothing is an integral part of human life and has a number of functions: adornment, status, modesty and protection. Consumers are becoming increasingly very much conscious to environmental friendly consumer goods and much concerned about the green activities. This tendency for eco-friendly come into contact with the skin for a prolonged period of the time says Dharani *et al*. (2010). Fiber blending has been a common practice in the textile industry for a long time, stimulated to a great degree by the availability of an ever increasing number of manmade fibers. Fiber blending can achieve quality products that cannot be realized using one fiber type alone, and it can also reduce the cost by substituting a less expensive fiber for a more costly one. (Das, *et al*., 2009). The survival of textile industry depends primarily on the diversification of end products to meet the national as well as international demands. Diversification in the product can be brought about at various stages viz., yarn, fabric, design, fashion and style. Blended fabrics can be created with variegated novelty effect that caters to the fashion world today. Hence, the study was proposed with the following objectives:

- To blend regenerated bamboo fibre with silk, and
- To construct fabric of plain weave using blended yarn.

II. Materials and Methods

Bamboo fibre is regenerated cellulosic fibre produced from bamboo. The type of bamboo used for apparels is Moso bamboo (*Phyllostachys pubscents).* Mulberry silk is comes from the silkworm, *Bombyx mori L*, which solely feeds on the leaves of mulberry plant. Form of availability of raw material of bamboo and silk are differ, and also the basic fiber properties vary, hence they need to undergo different processes till they are suitable for good blending. The silk is always available in cocoon form. These cocoons contain sericin gum which is to be removed for further smooth processing. So the first process is degumming further followed by other processes. Both the fibres were blend in carding and drawing stage and Yarns of three different blends along with 100% bamboo and silk yarn were produced after proper blending. The blend proportion of prepared yarns samples were 20:80, 50:50 and 80:20 of bamboo/silk . The yarns produced were then wound to form cones. The controlled and blended fabrics were weaved in the Fabric plus industry Private Ltd. Guwahati, Assam. From the different blended yarn, fabrics were constructed using plain weave. Blended yarns of different ratios were used for making fabrics in both warp and weft. The nomenclature of the fabric sample was done according to the blend proportions.

Table 1. Constructional details of regenerated bamboo and mulberry silk blended fabrics

Sl. No	Sample	Weave	Types of loom	Yarn count	Composition Warp weft % %	Reed count	Loom pick	Cloth width
1	Bamboo 100%	Plain	Handloom Fly Shuttle Loom	1/60 s	Same in both way	48	54	36”
2	Mulberry 100 %	Plain		1/60 s	Same in both way	48	54	36”
3	Bamboo Mulberry 20:80	Plain		1/60 s	Same in both way	48	54	36”
4	Bamboo Mulberry 50:50	Plain		1/60 s	Same in both way	48	56	36”
5	Bamboo mulberry 80:20	Plain		1/60 s	Same in both way	48	54	36”

Note:

BP=Bamboo (control) plain weave
MP= Mulberry (control) plain weave
BMP 20:80= Bamboo x mulberry silk plain weave (20:80 ratio)
BMP 50:50= Bamboo x mulberry silk plain weave (50:50 ratio)
BMP 80:20= Bamboo x mulberry silk plain weave (80:20 ratio)

III. Research Findings

The findings of the study are presented in the following head.

Assessment of Functional properties of blended fabrics:

The test fabrics were tested for their functional properties such as tensile strength, elongation, wicking height, abrasion resistance, absorbency etc. according to the IS and BS methods.

Table 2. Tensile strength of plain weave blended fabric (kg f)

Fabrics	**Tensile strength (kg f)**	
	Warp way	**Weft way**
BP	53.12	42.65
MP	53.49	44.43
BMP 20:80	58.07	53.54
BMP 50:50	62.00	47.80
BMP 80:20	54.67	55.67
S.Ed(±)	**0.34**	**0.20**
CD	**0.65**	**0.54**

The results are the arithmetic mean of five determination of each sample.

Table 3. Elongation of plain weave blended fabric (%)

Fabrics	**Elongation (%)**	
	Warp way	**weft way**
BP	20.09	19.65
MP	22.52	24.78
BMP 20:80	24.02	22.31
BMP 50:50	25.12	24.80
BMP 80:20	23.71	25.67
S.Ed(±)	**1.08**	**0.40**

C.D	**2.45**	**0.87**

Table 4. Drape co-efficient of plain weave blended fabric (%)

Fabrics	Drape co-efficient %
BP	46.10
MP	48.39
BMP 20:80	43.12
BMP 50:50	45.34
BMP 80:20	41.56
S.Ed(±)	**0.75**
CD(0.05%)	**0.22**
CV%	**0.26**

Table 5.Wicking height of plain weave blended fabric (cm)

Fabrics	Wicking height(cm)	
	Warp way(cm)	Weft way(cm)
BP	6.04	6.80
MP	4.05	4.15
BMP 20:80	6.35	6.40
BMP 50:50	6.55	6.90
BMP 80:20	6.90	6.95

The results are the arithmetic mean of five determination of each sample.

Table 6. Water Absorbency of the blended woven fabric(%)

Fabrics	Absorption (%)
BP	55.52
MP	49.21
BMP 20:80	56.54
BMP 50:50	58.14
BMP 80:20	61.87
S.Ed.(±)	**0.28**
CD	**0.47**

The result of the tensile strength of plain weave blended fabric, the Table 2, illustrated that among the test samples highest tensile strength (62kg f) was shown by BMP 50:50 in warp direction, and the least was exhibited by BP (53.12kg f). While in weft direction, sample BMP 80:20 has a maximum strength (55.67kg f) and lowest tensile strength was found in BP (42.65kg f).The highest tensile strength was found in the blended samples, which may be due to the highest strength of the silk fibres. The table 3, showed the elongation of test samples. From the table it was observed that the elongation of all the samples in warp way have more or less difference with each other. In warp direction sample BMP 50:50 shows highest elongation (25.12%) followed by BMP 20:80 (24.02%). The lowest value was found in control bamboo plain weave fabrics (20.09 %).While in weft direction sample BMP 80:20 shows maximum elongation (25.67 %) while sample BP and BMUP 20:80 were at par (19.65%).

Table 4, Illustrated the drape coefficient of controlled and blended fabrics. It depicts that the highest drape coefficient (48.39%) was found in controlled fabric sample MP and least drape coefficient was found in fabric sample BMP 80:20 (41.56). Drapability of a fabric is combined effect of several factors such as stiffness, flexural rigidity, weight, thickness etc. Stiffness, an attribute of fabric hand is one of the most important factors determining draping quality of fabric e.g. soft fabric drapes closer to the body forming ripples whereas stiff fabric drapes away from the body. (Pant, 2010) From table 5, it can be seen that the wicking height of plain weave test fabrics found to be maximum in control fabric of bamboo mulberry 80:20 (6.90 cm) and minimum value was found in MP control sample (4.05cm) in warp direction. While in case of weft ways, BMP 80:20 registered highest wicking height (6.95cm) and lowest was seen in MP (4.15cm).The sample BMP 80:20 showed maximum wicking height (table 5) in both warp and weft direction may be due to higher percentage of bamboo fibre in blended yarn. Since the bamboo fibre has good absorbency properties, so it may increase the wicking height of the tested samples. On the other hand MP showed a decreasing trend of wicking height in both the warp and weft direction, which may be due to higher percentage of sericin present in the fibre. In case of the water absorbency of the woven fabrics, the bamboo mulberry 80:20 blended test fabrics attained the highest absorbency (61.87%) while MP control sample recorded lowest absorption of water (49.21 %). It may be due to the amount of gum present in mulberry fibre. But in case of other blended samples also absorbency increases with the increase in bamboo content.

IV. CONCLUSION

Both regenerated bamboo and silk fibre can be used to blend with different proportions. Considering all the physical tests, the 80:20 blend proportion shows better result than other blends, which is required for clothing materials. From the aforesaid, it can be inferred that all the three proportions can be used for producing the blended yarn. Blending of bamboo with silk fibres offers excellent scope for producing a variety of materials for different uses. Apart from these blend proportions, different blend proportions can be tried with silk & other fibers for different end uses.

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