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Effect of Blend Ratio on the Quality Characteristics of Bamboo/Cotton Blended Ring Spun Yarn

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Abstract
The present study reveals a comparison of the physical properties of three sets of bamboo/cotton blended yarns of linear density 19.68, 14.76 and 11.81tex with those of 100% cotton yarn. Each set consisted of three yarns of fibre blend ratios 67:33, 50:50, and 33:67. The test results showed that for all the three sets of yarn, the properties of the 50:50 blended yarns were comparable with those of the 100% cotton yarn. In the case of the 19.68-tex yarn set, the 67:33 blended yarn showed properties similar to those of the 50:50 blended yarn. It was also observed that increasing the bamboo content led to a reduction in properties. Thus the quality characteristics of the blended yarn depend upon the bamboo content in the blend.

Key words: *blending, yarns, bamboo/cotton ratio, ring spun yarn, physical properties.*

Introduction

It is well known that textile fibres are blended to obtain desirable combinations of properties [1, 2], and that intimate blending, which is an almost random mixing of different staple fibres, is the most common practice.

Natural fibres and their blends with classic fibres bear valuable properties, so at present there are various products made of these fibres. It is observed that in respect of properties like the absorption and discharge of moisture, non-irritating, antibacterial, and anti-allergic characteristics, protection against the Sun‘s harmful ultra-violet rays and other valuable properties, blended yarns are better than classic yarns. Hence they may be used for clothing, underwear, socks, hygienic textile products as well as for composites [3].

In the cotton spinning process, blending has the objective of producing yarn with acceptable quality and reasonable cost. A good quality blend requires the use of adequate machines, objective techniques to select bales and knowledge of its characteristics. Knowledge of the importance of blended products in the textile industry and the generally rising costs of production make the achievement of economic and good quality blends with different kinds of cotton more and more critical [4].

The blending of fibres is usually done using different fibres with variations in their properties, with a view to achieving or improving certain characteristics of the yarn form or its processing performance. Fabric produced from blended yarn might have better characteristics than those obtainable from a fabric produced from a single fibre [5]. The blending of cotton with other fibres is done to impart drape, comfort, durability, dyeability and other properties to fabric products. Any successful attempt to blend new fibres with cotton would be a breakthrough in the field of textiles.

The blending of different types of fibres is a widely practised means of not only enhancing the performance but also the aesthetic qualities of textile fabric. Blended yarns made 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, yielding a stronger marketing advantage [6]. Prediction of the mechanical properties of blended yarns has also been studied by numerous authors [7 - 11]. Theoretical and mathematical models were proposed in these studies.

Bamboo and bamboo-cotton blended yarns are a key part of the ‘natural product’ theme and are recommended for use in ‘soft look/soft feel’ textiles, like towels, knits and socks, as well as in home-textiles sourced by leading global MNC brands. Yarns of bamboo fibre provide the desirable properties of high absorbency, antimicrobicity and soft feel in textiles and made-ups. The present study was conducted to find out the impact of the bamboo/cotton blend ratio on the quality characteristics of yarn and also to optimise the blending ratio that produced excellent quality yarn.

Material and methods

The experimental part of the present study investigating the influence of the bamboo content in bamboo/cotton blends at the different stages of spinning fibre to make yarn was carried out at the TIFAC-CORE Textile Research Centre and Centre of Excellence for Textiles, Kuamarguru College of Technology (KCT), Coimbatore, Tamilnadu, India.

Cotton samples of Sankar-6 were obtained from a spinning mill; the mean fibre properties were found to be as follows: fibre length 27.27 mm, fibre length uniformity ratio 49.58%, fibre fineness 4.52 ug/in, fibre maturity 82.53% and trash content 0.19%.

The bamboo fibre chosen for the study had the following fibre quality characteristics: length 36 mm, linear density 0.155 tex, moisture regain 11.42%, and elongation 21.2%. Besides preparing 100% bamboo and 100% cotton yarns, blended yarn of blend proportions 67:33, 50:50 and 33:67 bamboo: cotton were also prepared for the study. It should be emphafised thad the bamboo fibres are the cellulose fibres manufactured from bamboo polp.

The process steps of fibre blending, lap production, carding, drawing, rove-preparation and spinning were controlled to result in blended yarn of linear density 19.68 tex, 14.76 tex and 11.81 tex. The blended yarn samples were evaluated for specific properties at the Textile Testing Centres of Thiagarajar Polytechnic College and Sona College of Technology, Salem, India. Yarn strength was tested using a Universal Tensile Strength

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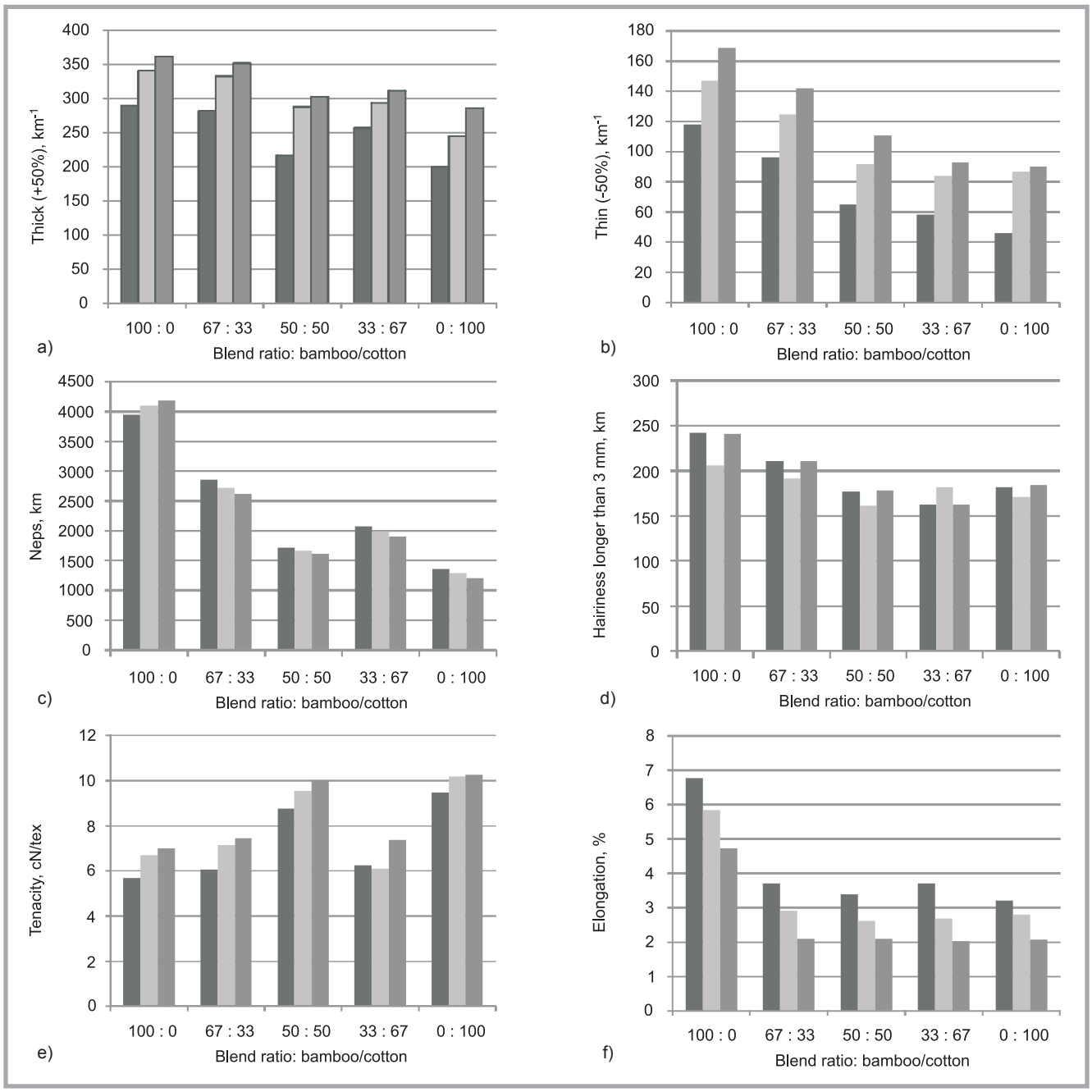

Figure 1. *Relation between blend ratio and thick places (a), thin places (b), neps (c), hairiness index (d), tenacity (e), and elongation (d) of bamboo blended yarn; ■ - 19.68 tex, ■ - 14.76 tex, ■ - 11.81 tex.*

Tester, and yarn irregularities and yarn hairiness with an Uster Evenness Tester, all of which performed under standard conditions of temperature and humidity. For the evenness and hairiness tests, 10 ring cops were used, and for the yarn strength test, 20 specimens from each of the 10 cops were tested.

Results and discussions

Figure 1.a shows the relationship between the yarn blend ratio and thick places for the three sets of yarn. It is clearly evident that the number of thick places increases with the bamboo content in the blend, irrespective of the yarn linear density.

Figure 1.b shows the relationship between the blend ratio and number of thin places in the yarn for the three sets of yarn. It may be observed that the number of thin places increase with the content of bamboo in the blend, irrespective of yarn linear density.

Figure 1.c shows the count of neps/km for the three sets of yarn. The increasing trend of neps with an increase in bamboo content in the blend may be clearly seen. It is also apparent that there is a marginal increase in neps in 50/50 bamboo/cotton yarn compared with 100% cotton yarn.

Figure 1.d displays the yarn hairiness index for the three sets of blended yarn. Here too, despite the increasing trend of hairiness with bamboo content, the hairiness of 50:50 bamboo: cotton yarn is closely comparable with that of 100% cotton yarn.

Figure 1.e shows the yarn tenacity in relation to the blend ratio for the three sets

of yarn under investigation. The overall trend is that an increase in bamboo content decreases yarn tenacity. Here again, 50:50 blended yarns show values that are comparable with those of 100% cotton yarn for all three sets of yarn.

The influence of bamboo content in blended yarn on yarn elongation is displayed in ***Figure 1.f***. The decrease in elongation with an increase in bamboo content is clearly visible. The elongation of 50:50 blended yarns is seen to be similar to that of 100% cotton yarn, irrespective of the yarn linear density.

While the overall trend appears to indicate that the bamboo content distinctly influences yarn properties, it may also be observed that the properties of the 33:67 blend show values that appear to deviate from the trend, especially in the case of the number of neps and yarn tenacity. The cause of the visible departure from consistency is not clear at present, and more elaborate work will need to be done to ascertain the reasons. Moreover further work is planned for a study of the comfort properties of knitted fabric produced from these yarns.

Conclusions

The following conclusions were arrived at from the above study.

- An increase in the bamboo content of bamboo:cotton blended yarn has a significant influence on the overall quality of the yarn in terms of yarn imperfections and mechanical properties, such as strength and elongation, for the linear density of yarns studied.
- It is also interesting to note that the quality of 50/50 bamboo/cotton blended yarn is most closely comparable with that of 100% cotton yarn. Hence it would seem advisable to blend cotton with bamboo to obtain the necessary fabric comfort rather than opting for 100% bamboo, which has less desirable properties and is also not cost-effective.

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