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Effect of Cotton/Micropolyester Blends on Physical Properties of Ring Spun Yarn

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Abstract

The present study reveals a comparison of the physical properties of cotton/micro polyester yarns of count $30^{s}Ne_{c}$ with those of the 100% cotton and 100% micro polyester yarn. This set consists of 5 blend ratios 80:20, 65:35, 50:50, 35:65, 20:80 along with 100% cotton and 100% micro polyester. These yarns are tested for its strength, yarn evenness and imperfections. The properties of the 65:35 blended yarns were comparable with the 100% cotton yarn. It was also observed that increasing the micro polyester content led to increase in properties. But the cotton plays a major role in the yarn property. The micro polyester proportion improves strength properties in the yarn. In this study, the ultimate proportion of the cotton and micro polyester is found to be 65:35 blend proportions from the test results.

Keywords: Blend ratio; Cotton; Micro polyester; Physical properties; Ring spun yarn

Introduction

Blending of fibres is usually made with different fibres having dissimilarity in their properties, with a view to achieving or improving certain characters of the yarn or its processing performances. Fabric produced from the blended yarn might have better characteristics than what could be obtained in a fabric produced from a single fibre. The blending of cotton is done to develop drape properties, comfortability, durability, dyeability and many other properties of the fabric products. Any successful attempt to blend this fibre with cotton would be a breakthrough in the field of textile [1-4].

In the cotton spinning process, blending has the main objective of yarn manufacture with good quality at a reasonable cost. The properties of blended yarns are largely dependent on the type and characteristics of the blend components and their proportions. For a correct choice of the component fibres in a blend, it is essential to know how the individual properties of one component of fibres in the blend interact with those of other component in the yarn index. The regular blending of cotton and polyester staple fibre is done in most of the industries. In the cotton/polyester blends, polyester fibre plays a vital role in the textile applications in all areas from the life saving medical textiles to the geo-textiles [5]. The advantages of polyester over other fibres are strength, lustre, aesthetics, economics, consistency in quality and ready availability [6]. But, it has low moisture regain 0.4% as compared to cotton 8%. The polyester fabric will absorb and wick less water. In order to overcome these limitations, micro-fibres were introduced to improve the polyester wickability, and thereby dry the material quickly. This is the ultimate requirement for active sportswear. This blending with micro polyester gives good comfort, Drape, durability, dyeability and other properties to fabric products.

The mechanical properties of the blended yarns also were studies by various authors [7-10]. Nawaz et al. [11], studied that there is a gradual decline in yarn strength as the share of polyester fibres decreases in the blend. Li et al. [12], investigated that fibre properties had a significant effect on yarn strength. Anandjiwal et al. [13], studied that the blending of dissimilar fibres leads to their non-uniform distribution throughout the yarn cross-section, which in turn leads to preferential migration depending on both fibre properties and mechanism of certain spinning processes.

The present study was conducted in order to find out the impact of cotton/micro polyester ratio on the quality characteristics of yarn and also to find out the optimal blending stage that produced excellent quality yarn.

Materials and Methods

The experimental part of the present study investigating the influence of the micro polyester content in Cotton / Micro polyester 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, Kumaraguru College of Technology (KCT), Coimbatore, Tamil Nadu, India. Cotton samples were obtained from a spinning mill; the mean fibre properties were found to be as follows: fibre length 28.1 mm, fibre length uniformity ratio 48.4%, fibre fineness 3.6 µg/in and moisture content 6.1%.

The micro polyester fibre chosen for the study had the following fibre quality characteristics: length 40 mm, linear density 0.8 denier. Besides preparing 100% micro polyester and 100% cotton yarns, blended yarn of blend proportions 80:20, 65:35, 50:50, 35:65, 20:80 cotton:micro polyester were also prepared for the study.

The process steps of fibre blending, lap production, carding, drawing, rove-preparation and spinning were controlled to result in blended yarn of linear density $30^{s}Ne_{c}$. The blended yarn samples were evaluated for specific properties at the Textile Testing Centres of Thiagarajar Polytechnic College, Salem, India and TIFAC-CORE Textile Research Centre and Centre of Excellence for Textiles, Kumaraguru College of Technology (KCT), Coimbatore, Tamil Nadu, India. Yarn strength was tested using a Universal Tensile Strength

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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, 5 ring cops were used, and for the yarn strength test, 10 specimens from each sample were tested.

Results and Discussions

Figure 1a shows the relationship between the yarn blend ratio and U% for various blend ratios of cotton and micro polyester. It is clearly revealed in the graph that U% decreases gradually with the increase in micro polyester proportion.

Figure 1b displays the relationship between the blend ratio and number of thick places in the yarn for the various blend ratios. It is observed that the number of thick places in the yarn decreases with the increase in the micro polyester proportion in the blend.

Figure 1c displays the relation between the blend ratio and number of thin places in the yarn for the various blend ratios. It is observed that the number of thin places in the yarn decreases with the increase in the micro polyester proportion in the blend.

Figure 1d shows the relation between the blend ration and the neps in the yarn per km. Neps also shows a decrease nature with the increase in polyester proportion in the blend ratio.

Figure 1e graph gives relation between blend ration and hairiness index of the various blended yarns. The nature of the graph shows that an increase in micro polyester proportion doesn't influence the hairiness of the yarn.

Figure 1f shows the strength values of the various blend ratio yarns. The graph reveals that increase in micro polyester proportion increases the yarn strength.

Figure 1g shows the elongation of the yarn for the various blend proportions. The graph reveals the increase in extension with an increase in the micro polyester proportion.

Figure 1h shows the tenacity values of the blended yarns. The graph shows that the tenacity value increases with the increase in micro polyester proportion.

From the above statements, it is observed that the overall trend appears to indicate that the micro polyester content distinctly influence the yarn properties. There is a huge deviation between 100% cotton and 100% micro polyester yarns. In the experiment, the micro polyester in addition with the cotton gives good results and the blended yarns exhibits properties of both the cotton and micro polyester fibres.

While the overall trend appears to indicate that the 65:35 blend ratio and 50: 50 blend ratio performs better with the properties of both the micro polyester and cotton. The values deviate from the trend in the case of thick places, thin places and strength aspect. More elaborate work is needed to obtain the reasons for the change in trend. Future work will give a clear idea about the micro polyester and cotton properties contribution in the blend ratios.

Conclusion

The following conclusions were arrived from the above experimental study.

- An increase in the micro polyester content of micropolyester: cotton blended yarn has a significant influence on the yarn quality parameters in terms of yarn evenness, imperfections and mechanical properties such as strength and elongation for various blend ratios were studied.
- It is also important that the quality of 65:35 micropolyester/ cotton blend ratio shows better notable improvement than the 100% cotton yarn in which a small proportion of micro polyester is there. Hence we can conclude that this blend ratio will perform in the subsequent processes and end products in which both the cotton and micro polyester properties will be exhibited.

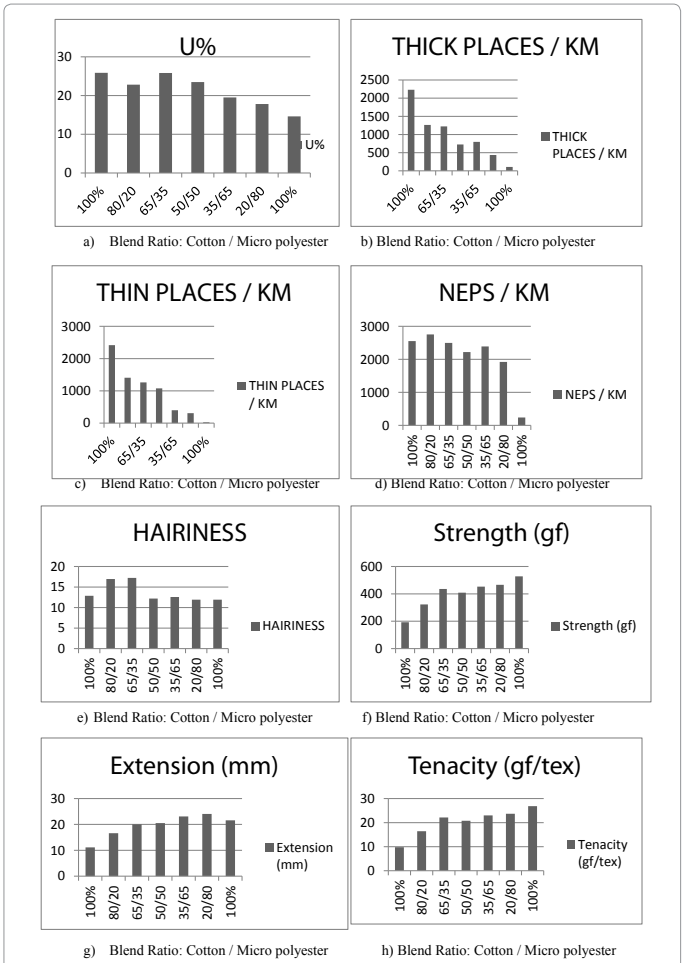

Figure 1: Relation between blend ratio and U% (a), Thick places (b), Thin places (c), Neps (d), Hairiness index (e), Strength (f), Extension (g) and Tenacity (h) of cotton micro polyester blended yarn.

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