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Cotton and Polyester Double Rove Feeding Effect on Blend Yarn Imperfections

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ABSTRACT

The effect of roving position twist factor and spindle speed upon thin and thick places and yarn neps were investigated in this study. The roving displacement of 15 mm span recorded excellent over yarn imperfections. The lowest spindle speed also generated similar effects. Factors strand spacing and spindle speed also presented highly significant interaction; whereas, twist factor and its interactions showed non-significant differences for yarn imperfections.

Key Words: Double rove feeding; Cotton/polyester blend; Yarn imperfections; Spindle speed

INTRODUCTION

Among synthetic fibre derivatives, polyester fibre consumption is the highest not only due to its tensile parameters but also due its blending susceptibility. When polyester properly combined with cotton, it adds strength, provides smoothness, silkiness and dirt rejection. It also reduces the weight of the fabrics and increases its wrinkle resistance. Whereas, cotton gives body to the yarn softness and essential moister absorption. The combination permits the weaving of fabrics that are soft, supple, and extremely serviceable when polyester blend with cotton, it develop a cotton rich, high tenacity, filament core yarn and fabric with sufficient cotton on the outer surface for effective flame retardant and durable press finishing. Polyester blended with cotton is also reported to provide the wearer with the same protection against the flash thermal radiation. Blending is to assemble and combine together the correct proportions of component fibres so that the relative amount of each fibre should be present in it. Blending process is not an intimate mixture of fibres but rather a fibre assembly in the required proportions to enable the following process to bring about the necessary fibre to fibre mixing. Double rove spinning is becoming more popular because of tremendous cost saving. Double rove feed is a process of feeding two rovings side by side in the drafting zone and combined at the nip of the front roller. This technique provides a yarn with improved strength of 14% pure cotton than the conventional yarn and less hairiness. A novel pseudo composite blend yarn of improved strength can be produced by separating, the drafting of different component rovings on a modified ring spinning frame. A cotton/polyester composite blend yarn thus produced gives about 14% higher strength than a similar blend yarn produced with the same rovings combined and drafted together in the spinning drafting zone. A 65/35 or a 50/50 cotton/polyester blend yarn made with the new technique may be significantly stronger than the comparable conventional yarns. These cotton-rich yarns, being relatively stronger, should make stronger fabrics. This yarn, being stronger, may also yield substantial productivity gains in the down stream yarn preparatory and weaving processes and provide improved product quality and performance. Because of the potential gains in the productivity and quality, these new relatively strong yarns and fabrics may even offer some overall cost advantages over the conventional products, as there should be no difference in the manufacturing costs of these types of yarn. Moreover, twist in thin places increases the bulk density. If further twists are added it flows into thick places causing a reduction in the difference between the visual appearance of thick and thin places. Therefore proper amount of protective twist must be inserted in order to hold the fibre together. The spacing between cotton and polyester rovings drafting simultaneously on the ring frame affects yarn structure, resulting in significantly stronger yarn, than those produced by drafting the same two rovings together. The composite or combination yarns may be useful in developing relatively stronger cotton rich materials suitable for variety of finishes and end uses. Bandopadhay *et al.* (1982) reported that blend proportion and count of yarn had a major effect on yarn quality; whereas, Mumtaz (2001) recorded the range value of 30s PC yarn for evenness as 10.37-10.61%. Ahmad (1994) also observed highly significant effect of twist upon yarn regularity. Stalder (1991) concluded that increasing tension leads to the poorest IPI values.

MATERIALS AND METHODS

The present technological study on the “multi roving blending of cotton and polyester at ring frame” was initiated in the Department of Fibre Technology, University of Agriculture, Faisalabad and carried out at the Crescent Textile Mills Limited, Faisalabad during the year 2001. The details of raw materials spun and the methods applied to determine the various quality characters of raw cotton, polyester fibre and its spun yarn are described here under.

Materials. The representative lint cotton samples of the variety MNH-93 and polyester fibre were collected from the running stock of Crescent Textile Mills Limited, Faisalabad.

Specification of variables

1. Roving position or strand spacing: D0 = 0mm; D1 = 10 mm; D2 = 15 mm; D3 = 20 mm
2. Spindle speed: S1 = 8000 rpm; S2 = 9000 rpm; S3 = 10000 rpm
3. Twist multiplier: T1 = 3.32; T2 = 3.37; T3 = 3.45

At different roving positions, spindle speeds and twist multipliers, the yarn of 30s (P/C, 50/50) was prepared, and tested for following characteristics.

Imperfections. Equipment employed was Uster Evenness Tester (UT-3), which simultaneously measures the imperfection *viz*. Thin, thick places, and neps per 1000 meters of yarn. The sensitivity setting for the determination of imperfections is –50% for thin places, +50% for thick place and +200% for neps.

Analysis of data. Analysis of variance test (CRD) was applied for testing the differences among the arrangement of treatments of strand spacing, spindle speed and twist multiplier. Duncan's new multiple range test was also used for individual comparison, as advocated by Steel and Torrie (1980), applying M-Stat microcomputer (statistical techniques derived by Fareed, 1992).

RESULTS AND DISCUSSION

Yarn thin places. The effect of roving position and spindle speed upon thin places are highly significant (Table I) while the effect of twist multiplier and interactions is non-significant. Comparison of individual mean (Table I) indicates that minimum thin places are obtained at D2, with mean values as 26.22 km^{-1} while maximum thin places are obtained at D3 with mean value as 43.38 km^{-1} while thin places at D0 and D1 are 35.55 and 35.66 km^{-1}, respectively. Too wide or too closer strand spacing increased the thin places in core spun yarn.

Now considering the effect of spindle speed, the table indicates that thin places at S1, S2 and S3 are 28.04, 37.00 and 40.50 km^{-1}, respectively. From this table, it can be concluded that by increasing the spindle speed thin places also increases and this result get full support from Ahmad (1994) who also showed more thin places at more spindle speed. Same conclusions were drawn by previous research workers by Iqbal (1992) and Abbasi (1994).

The effects of twist multiplier upon thin places, the table shows that minimum thin places are obtained at T3 and maximum at T2, with mean values as 32.62 km^{-1} and 35.87 km^{-1}. This conclusion gets full support from Iqbal (1992) and Abbasi (1994) who concluded that thin places increase with decrease of twist. While Mumtaz (2001) recorded the range value of thin places for 30s P/C yarn as 9.32-14.70, which are significantly lower than those recorded in the present results, which might be due to the fact that double rove spinning does not have better fibre control.

Table I. Individual mean values for yarn thin places

Roving position	Mean	S.S.	Mean	T.M.	Mean
D0	35.55b	S1	28.04a	T1	35.87
D1	35.68b	S2	37.00b	T2	37.12
D2	26.22a	S3	40.50b	T3	32.62
D3	43.38c				

Mean values having different letters differ significantly at 0.05 level

Yarn thick places. The effect of roving position and spindle speed upon thick places are significant, while the effect of twist multiplier was non-significant (Table II). Similarly interaction of D x T is highly significant. These results correlate with Ahmed (1994) who also showed highly significant effect of spindle speed upon yarn thick places. However, it does not match with Abbasi (1994) who concluded highly significant effect of twist multiplier upon thick places.

Table II. Individual mean values for yarn thick places

Roving position	Mean	S.S.	Mean	T.M.	Mean
D0	488.80c	S1	366.90a	T1	398.6
D1	354.11b	S2	395.62b	T2	404.6
D2	272.70a	S3	428.04b	T3	387.37
D3	471.70c				

Mean values having different letters differ significantly at 0.05 level

Now considering the effect of roving position upon thick places it is observed that minimum thick places are obtained at D2 while maximum thick places are obtained at D0 with mean value as 272.7 and 488.8, respectively. It is obvious that cotton and polyester drafted separately produced the yarn with less thick places as compared to the yarn with zero strand spacing.

Bandopadhay *et al.* (1982) reported that drafting speed at draw frame, denier of polyester fibre, blend proportion and count of yarn had a major influence on the quality of blended yarn.

Now considering the effect of spindle speed upon thick places, the reveals the values of thick places at S1, S2 and S3 are 366.9, 395.62 and 428.04 km^{-1}. It can be concluded that with increases spindle speed, the number of thick places increases. This evidence gets full support from Ahmed (1991) and Abbasi (1994) who also observed increased no of thick places with increased spindle speed.

Now considering the effect of twist multiplier the table shows that minimum thick places are obtained at highest TM having thick places as 387.33 while thick places obtained at T1 and T2 are 398.6 and 404.6, respectively. All these values differ significantly from one-another. Overall best results were observed at highest twist, same results were given by Abbasi (1994) who also observed same view. Mumtaz (2001) recorded that range value for thick places of 30s P/C yarn as 99.69-191.47.

Yarn neps. The effect of roving position is highly significant while the effect of spindle speed is significant and the effect of twist multiplier is non-significant (Table III). Similarly, the interactions show possible non-significant effect upon neps of yarn.

Table III. Individual mean values for yarn neps

Roving position	Mean	S.S.	Mean	T.M.	Mean
D_0	316.94b	S_1	271.70ab	T_1	286.50
D_1	292.94b	S_2	285.83a	T_2	290.16
D_2	237.00a	S_3	300.16b	T_3	281.04
D_3	296.72b				

Mean values having different letters differ significantly at 0.05 level

These results correlate with the findings of Ahmad (1994) who stated that the effect of spindle speed upon neps is significant but these results deviate from Abbasi (1994) who concluded highly significant effect of spindle speed and twist multiplier upon neps.

Comparison of individual mean Table III indicates that minimum neps are obtained at D2, with mean value as 237.00 while maximum neps are obtained at D0 with mean value as 316.94.

While neps at D1 and D3 are 292.94 and 296.72 respectively. Stalder (1991) concluded that increasing tension leads to the poorest IPI values.

Now regarding the effect of spindle speed the table indicates that neps at S1, S2 and at S3 are 271.70, 285.83, 300.16. It can be concluded that by increasing the spindle speed neps also increases. This conclusion gets full support from Iqbal (1992) and Abbasi (1994) who also observed that by increasing spindle speed neps increase and vice-versa.

The mean value of neps at different levels of twist multiplier T1, T2 and T3 are 286, 290 and 281, respectively. This indicates that lowest neps are obtained at maximum twist multiplier (TM3).

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