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# Comparative Study of Compact Versus Ring Spinning for Neps in Cotton Yarn

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## ABSTRACT

In this study, spinning potentials of Ring versus Compact spinning for Twist multiplier and break draft on G-33 ring and K-44 Compact spinning frame were compared. Highly significant effects were observed from Neps of 20's combed cotton yarn.

**Key Words:** Spinning; Cotton yarn

## INTRODUCTION

The ultimate goal of spinning technologists is focused on higher productivity, combined with adequate quality. Hence, the ring spinning systems has gone through tremendous improvements during the last decades. No doubt, modern yarn spinning techniques have a remarkable production edge on ring spinning, but still the characteristics of ring spun yarn are matchless and presently it looks very difficult to replace ring spinning with any other spinning system. With the passage of time, the production cost of spun yarn is becoming higher and higher. Reduction in production cost is the only solution, which is possible through increasing the production per spinning position. Many successful efforts have been made to increase the productivity of ring spinning frame but at the same time some new spinning techniques were also introduced from time to time such as, open end and air jet spinning. There have been a lot of developments in ring spinning in the past but the development of compact spinning has changed all aspects of advancement. This is the development, whose advantages are not limited up to the extent of quality and productivity elevation; rather it is multidirectional and also covers the sphere of subsequent processes of weaving, knitting and dyeing with tremendous and significant increase in productivity.

Compact Spinning is simply the modification of conventional ring spinning system at drafting zone with some addition and modification in its existing drafting system. After drafting, a thin but laterally wide fibrous fleece is delivered from the nip of front drafting rollers; which is collected by the twist insertion point, forming a so-called “Spinning triangle”. This spinning triangle is unable to catch all the delivered fibres, hence some fibres are at the shoulders of fleece are either not twisted in the yarn and form fly waste, or other way attached to the yarn in an uncontrolled manner resulting in hairiness and unevenness in yarn. Compact spinning provides a control on fibres in this area. When the width of fleece is reduced to a minimum, the control on peripheral fibres will become much easy and that is the basic principle of compact spinning.

In this study, spinning potentials of Ring versus Compact spinning for Twist multiplier and break draft on G-33 ring and K-44 Compact spinning frame were compared

## MATERIALS AND METHODS

**Spinning process.** American upland cotton variety Acala 1517-95 was processed in blow room, carding, drawing frame and simplex frame at standard machine setting and processing variables. Rieter fed the hank roving of 0.68 in modified ring frame (K-44) and conventional ring frame (G-33)

Following variables were selected to study their effects on yarn quality parameters.

| Process | T.M | Break draft | Spacer |
|---|---|---|---|
| P1=Comfor spinning (k-44) | T1=3.50 | B1=1.14 | S1=2.75 |
| P2= Ring Spinning (G-33) | T2=3.75 | B2=1.19 | S2=3.00 |
| | T3=4.00 | B3=1.24 | S3=3.25 |

The yarn of $20^s$ combed cotton was spun on Rieter ring frames i.e. K-44 and G-33 at 15500 rpm spindle speed.

**Statistical analysis.** The data thus obtained was analysed statistically using completely randomized design. Duncan’s Multiple Range test was also applied for individual comparison of means among various quality characteristics as suggested by Faqir (2000).

## RESULTS AND DISCUSSION

**Yarn neps.** The results revealed highly significant differences for machines (P), twist multipliers (T), break drafts (B) and interaction T x B. while spacer (S) and the remaining interactions recorded non-significant.differences in the mean values of yarn neps (Table I, Fig. 1.).

The comparison of individual mean values for yarn neps per thousand meters due to machines effects indicated that $P_1$ is highly significant from $P_2$ (Table II). The highest

**Table I. Analysis of variance for yarn neps**

| S.O.V | DF | S.S. | M.S. | F. value | Prob |
|---|---|---|---|---|---|
| P | 1 | 1289.259 | 1289.259 | 1277.4312 | 0.0000** |
| T | 2 | 10.822 | 5.411 | 5.3615 | 0.0053** |
| B | 2 | 15.556 | 7.778 | 7.7064 | 0.0006** |
| S | 2 | 2.467 | 1.233 | 1.2220 | 0.2967 |
| P x T | 2 | 1.696 | 0.848 | 0.8404 | |
| P x B | 2 | 2.341 | 1.170 | 1.1596 | 0.3155 |
| T x B | 4 | 17.889 | 4.472 | 4.4312 | 0.0018** |
| P x S | 2 | 2.052 | 1.026 | 1.0165 | 0.3636 |
| T x S | 4 | 2.778 | 0.694 | 0.6881 | |
| B x S | 4 | 7.378 | 1.844 | 1.8275 | 0.1246 |
| P x T x B | 4 | 1.770 | 0.443 | 0.4385 | |
| P x T x S | 4 | 3.859 | 0.965 | 0.9560 | |
| P x B x S | 4 | 6.681 | 1.670 | 1.6550 | 0.1616 |
| T x B x S | 8 | 5.711 | 0.714 | 0.7073 | |
| P x T x B x S | 8 | 10.941 | 1.368 | 1.3550 | 0.2179 |
| Error | 216 | 218.000 | 1.009 | | |
| Total | 269 | 1599.200 | | | |

* = Significant ** = Highly significant N.S = Non-significant
C.V= 6.23%

**Table II. Comparison of individual means for yarn neps**

| P. | Means | T | Means | B | Means | S | Means |
|---|---|---|---|---|---|---|---|
| $P_1$ | 13.948b | $T_1$ | 16.39 | $B_1$ | 15.91 | $S_1$ | 16.02 |
| $P_2$ | 18.319a | $T_2$ | 16.11 | $B_2$ | 16.02 | $S_2$ | 16.12 |
| | | $T_3$ | 15.90 | $B_3$ | 16.47 | $S_3$ | 16.26 |

*Mean values having different letters differ significantly at 0.05 level of probability

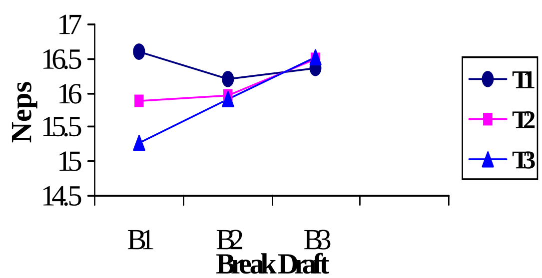
value of yarn neps are obtained for conventional machine ($P_2$) as 18.32 per thousand meters of yarn followed by modified machine ($P_1$) as 13.95 per thousand meters of yarn. Conventional machine produces more irregular yarn than modified ring spinning machine. These results are supported by Sheikh (2000a) who investigated that the compact yarns are much better in quality as compare to conventional ring spun yarns and posses little hairiness, better strength, better uniformity, lower I.P.I. values. Similarly Stalder (2000) observed that comfor yarns display better Uster CV and I.P.I. values. Whereas, Anonymous (2002) stated that fewer weak points and better imperfections (I.P.I.) for comfor yarns.

Duncan's multiple range test indicates the highest value of yarn neps 16.39% for $T_1$ (3.50) followed by 16.11 and 15.90% for $T_2$ (3.75) and $T_3$ (4.00), respectively. The values have highly significant difference with respect to one another and show significant effect on yarn neps. It is inferred that as the twist value is increased the value of yarn neps decreases, which is in line with the findings of Abbasi (1994) who stated that optimum neps were recorded at twist multiplier (4.30). While Mangialardi (1985) concluded that neps are formed during harvesting, ginning and processing operations, but as such no precise cause has been determined. Whereas, Maqsood (2000) recorded the range of yarn neps for $20^s$ yarn as 31.89 to 45.97 per km with mean value of 39.14 per km. These results may be different for 100% combed cotton, controlled working conditions, proper settings and new modified machines (K-44 and G-33) which removes the short fibres, dust through suction and irregularity of yarn reduces to minimum.

The individual comparison of mean values at different levels of break drafts (1.14, 1.19, 1.24) for neps in yarn shows significant differences with respect to one another. The highest value for break draft $B_3$ as16.47 per thousand meters of yarn followed by $B_2$ and $B_1$ with their respective mean values 16.02 and 15.91 per thousand meter of yarn. Present results recorded the increase in neps with the increase in break draft. These results are in accordance with the findings of Subramanian *et al.* (1991) who corroborated that neps show an increase with the increase of break draft. Similarly, Mahmood (1995) observed that neps are positively correlated with the break draft. In a previous research work Naseem (1995) reported that formation of thin, thick places and neppiness in yarn spinning is unavoidable, to improve the faulty

Creation is to keep them under controlled level of

**Fig. 1. Interaction Effect of TxB on yarn neps**




minimum. It has been reported by Frydrych *et al.* (2001) that neps are higher if the fibres are thinner and less mature. As regard to the effect apron spacing, results revealed that the highest value of yarn neps (16.26%) is recorded for $S_3$ (3.25 mm) followed by 16.12 and 16.02% for $S_2$ (3.00 mm) and $S_1$ (2.75 mm), respectively. Present results show a non-significant effect of spacers on yarn neps.

The comparison of individual means, concerning to yarn neps percentage due to interaction of twist multiplier and break draft (T x B) has been presented in Table III. The over all range was 15.27 to 16.60%. The highest value of yarn neps was 16.60% obtained under the combination of $T_1B_1$ followed by combinations $T_3B_3$ and $T_2B_3$ with a value of 16.53 and 16.50%, respectively.

**Table III. Comparison for the interaction T X B**

| | $B_1$ | $B_2$ | $B_3$ |
|---|---|---|---|
| $T_1$ | 16.60a | 16.20abc | 16.37abc |
| $T_2$ | 15.87c | 15.97bc | 16.50ab |
| $T_3$ | 15.27d | 15.90c | 16.53ab |

*Mean values having different letters differ significantly at 0.05 level of probability.

## CONCLUSION

Based on the results, it was concluded that Modified (K-44) and conventional (G-33) ring spinning machines, twist multipliers, break drafts and spacers, do exert a significant impact upon most of the yarn parameters, especially for Neps of cotton yarn, However modified ring spinning frame (K-44), at twist multiplier (4.00) and moderate break draft (1.19) recorded optimal results for Neps of yarn.

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