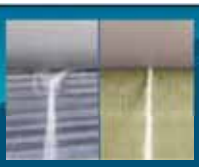

PRODUCTION OF CARDED COMPACT COTTON YARN OF COMPARABLE QUALITY TO THE COMBED CONVENTIONAL YARN

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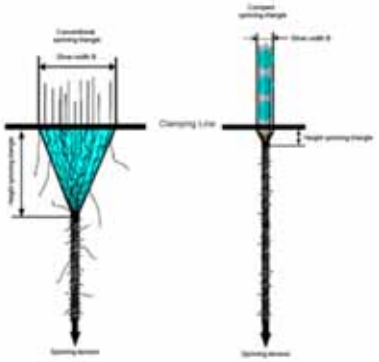
The main goal of any spinning company is to achieve improved yarn quality that will ensure better competi-tiveness and higher price. There-fore, it was felt useful to compare the quality of conventional and compact spun yarns so as taking into account the production costs, to explore whether the quality parameters of compact yarns are improved significantly enough to justify the purchase of new machines.



Compact yarn is a revolution in spinning technology. Over recent years, the system of compact spinning has constituted a rapidly developing technological trend in most countries. The spinning triangle that occurs while the yarn is formed is the reason why many fibers leave the drafting roving, or become partly spun into the yarn with one end only. This causes a greater waste of fibers, a lower exploitation of fiber tenacity in yarn, a poorer appearance and a greater hairiness of the spun yarn

According to expert estimates, the combing operations account for nearly 9 % of the total production cost of a 30 Ne combed cotton yarn. This represents approximately 21 % of the processing cost. While the compact technology is promising, there are still major questions to be answered. These include the following:

•In order to produce a carded compact yarn with comparable performance to the combed conventional one, what type of raw cotton fiber should be used?

•Do the fiber quality requirements vary depending on the yarn production sequence? If so, what are the fiber properties that are most crucial for the alternative process?

The purpose of this study was to determine the influence of cotton type in order to produce a carded compact yarn with comparable performance to the combed conventional one

MATERIALS AND METHODS

Giza 80 and Giza 90 as Long Staple Egyptian Cotton, and a Medium Long Staple Upland Greece cotton yarns, were manufactured, combed and carded on both the compact and the conventional spinning frame "Olfil RST1 Marzoli machine". The linear densities of the yarns obtained were 14.76 tex (40 Ne), 19.68 tex (30 Ne), and 29.53 tex (20 Ne). The carded and combed yarns were manufactured from the same cotton, eliminating 18% of noils during combing process.

Within this research work, the quality parameters of the yarns for the following parameters were assessed: single yarn strength "cN/tex", yarn strength c.v. "%" elongation at break "%" using Statimat ME. Mass irregularity, hairiness, and yarn faults were also measured via Uster Tester 3, at a yarn feeding of 400 m/min. The results obtained of the analyzed yarn parameters were compared with the Uster Statistics, (2007).

Table1. HVI and Micromat fiber data of the raw cotton

Fiber Properties	Giza 80	Giza 90	Upland cotton (Greece)
Upper Half Mean mm.	31.0	30.0	27.8
Uniformity Index (%)	85.6	85.5	79.2
Strength cN/Tex)	38.4	37.8	33.5
Elongation (%)	7.4	7.5	7.4
Short Fibers (%)	5.7	6.3	10.2
Micronaire value	4.2	4.1	4.1
Maturity	0.94	0.92	0.83
Fineness	167	153	155
Reflectance Rd%	63.7	65.7	73.4
Yellowness +b	12.6	11.8	9.4

Yarn strength and elongation

Figure 1 compares the results of yarn quality properties obtained of the carded compact yarns versus the conventional combed yarns. The difference of yarn strength was statistically insignificant. For all cotton varieties, the single yarn strength and elongation (%) values of compact carded yarns were slightly higher than those of the conventional combed ring yarns.

When single yarn strength was examined, there was an important difference between compact and conventional ring yarns which were produced the three cotton varieties under the studied three yarn counts. The compact-spun yarns' strength and elongation (%) values are higher than the conventional ones. In this respect, Giza 80 and Giza 90 Egyptian Long staple cotton showed higher strength and elongation (%) than the Upland cotton.

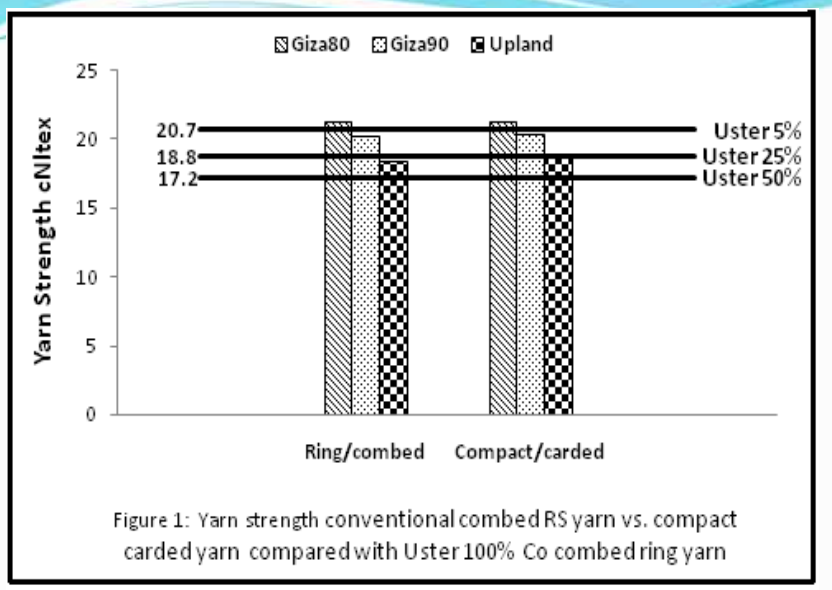


Figure 1: Yarn strength conventional combed RS yarn vs. compact carded yarn compared with Uster 100% Co combed ring yarn

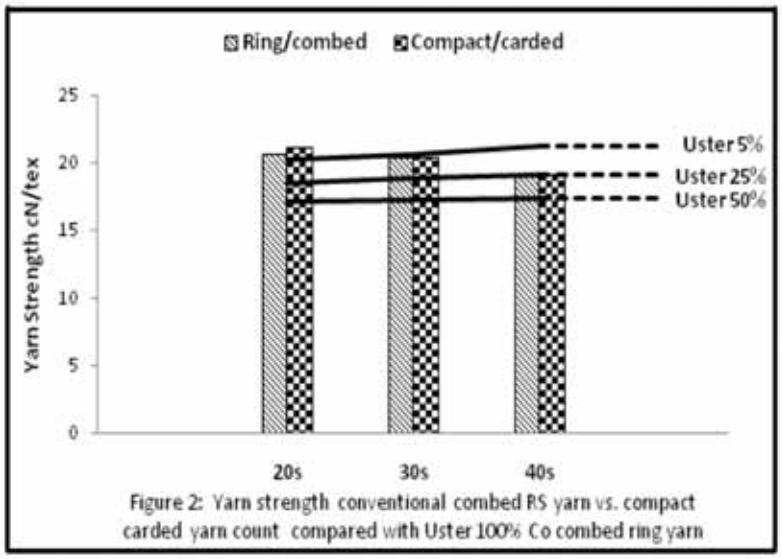


Figure 2: Yarn strength conventional combed RS yarn vs. compact carded yarn count compared with Uster 100% Co combed ring yarn

Yarn evenness

The carded compact spun yarns had higher yarn unevenness values - irregularity, thin and thick places and nep values, than the conventional combed ring spun yarns for all cotton types and consequently yarn counts.

The Uster evenness CVm%, thin and the thick place values of both compact carded yarns and conventional combed one were found to have a statistically significant difference for a significance level of $\alpha=0.05$ for all cotton types “Giza 80, Giza 90 and Upland cotton” and yarn counts “20’s, 30’s and 40’s”

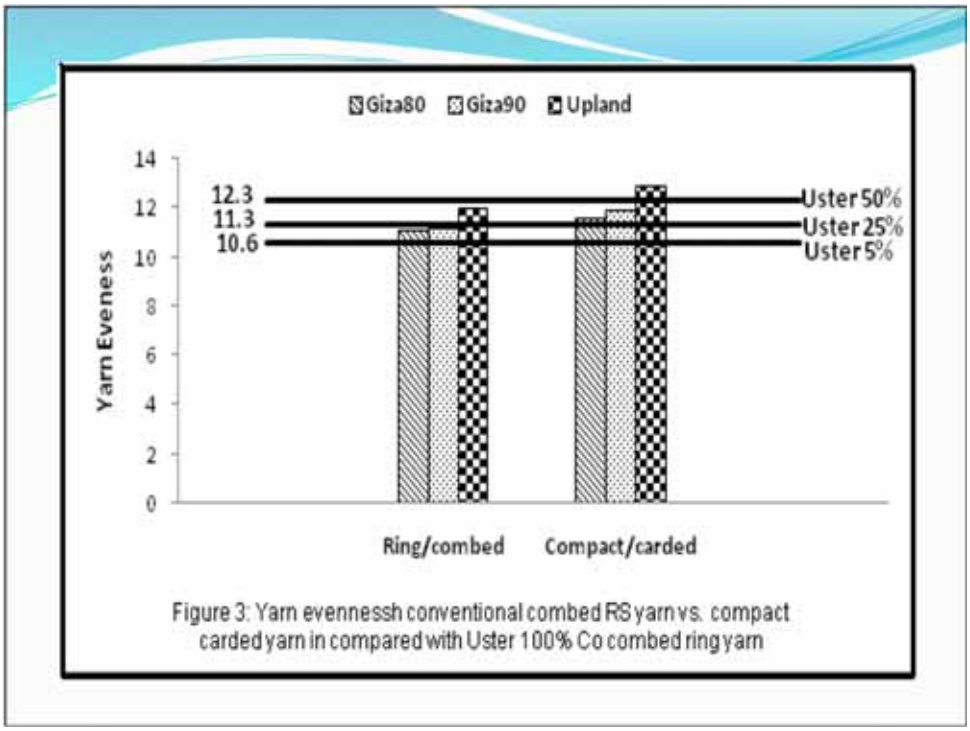


Figure 3: Yarn evennessh conventional combed RS yarn vs. compact carded yarn in compared with Uster 100% Co combed ring yarn

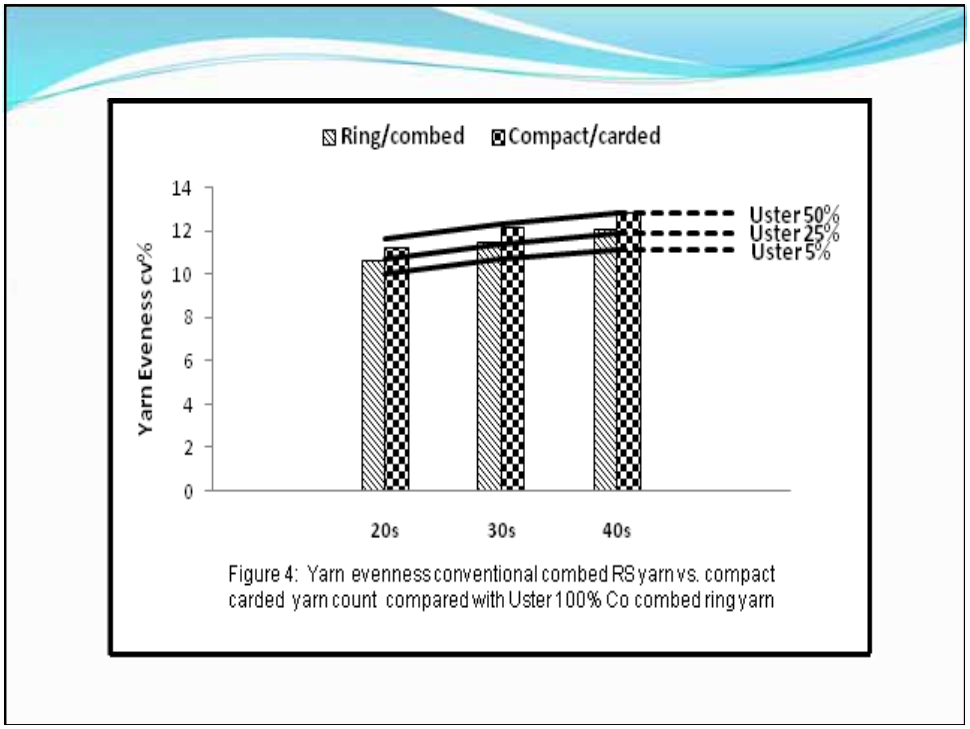


Figure 4: Yarn evenness conventional combed RS yarn vs. compact carded yarn count compared with Uster 100% Co combed ring yarn

in addition to removing short fibers, the combing operation eliminates many impurities remaining in the fiber after the carding process. Some of these, namely fiber neps and seed-coat fragments (SCFs), are known to significantly deteriorate yarn evenness and increase its defects (Krifa et al., 1999 and 2000). Without combing, these particles remain problematic, and the compact spinning is not likely to overcome them. It is not surprising, then, that the carded compact yarns did not compare favorably to the combed conventional yarn when considering the evenness aspect.

These evenness results would limit the application of carded compact yarns in traditionally combed yarn markets. However, there are ways to improving the evenness problem, meaning that using Egyptian Long Staple cotton varieties which characterizing by lower short fiber index and somewhat lower contamination

Yarn hairiness

As the result of comparison of the yarn hairiness obtained with the Uster Statistics (2007) in both different cotton varieties and yarn counts which could be stated that;

- Yarn hairiness of compact carded yarns of Giza 80 and Giza 90 and Upland cottons below 5% Uster level
- With regard to yarn count, Ne 20's and 30's for all cotton varieties substantially below the level of 5%, while in 40's yarn count the conventional combed yarn was equivalent of 5% Uster level, on the other hand, 40's compact carded yarns substantially below at the level of 25%.

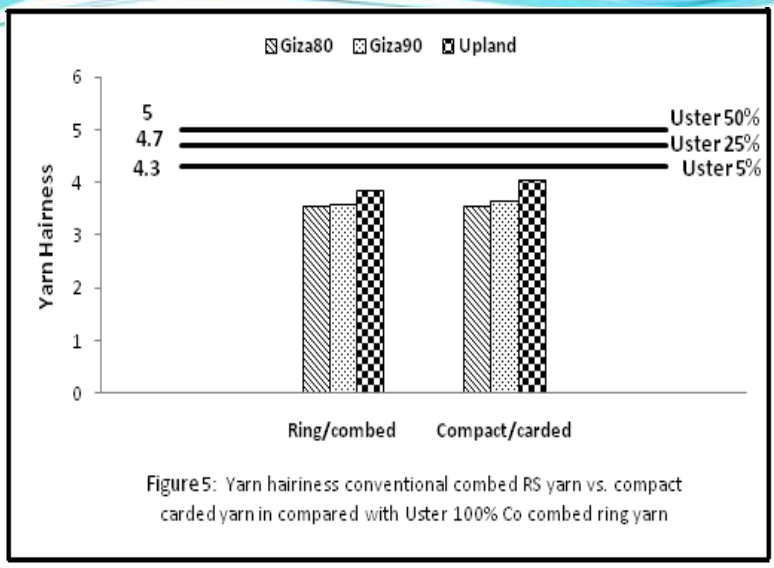


Figure 5: Yarn hairiness conventional combed RS yarn vs. compact carded yarn in compared with Uster 100% Co combed ring yarn

Thank you