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QUALITY ASSESSMENT OF THE NEW EGYPTIAN COTTON VARIETY GIZA 90

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Abstract

This study was carried out in Kom Hamada Spinning and Weaving Company, and Cotton research Institute, to assess the quality of Giza 90, the new promising long-staple Egyptian cotton variety. The goal of new variety introduction is to replace a current variety with one that shows significant improvement in particular areas, notably yield, fiber quality, resistance to relevant diseases or pests. From the breeding perspective, new varieties should always be "available". From textile and commercial perspective, availability will depend on the probable profit potential of a new variety. Giza 90 was produced to meet these requirements and may replace Giza 83.

The three long-staple Egyptian cottons; the commercially grown Giza 80, and Giza 83 and the newly introduced Giza 90 were spun into 20s and 30s counts on both ring and rotor spinning systems. Yarn quality parameters were determined. Giza 90 was found to be generally better to Giza 83 in single yarn strength, yarn unevenness, yarn neppiness and yarn hairiness. However, as coarseness is required and preferred by many mills, Giza 90 could be regarded as comparable to Giza 80 and to be grown commercially so as to suffice the requirements of as many mills as possible. Compared to ring yarns, rotor yarn of the three varieties possessed lower strength. This strength loss was, however, partially compensated by a lower hairiness and greater evenness of the rotor yarns.

INTRODUCTION

Improving cotton quality through introducing new varieties is one of the most important objectives of the cotton research program carried out by the Cotton Research Institute (C.R.I.). Cotton quality is a composite characteristic; it includes the various fiber properties that affect processing and the quality of the end product. The various fiber characteristics, staple length, strength, fineness and maturity beside yarn properties are the most obvious and method available for its determination and assessment of cotton quality.

Sadek and Abdel-Salam (1969) reported that the improvement of cotton relies mainly upon the cotton breeder, who, through a long process of hybridization and selection arrives at new varieties of superior quality to replace the old ageing ones. The problem of judging the quality of two or more varieties not differing widely in their properties, is not easy for the breeder as it is for a cotton mill with definite equipments and requirements. The cotton breeder has to keep in mind the different requirements of scores of mills.

Giza 90, the new Long-Staple promising variety of Egyptian long-staple cotton, is a cross between Giza 83 and Giza 31 (Dandara). Its breeding started in 1985, and the first commercial propagation was in 2002 when it was grown in 2005 feddans with a yield of 9.17cantar/feddan. The success of this variety led to its quick expansion so as in 2003 it covered an area of 15975 feddans.

In this study, the quality properties of the new commercial variety Giza 90 were compared with those of the established commercial varieties, Giza 80 and Giza 83 long-staple cotton varieties from the standpoint of quality level.

MATERIALS AND METHODS

The present study was carried out in Kom-Hamada Spinning and Weaving Company, and Cotton Research Institute to assess the quality of Giza 90 new cotton variety. Giza 80 and Giza 90 cotton varieties were processed from opening through conventional ring spinning into single yarns of two different sizes: 20Ne and 30Ne. each yarn was spun into constant twist multiplier (4.0). Five Kilogram sliver sample of each cotton variety was taken and possessed into Schlafhorst Auotocoro 288 OE rotor spinning to produce the same yarn counts. In addition, samples of Giza 83 cotton was taken from commercial cotton and spun on ring and open-end spinning in the same yarn counts and twist factor in the Cotton Technology Research Division, Cotton Research Institute.

All fiber properties measurements were made on slivers, using individual instruments according to ASTM method, (A.S.T.M., D-1440-67) for the fiber length, and (A.S.T.M., D-1445-75, 1984) for the fiber strength and also micronaire reading (A.S.T.M., D-1448-59, 1984).

The single yarn strength and elongation % were determined on Tensojet Automatic Tensile Tester, CRE, 5m/min. Yarn uniformity, imperfections and hairiness were measured on Uster Tester III (A.S.T.M., D-1425-84). results were compared with the Uster provisional 5% level (Zellweger Uster, 2001). Fiber properties were determined at the Cotton Technology Research Division Laboratories, Cotton Research Institute, Giza, Egypt. Single yarn properties were determined at Textile Consolidation Fund, Alexandria, Egypt. All fibers and yarns were tested under standard conditions of 65 ± 2% relative humidity and 21 ± 1°C temperature.

RESULTS AND DISCUSSION

Three long-staple cotton varieties are grown in Upper Egypt region. These are Giza 80, Giza 83 and Giza 90. Giza 80 was introduced for commercial production since 1981 and gained a good reputation and Giza 83 was introduced for commercial production also, since 1991. These two varieties together contribute the bulk of the Egyptian production in Upper Egypt region. Giza 90 is a new variety and is intended to be grown in the same region. Thus, it would be useful to compare the fiber and yarn quality of these three varieties.

a. Fiber quality

Table 1 shows fiber properties of Giza 80, Giza 83 and Giza 90 commercial samples.

Table 1. Fiber properties (from tests on sliver).

Cotton variety	Fiber length parameters		Fiber tenacity		Mic. reading
	2.5%S.L. (mm)	UR %	T (g/tex)	El (%)	
Giza 80	30.8	50.1	29.53	7.6	4.3
Giza 83	30.0	48.6	27.30	7.3	4.2
Giza 90	29.5	50.3	26.73	7.7	4.3

Because of the importance of staple length, or in fact the length properties and tensile fiber properties and micronaire reading in assessing the quality of the long-staple cottons, it is useful to compare in some detail the length properties and fiber te-

nacity and micronaire reading of these varieties. The 2.5% Span Length of Giza 80 is apparently longer than both Giza 83 and Giza 90 with about 0.8mm and 1.3mm, respectively. The uniformity ratio, calculated from length parameters, measured by the Fibrograph, is 48.6% for Giza 83 compared to 50.1 % for Giza 80 and 50.3% for Gíza 90. With regard to fiber tenacity, the information provided by Stelometer instrument show that Giza 80 is generally stronger than Giza 90 but of nearly the same elongation. Giza 83 is stronger than Giza 90 but this increase in strength is partially at the expense of elongation. The Micronaire reading is similar for the three varieties. The importance of this point is well understood when it is realized that the most of the lint produced of these three varieties is used in coarse spinning and popular fabrics for local consumption.

b. Yarn quality

Table 2 shows yarn properties of the three cotton varieties i.e., Giza 80, Giza 83 and Giza 90 when spun on two different spinning systems and different yarn counts. It is apparent that the mean value of single yarn strength of Giza 90 is somewhat slightly lower than that for Giza 83 and the difference was insignificant. Since Giza 90 is of weaker fiber than Giza 83, as previously stated (Table 1), it was expected that its yarn might be weaker. The results showed insignificant differences between yarn elongation at break. Both Giza 80 and Giza 90 are similar in yarn unevenness, imperfections and hairiness; Giza 83 recorded the highest value of yarn unevenness, imperfections and hairiness. Compared to ring yarns, rotor yarn possessed lower strength. This strength loss was, however, partially compensated for from the standpoint of general quality by a lower hairiness and greater evenness of the rotor yarns. As yarn becomes finer, the yarn strength and elongation decreased, whereas their imperfections increased. The increase in yarn unevenness with increasing yarn count could be explained by the lower number of fiber in the cross-section of fine yarns.

Table 2. Summary of main effects.

	Strength (cN/tex)	Elongation at break (%)	Unevenness (%)	Thin places (Km)	Thick places (Km)	Neps (Km)	Hairiness
Cotton variety effect							
G.80	21.08^{a*}	5.8^{ns}	12.27^{b}	8^{b}	26^{b}	26$^{a b}$	5.31^{b}
G.83	20.18^{b*}	5.9^{ns}	13.58^{a}	23^{a}	41^{a}	32^{a}	5.73^{a}
G.90	19.66^{b*}	5.8^{ns}	12.36^{b}	11^{b}	28^{b}	24^{b}	5.46^{b}
Spinning system effect							
Ring spinning	23.60^{a}	6.0^{a}	13.78^{a}	23^{a}	55^{a}	51^{a}	6.69^{a}
Rotor spinning	18.65^{b}	5.6^{b}	11.69^{b}	5^{b}	9^{b}	4^{b}	4.33^{b}
Yarn count effect							
20's	22.38^{a}	6.0^{a}	12.25^{a}	11^{b}	24^{b}	14^{b}	5.97^{a}
30's	18.24^{b}	5.7^{b}	13.23^{b}	17^{a}	40^{a}	41^{a}	5.03^{b}

* : Significant at 0.05% level, the same letter showed insignificant
ns: insignificant

Single yarn tenacity

The single yarn tenacity values of ring and rotor spun yarns are shown in Table 3. and Figure 1. Single yarn tenacity of Giza 80 is insignificantly higher than that for Giza 83 and Giza 90 in both 20s and 30s yarn count. Ring-spun yarns in general, are stronger than rotor-spun yarns by about 17% to 20%.

The differences in tenacity values observed between ring and rotor yarns may be explained as follows. In ring-spun yarns, the majority of the fibers are twisted along the longitudinal axis of the yarn, and all these fibers contribute to the over-all strength of the yarn, whereas, in rotor-spun yarns, a considerable number of fibers are loosely warped around the yarn, and these warped fibers do not contribute as much to yarn strength. The tenacity of ring and rotor-spun yarns steadily decreases as yarn becomes finer.

Table 3. Tenacity (cN/tex) of ring and rotor-spun yarns.

Cotton variety	Yarn count			
	20s		30s	
	Spinning system			
	Ring	Rotor	Ring	Rotor
Giza 80	24.56	19.54	22.56	17.69
Giza 83	23.59	18.88	20.65	17.60
Giza 90	23.06	18.75	20.29	17.54
Uster provisional at 5% level	23.00	17.00	22.00	16.00

L.S.D. = 1.51

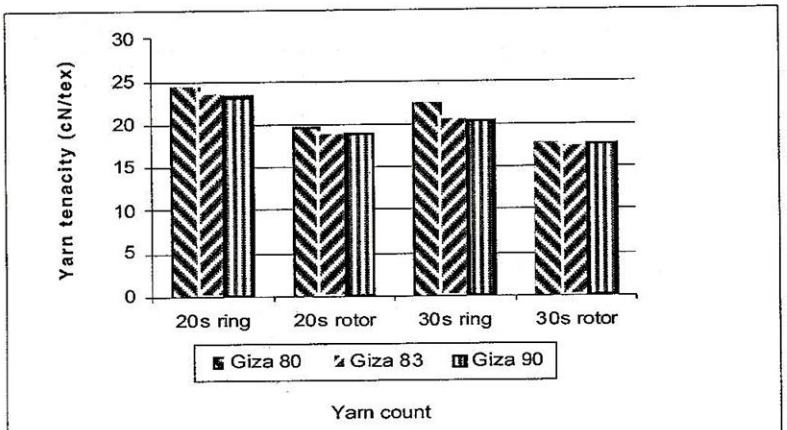

Fig. 1. Single yarn tenacity of three long-staple cottons of ring and rotor-spun yarns.

2. Yarn unevenness (c.v.%)

The unevenness (c.v.%) values range between 12.70 and 14.48 in ring yarns, and between 9.93 to 13.23 in rotor-spun yarns of various counts, (Table 4). Generally, Giza 80 recorded the lowest unevenness value in ring yarns followed by Giza 90 and finally, Giza 83. On the other hand, Giza 90 recorded the lowest unevenness value in rotor yarns followed by Giza 80 and also, finally, Giza 83. the improvement in yarn unevenness of rotor-spun yarns is generally ascribed to the higher number of doublings taking place inside rotor.

Table 4. Unevenness (c.v.%) of ring and rotor-spun yarns.

Cotton variety	Yarn count			
	20s		30s	
	Spinning system			
	Ring	Rotor	Ring	Rotor
Giza 80	12.70	10.44	13.83	12.11
Giza 83	13.81	12.82	14.48	13.23
Giza 90	13.80	9.93	14.11	11.62
Uster provisional at 5% level	12.00	10.50	13.00	11.00

L.S.D. = 1.04

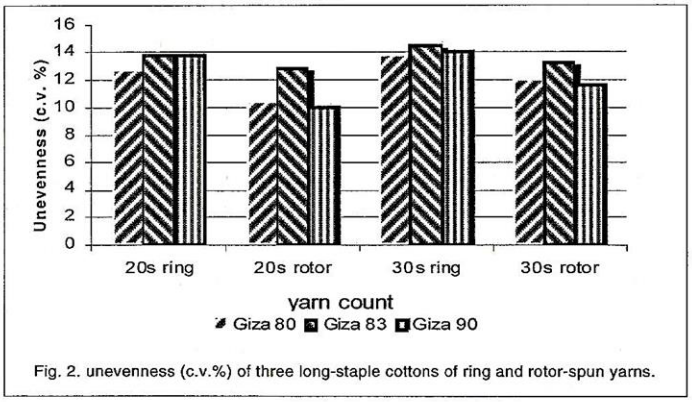

Fig. 2. unevenness (c.v.%) of three long-staple cottons of ring and rotor-spun yarns.

3. Yarn neppiness

Generally, yarn neppiness of rotor yarns are found to be better than that of ring yarns. The interaction between cotton variety, yarn count and spinning system was significant, Table 5. The lowest value of number of neps was obtained from the rotor yarns (Figure 3), while the highest value was recorded from the ring-spun yarns. The differences in number of neps among Giza 80, Giza 83 and Giza 90 of the 20s ring-spun yarn were insignificant. While, in 30s ring yarns, Giza 90 had significantly lower number of neps than Giza 83.

Table 5. Neps of ring and rotor-spun yarns.

Cotton variety	Yarn count			
	20s		30s	
	Spinning system			
	Ring	Rotor	Ring	Rotor
Giza 80	23	1	76	4
Giza 83	33	4	83	9
Giza 90	23	1	69	3
Uster provisional at 5% level	30	3	100	15

L.S.D. = 13.06

4. Yarn hairiness

Ring-spun yarns, in general, appear to be more hairy than the rotor-spun counterparts. Yarn hairiness in Giza 80, and Giza 90 of the 20s ring-spun yarn was similar and significantly lower than the respective Giza 83. While, in 30s ring yarns, Giza 80 was of insignificantly lower hairiness than both Giza 90 and Giza 83. The high degree of hairiness of ring-spun yarns may be attributed to rubbing of the yarn over the traveler. In this respect, Mohamed et.al. (1975), reported that the reduction in the hairiness of the rotor-spun yarns is thought to be due to the increase in migration, which affects how tightly the surface loops are pulled into the yarn structure. However, the hairiness tends to decrease as the count becomes finer for yarns spun on the two spinning systems (Table 6 and Figure 3). In the case of 20s count, the average number of hairs/meter is about 4.4 in rotor-spun yarns and 7.5 in ring-spun yarns.

Table 6. Hairiness of ring and rotor-spun yarns.

Cotton variety	Yarn count			
	20s		30s	
	Spinning system			
	Ring	Rotor	Ring	Rotor
Giza 80	6.98	4.30	5.76	4.21
Giza 83	8.36	4.33	5.98	4.24
Giza 90	7.28	4.57	5.78	4.21
Uster provisional at 5% level	5.00	4.50	4.00	3.70

L.S.D. = 0.35

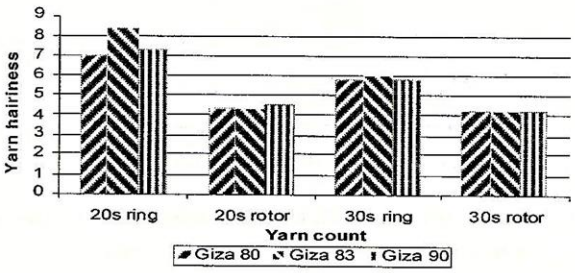

Fig. 3. Yarn hairiness of three long-staple cottons of ring and rotor-spun yarns.

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تأكيد جودة صنف القطن المصرى الجديد جيزة ٩٠

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أجريت هذه الدراسة فى شركة كوم حماده للغزل والنسيج التابعة للشركة القابضة للقطن والغزل والنسيج والملابس ومعهد بحوث القطن بهدف مقارنة جودة صنف القطن المصرى طويل التيلة جيزة ٩٠ الذى أدخلت زراعته حديثا مع الصنفين المنزرعين جيزة ٨٠ وجيزة ٨٣ . الهدف من إنتاج صنف جديد هو إحلاله محل صنف منزرع لتفوقه معنويا فى نفس منطقة الزراعة، وفي إنتاج محصول أعلي، وجودة تيلة أفضل، بالإضافة الى المقاومة للأمراض والحشرات التى قد تصيب الصنف المراد إحلاله.

من منظور مربى القطن، فإن الاصناف الجديدة يجب أن تكون متوفرة دائما، أما من المنظور التجارى لصناعة الغزل والنسيج فإن إحلال صنف جديد محل صنف آخر يعتمد على مدى تحقيقه ربحية أعلى وتوافقه لمتطلبات الصناعة. هذا، وقد أنتج الصنف جيزة ٩٠ ليقابل متطلبات المربى وصناعة الغزل والنسيج وليحل محل الصنف جيزة ٨٣ .

ثلاثة أصناف من القطن المصرى المنزرعة فى الوجه القبلى هى جيزة ٨٠، جيزة ٨٣ وجيزة ٩٠ تم غزلها على نمر ٢٠ و ٣٠ إنجليزى على نظامى الغزل الحلقى والطرف المفتوح . وقد قدرت خواص جودة الخيوط المنتجة. وقد أظهرت النتائج تفوق الصنف جيزة ٩٠ على الصنف جيزة ٨٣ فى خواص متانة الخيط المفرد، وخواص الانتظام وعدد العقد وكذلك التشعير. وحيث أن الغزول السميكة مطلوبة وتفضل إنتاجها العديد من المغازل وأن الصنف جيزة ٩٠ يعتبر متمما للصنف جيزة ٨٠ ، يمكن إنتاجهما على نطاق تجارى واسع لسد حاجة المغازل من هذه النوعية من الأقطان.

بالمقارنة مع خيوط الغزل الحلقى، فإن خيوط غزل الطرف المفتوح تعطى متانة أقل ، هذه المتانة المنخفضة يمكن تعويضها جزئيا من منطلق مفهوم الجوده بوجه عام بالنسبة لانخفاض نسبة التشعير مع الانتظامية العالية لخيوط غزل الطرف المفتوح.