

## QUALITY LEVELS OF EGYPTIAN COMMERCIAL COTTONS

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### Abstract

This work has been conducted to study the quality properties of different quality levels within each cotton category and to find the standard limits for this quality levels. Quality properties of commercial cotton varieties grown through thirteen years (1982-1994) were studied. The essential findings of this study could be summarized as follows :-

- 1- Commercial cotton varieties of each cotton category differ significantly in most quality properties.
- 2- Commercial cotton varieties of each cotton category was divided significantly into two separate quality levels.
- 3- Confidence limits at 1% level of significance were made for the quality levels of each cotton category.

### INTRODUCTION

Egyptian cotton has the most worldwide reputation for its quality, so, it is kept under strict government control at all stages from sowing to export (Al-Didi 1982). 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 (CRI). Cotton quality is a composite characteristic, it includes the various fiber properties that determine its for processing on the different modern spinning systems, as well as the quality of the end product .

Extra-long staple cottons are usually used for fine combed spinning, while medium and long staple cottons are used for coarse and medium carded counts. The im-

portance of fiber to yarn properties has been discussed (Hertel 1961, Grant *et al.* 1962, Rusca 1970 and Lord 1981). Working on Egyptian cottons, Aboul-fadi (1970), Garawain (1976) and Syiam (1980) concluded that fiber properties change their order of importance to yarn quality according to change in cotton category of length and spinning variables. Nomeir *et al.* (1990) found that Giza 45 has the top quality when spun into 150 combed count compared with other extra long staple Egyptian cottons.

According to the international classification of staple length, the Egyptian commercial cotton varieties fall under two categories of staple length, the extra long staple (ELS), represented by five cotton varieties; Giza 45, Giza 76, Giza 84, Giza 77 and Giza 70, and the long staple category (LS) represented by seven cotton varieties; Giza 69, Giza 75, Giza 81, Giza 85, Giza 80, Dendara and Giza 83. Each category has its own end uses and market. ELS cottons are usually used for fine combed spinning, and LS cottons for medium counts. Abdel-Salam (1992) concluded that both categories could be divided further according to quality differences or geographical zoning, also he reported that Giza 76 cotton variety was bred to replace Giza 45, but because of its relatively shorter staple and coarser fibers and consequently lower yarn strength at very fine spinning counts, it did not replace Giza 45 completely, which still occupies the top position in quality among world cottons.

This research was conducted; firstly to study the commercial cotton varieties and the proposed level or cotton quality within each cotton category with respect to the studied quality properties, and secondly to find out a standard quality limits for quality within each cotton category to help cotton breeder in his selection for quality properties in Egyptian cottons.

## MATERIALS AND METHODS

Data of the studied quality properties of nine commercially grown cotton varieties were obtained from the "Spinning Test Reports on the Egyptian Cotton" published by CRI through thirteen years (1982-1994). This period was chosen because the same instruments were used in measuring the studied quality properties. These data are based on the routine testing procedures followed at Fiber and Spinning Research Sections of CRI and could be summarized as follows: raw samples of grade "Good to fully Good" and "Good" for each of the ELS and LS cotton varieties respectively, were drawn from commercial deliveries and supplied through the courtesy of Egyptian exporting cotton companies. Composite samples of each of the four ELS cot-

tons were spun into 60's carded and 120's combed yarn counts, while samples of the five LS cottons were spun into 60's carded count. One twist multiplier (3.6) was used for all yarns. Yarn strength in terms of strength (lea product), fiber length in terms of 2.5% span length in millimeters, fiber strength in terms of strength weight ratio (SWR) and grams per tex (g/Tex), fiber elongation % (Eo), and fiber fineness and maturity in terms of micronaire reading were measured according to the standard methods of testing (ASTM, 1975).

The data were exposed to the proper statistical analysis of variance of randomized complete block design as described by Snedecor and Cochran (1967). For comparing means, Least Significant difference test (LSD) was used (Steel and Torie, 1960) T test and confidence limits at 1% level of significance were made according to Fisher (1954) to study the possibility of classing the quality of Egyptian cotton categories into different quality levels and making confidence limits around these quality levels.

## RESULTS AND DISCUSSION

### (A) Cotton varieties and their quality properties .

The levels of cotton varieties within each of the two Egyptian cotton categories in thirteen years (1982-1994) with regard to the studied quality properties are given in tables 1, and 2. The average values of quality properties as shown in table (1) pertaining the extra long staple varieties, indicated that:

(1) Giza 45, Giza 76 and Giza 70 cotton varieties did not differ significantly in fiber length, and all of them are of significantly longer fibers than Giza 77 cotton variety, and their descending order was : Giza 45, Giza 70, Giza 76 and Giza 77 respectively.

(2) Regarding micronaire reading, Giza 45 cotton variety has the finest fibers and differ significantly from all other cotton varieties of ELS category. The two cotton varieties Giza 76 and Giza 77 have the same level of fiber fineness but they are of significantly lower micronaire reading than Giza 70 cotton variety. Their descending order in fiber fineness was : Giza 45, Giza 77, Giza 76 and Giza 70 cotton variety.

(3) Regarding fiber strength and elongation, both values of fiber strength at "0 or 1/8 " gauge length showed that Giza 76 and Giza 77 cotton varieties are sig-

Table 1. Average values for quality properties of ELS commercial cottons (1982-1994) .

Varieties	Yarn strength		Fiber length	Fiber strength		Elongation Eo. %	Micronaire reading
	120's combed	60's carded	2.5% SL (mm.)	0" gauge length SWR	1/8" gauge length (g/tex)		
Giza 45	2426	2997	35.7	10.85	35.1	6.32	3.06
Giza 76	2400	3072	35.6	11.15	36.2	6.15	3.70
Giza 77	2211	2997	34.5	11.08	35.2	5.90	3.68
Giza 70	2089	2900	35.5	10.97	34.9	5.89	4.02
L.S.D at 5% level of signif.	39	80	0.44	0.13	0.58	0.18	0.10

Table 2. Average values for quality properties of L.S commercial cottons (1982-1994) .

Varieties	Yarn strength 60's carded	Fiber length 2.5% S.L.(mm)	Fiber strength		Elongation Eo. %	Micronaire reading
			0" gauge length (SWR)	1/8 "gauge length g/Tex		
Giza 75	2413	30.8	10.65	31.7	6.03	4.53
Giza 81	2260	30.6	10.25	30.9	6.30	4.15
Giza 80	2057	30.6	09.65	28.8	7.05	3.88
Giza 69	2195	30.5	10.05	29.8	6.38	3.95
Dendara	2018	30.1	9.483	28.1	7.83	3.78
L.S.D at 5% level of signif.	92.616	No NS	0.231	0.95	0.55	0.17

Table 3. Means of quality levels of each cotton category compared by T test value.

Quality Levels	Yarn strength 120s		Yarn strength 60s		2.5 % S.L		Fiber strength 0 "gauge		Fiber stren 1/8 "gauge		Elongation %		Micronaire reading	
	M	T	M	T	M	T	M	T	M	T	M	T	M	T
ELS cottons														
Level A	2426	---	3000	---	35.72	---	10.82	---	35.84	---	6.41	---	3.09	---
Level B	2233	2.40*	2981	0.50	35.09	2.31*	10.06	3.81**	35.67	0.18	6.01	3.64**	3.79	8.45*
LS Cottons														
Level C	---	---	2292	---	30.67	---	10.95	---	30.73	---	6.15	---	4.07	---
Level D	---	---	2038	10.07**	30.25	2.10*	9.54	2.03*	28.22	4.43***	7.21	---	3.74	3.46**

M = Mean T = t value \* Significant at 5% level of significance \*\* Significant at 1% level.

Table 4. Confidence limits for levels of quality properties within each category of commercial Egyptian cottons.

Cotton quality Levels	Yarn strength 120's comb.		Yarn strength 60's card.		Fiber length 2.5 % S.L		Fiber str. 0" gauge length		Fiber str. 1/8 gauge length		Elong. Eo %		Mic. reading	
	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit	Lower Limit	Upper Limit
Very fine ELS level A	2230	2625	2905	3095	35.18	36.27	10.61	11.03	33.59	37.49	6.12	6.70	2.91	3.26
Fine ELS level B	2120	2350	2930	3030	34.70	35.49	10.98	11.14	34.66	36.68	5.86	6.16	3.67	3.91
Delta LS level C	---	---	2235	2350	30.27	30.98	9.20	12.70	29.65	31.81	6.00	6.33	3.90	4.23
Upper Egypt LS level D	---	---	2005	2040	29.92	30.58	9.42	9.66	27.12	29.33	6.87	7.55	3.55	3.94

nificantly different from Giza 45 and Giza 70 cotton varieties in this trait, but for fiber elongation, it was found that Giza 45 and Giza 70 cotton varieties are of higher fiber elongation than Giza 76 and Giza 77 cotton varieties.

(4) For yarn strength of 60's carded count, it was found that each of Giza 76, Giza 77 and Giza 45 cotton varieties have the same level of strength of 60's carded yarns and all of them exceeded significantly Giza 70 cotton variety. Regarding the strength of 120's combed yarns, both Giza 45 and Giza 76 cotton varieties have the same level of the strength of 120's combed yarns and increased significantly than each of Giza 77 and Giza 70 cotton varieties. It could be noticed that as yarn count becomes higher (120's), Giza 45 cotton variety takes the top cotton quality and followed in descending order with Giza 76, Giza 77 and Giza 70 cotton varieties. This is due to that Giza 45 have the finer fibers than the other ELS cotton varieties:

The average values of studied quality properties shown in Table 2 pertaining the long staple cotton varieties, indicated that:

1- Fiber length of all cotton varieties belong to long staple category and grown commercially through thirteen years (1982-1994), did not differ significantly, and have the same level of staple length of about 30 mm

2- For fiber fineness and maturity in terms of micronaire reading, it was found that the cotton varieties Giza 80, Dendara and Giza 69 are of significantly lower values of micronaire reading than Giza 75 and Giza 81 cotton varieties.

3- Data of fiber strength measured at 0 "1/8" gauge length indicated that Delta long staple cotton varieties are of significantly higher values than Upper Egypt long staple cotton varieties. It could be arranged in descending order as follows; Giza 75, Giza 81, Giza 69, Giza 80 and dendara. But for fiber elongation percentage at break, it was noticed that Upper Egypt long staple cotton varieties are of significantly higher values than those grown commercially in Delt area.

4- Regarding yarn strength, it could be noticed (Table 2) that long staple cotton varieties grown commercially in Delta area were higher in yarn strength than those grown commercially in Upper Egypt. Giza 75 cotton variety has the strongest 60's carded yarns than the other cotton varieties .

#### **B. Quality levels :**

As mentioned before (Tables 1,2), it was found that cotton varieties within each cotton category could be divided into two separate quality levels, their differences in quality properties were compared by T test as shown in table (3) as fol-

lows:

**(1) ELS cotton category :**

Based on mean values of micronaire reading of ELS cotton varieties and according to the classification given by Grover and Hamby (1962), only fibers of Giza 45 cotton variety is very fine, whereas those of the other cotton varieties, i.e., Giza 76, Giza 77 and Giza 70 are only fine, so, cotton varieties of ELS cotton category were divided into quality levels (A,B). The first one (A) is very fine ELS cottons represented by Giza 45 cotton variety, and the second quality level (B) represented fine ELS cottons, i.e., Giza 76, Giza 77 and Giza 70 cotton varieties.

Results of comparing their differences in quality properties by using T test (Table 3) showed that the first quality level represents very fine ELS cottons are of significantly higher values of fiber length, fineness, strength at 0 " gauge length, elongation and yarn strength of 120's combed yarns than those for fine ELS cottons, but their differences in fiber strength at 1/8 gauge length and the strength of 60's carded yarns were not significant.

**(2) LS cottons :**

It was found, table (2), that the long staple commercial cotton varieties could be divided into two levels according to their quality properties. The third one (C) representing very strong long staple cottons which grown commercially in Delta area, i.e. Giza 75, Giza 81 and Giza 69 cotton varieties, and the fourth one (D) quality level represents Upper Egypt commercial cotton varieties i.e., Giza 80 and Dendara. It was found, table (3), that the third quality level named very strong LS cottons and grown commercially in Delta area differed significantly in all their studied quality properties from those for the fourth quality level (D) which are grown commercially in Upper Egypt.

**(C) Confidence limits :**

Confidence limits at 1% level of significance were made based on the mean values of the four quality levels constituting the range of quality properties of the two categories of Egyptian cottons through thirteen years (1982-1994) and given in table (4) for use as a guide in selection for quality in breeding programme . It could be concluded that selection for quality could be as follows :

(1) Only within the range of the two confidence limits of micronaire reading for each quality level.

(2) Not less than and exceeding the lower limits of the other quality properties for each quality level.

These rules were applied on quality properties of the ELS cotton variety Giza 84 (season 1994). As shown in Table 5, it was found that although it has higher strength and within the range of micronaire reading but it is of shorter length than the two lower limits of ELS levels with 2.4 and 1.8 mm, respectively and consequently outside the lower limits for strength of yarns spun on 60's carded and 120's combed of ELS cottons.

2.5 % S.L.	Mic. reading	Fiber strength		Elongation E %	Yarn strength	
		0" gauge	1/8 "gauge		60's Carded	120's Conbed
32.8	3.0	11.0	34.2	5.9	2780	1985



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## مستويات الجودة فى القطن التجارى المصرى

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تم دراسة بعض صفات الجودة التى تقدر بنفس الاجهزة لمدة ثلاثة عشر سنة متوالية من عام ١٩٨٢ وحتى ١٩٩٤ وذلك بهدف دراسة خواص جودة القطن التجارى المصرى ووضع مستويات جودة له داخل كل طراز من طرز القطن . وقد وجد أن جودة خواص تيلة وغزل القطن المصرى تتوزع داخل كل طراز الى مستويين للجودة يختلفان معنويا كما تم وضع حدود ثقة على متوسط كل مستوى جودة على مستوى ١٪ ليسانع المربى عند الانتخاب لخواص الجودة .