PHYSICAL AND STRUCTURAL PROPERTIES OF THE PROMISING EGYPTIAN LONG STAPLE COTTON CROSS (GIZA 89 X GIZA 86)

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ABSTRACT

A promising cotton inbred line characterized by high yielding ability, earliness in maturity and better fiber quality was developed via pedigree selection from the subsequent segregating generations of a cross between the two long-staple cvs.; Giza 89 and Giza 86 by the Cotton Breeding Section of the Cotton Research Institute. The purpose of this investigation aimed at assessment of the superiority of the physical and fine structural properties of the promising line derived from the cross (Giza 89 x Giza 86) over its parents. The results indicated that:

- The promising line surpassed its parents in upper half mean length, uniformity index, fiber strength, fiber elongation, micronaire value, maturity ratio, hair weight, dry fiber ribbon width, swollen fiber diameter, convolution number / cm., reversals number/ cm. and yarn strength.
- There were highly significant positive correlations between upper half mean length, uniformity index, convolution number/cm., fiber bundle strength and yarn strength.
- Highly significant negative correlations exhisted between dry fiber ribbon width, swollen fiber diameter, reversals number and bundle strength.

The promising line is now under propagation for growing as a commercial cultivar and would replace both parents in their growing areas.

Keywords: Cotton, Promising cross, Physical properties, Structural properties

INTRODUCTION

Breeding Egyptian cotton is directed mainly towards introducing higher yielding cultivars with improved fiber properties. The use of desirable parents characterized by high yield and good fiber quality in hybridization could enhance the performance of new recombinants. The progress of any breeding program depends on available genetic information. The hybridization-selection method has been utilized effectively in many instances and has been responsible for de-

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veloping most the present commercial cultivars in most of cotton growing countries. **Al-Didi, (1972)** reported that all the commercial cultivars grown in Egypt today were produced by hybridization except Dendera, which is the only one, produced by individual plant selection from Giza 3. Performance of the promising cotton cross was studied by several workers Awad *et al* (1996); Haikal *et al* **(1996) and El-Helow** *et al* **(2003).** The acknowledged reference method for maturity and fineness measurements on cotton is Image Analysis method. **Thibodeaux** *et al* **(2000).** Image Analysis has improved determinations of fiber biological fineness and maturity but it remain too slow and limited with respect to sample size. **Huang and Xu (2002)** reported that the Image analysis longitudinal measurements were correlated well with the data obtained from other methods.

MATERIAL AND METHODS

The Cotton Breeding Research Section at Giza is still fully depending on hybridization followed by the pedigree method for breeding and production of the alternative varieties. A new promising line was derived from a cross between the two long staple cultivars, Giza 89 and Giza 86.

Lint cotton samples of the promising inbred line and its parents were obtained from the different trials of Cotton Breeding Research Section during 2003 season. Upper half mean length (millimeter), length uniformity index, fiber tensile strength (g./tex) and fiber elongation were measured using HVI 900 according to **(ASTM: D 2253-86, 1998)** Micronaire reading, maturity ratio and fineness

(linear density) in millitex were measured by Micromat tester (new F/M T instrument) according to **(ASTM: D 3818-79, 1998).** The biological fineness (dry fiber ribbon width and swollen fiber diameter in micron) and fiber structural (convolution number/cm. and reversals number/cm.) were measured from the Image analysis with computer system according to **Huang and Xu (2002).** Yarn strength was measured according to **(ASTM: D 1578-67, 1998).**

The samples were tested under controlled atmospheric conditions of 65 ± 2% relative humidity and 70 ± 2°F temperature at the Cotton Technology Research Institute, Giza, Egypt.

The obtained data were subjected to statistical analysis of variance according to **Snedecor and Cochran (1976),** L.S.D. test was used for comparing the different means. Simple correlation analysis according to **Draper and Smith (1966)** were performed with a computerized SAS program.

RESULTS AND DISCUSSION

The statistical analysis of cotton fiber properties and yarn strength are given in Table (1). The results showed considerable differences between the promising line and its parents in most of the studied properties. These differences were significant at 5% level.

Comparing the promising line derived from the cross Giza 89 and Giza 86, data in Table (1) indicated that the promising cross surpassed its parents in upper half mean length, uniformity index, fiber strength, fiber elongation, micronaire reading, maturity ratio, hair weight.

Table 1. Means of fiber properties for the promising line as compared to its parents Giza 89 and Giza 86

Fiber properties	Promising line derived from Giza 89 x Giza 86	Giza 89	Giza 86	LSD at 5% level
Upper half mean Length (mm)	33.12	32.12	33.06	0.1180
Uniformity Index (%)	87.50	86.28	86.72	0.2627
Fiber strength (g/tex)	45.14	42.06	44.12	0.2222
Elongation %	7.20	7.14	7.02	0.1866
Micronaire reading	4.2	4.4	4.5	0.0907
Maturity ratio	0.97	0.93	0.89	0.0305
Hair weight (millitex)	172	174	173	2.2782

Data in Table (2) show fiber fine structural properties (dry fiber ribbon width, swollen fiber ribbon width, convolution number/cm. and reversals number/cm.) for the promising line and its parents. The statistical analysis showed significant differences between the promising line and its parents in favour of this line with regard to dry fiber ribbon width, swollen fiber diameter, convolution number/ cm., reversals structural number/cm. and yarn strength.

Simple correlations coefficients between fiber properties and mechanical properties (fiber and yarn strength) for the promising line and its parents are shown in Table (3). The results showed highly significant positive correlation between upper half mean length, uniformity index, convolution number/cm. and fiber bundle strength. While there are highly significant negative correlation between dry fiber ribbon width, swollen fiber diameter, reversals number and fiber bundle strength. On the other hand there are highly significant positive correlations between upper half mean length, uniformity index, convolution number/cm., fiber bundle strength and yarn strength. Whenever there is highly significant negative correlation between dry fiber ribbon width, swollen fiber diameter, reversals number/cm. and yarn strength.

The high value of yarn strength of the promising line could be related to their long, strong and fine fibers (higher number of fibers in yarn cross section) that surpassed the patents in each category.

CONCLUSIONS

It could be concluded that the promising inbred line derived from the cross between the long-staple cvs.; Giza 89 and Giza 86 surpassed its parents in fiber and fine structural properties, as well as, yarn strength. Therefore, it is recommended to replace both parents in their growing areas.

Table 2. Means of fiber fine structural properties for the promising line as compared to its parents Giza 89 and Giza 86

Fiber properties	Promising line derived from Giza 89 x Giza 86	Giza 89	Giza 86	LSD at 5% level
Image analysis data				
Dry fiber ribbon width (μ)	14.3	15.5	14.8	0.1331
Swollen fiber diameter (μ)	17.7	18.6	17.9	0.1445
Convolution number/cm.	37.6	36.7	33.9	0.6853
Reversals number/cm.	7.2	9.3	8.4	0.1943
Yarn strength.	2564	2475	2540	11.7923

Table 3. Simple correlation coefficients between various characters and mechanical properties for the promising line and its parents

Properties	Correlation values	
	Fiber strength	Yarn strength
Upper half mean length (mm)	0.921**	0.972**
Uniformity Index	0.975**	0.695**
Dry fiber ribbon width (μ)	-0.975**	-0.768**
Swollen fiber diameter(μ)	-0.965**	-0.858**
Convolution number/cm.	0.928**	0.893**
Reversals number/cm.	-0.894**	-0.571*
Fiber strength (g/tex)	-	0.993**

*, **: Denote significant at 5% and 1% levels of probability, respectively

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صفات فيزيائية وتركيبية للهجين المبشر بين صنفى القطن المصرى
(جيزة ٨٩٥ x جيزة ٨٦)

[١٨]

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تم إجراء هذا البحث على سلالة نقية مبشرة منتخبة بواسطة قسم بحوث تربية القطن خلال الأجيال الإنعزالية للهجين بين صنفين ينتميان إلى طبقة الأقطان الطويلة التيلة المنزرعة بالوجه البحرى هما جيزة ٨٩ وجيزة ٨٦ بهدف مقارنة خواصها الفيزيائية والتركيبية ومتانة الغزل بخواص الصنفين الأبوين لإثبات جودتها وإمكانية إحلال هذه السلالة المبشرة محل جيزة ٨٩ و جيزة ٨٦ فى أماكن زراعتهما.

أخذت عينات من كل من السلالة المبشرة والأبوين جيزة ٨٩ و جيزة ٨٦ وأبويه وتم إجراء الإختبارات عليها بمعامل تكنولوجيا القطن بمعهد بحوث القطن تحت ظروف قياسية من الحرارة ٧٠ °ف ± ٢ والرطوبة ٦٥ ±٢ بأجهزة الـ HVI و الميكرومات والـ Image analysis وجهاز متانة الشلة. وقد تم دراسة الصفات الفيزيائية (متوسط طول النصف الأعلى ومعامل الإنتظام لطول التيلة ومتانة وإستطالة التيلة) بجهاز الـ HVI وقراءة الميكرونير ونسبة النضج والنعومة بالوزن بجهاز الميكرومات. كما تم

قياس الصفات الدقيقة والتركيبية (عرض الشريط الجاف وقطر الشعرة المنتفخة وعدد الإلتواءات وعدد الإنعكاسات التركيبية / سم) بجهاز Image Analysis.

وقد أوضحت النتائج تفوق السلالة المبشرة على الأبوين فى صفات الطول (متوسط طول النصف الأعلى وإنتظام الطول) وقراءة الميكرونير ونسبة النضج والنعومة بالوزن ومتانة وإستطالة الخصلة .

كما تفوقت السلالة المبشرة على الأبوين فى صفات النعومة الذاتية (عرض الشريط الجاف وقطر الشعرة المنتفخة) والصفات التركيبية (وعدد الإلتواءات وعدد الإنعكاسات التركيبية / سم).

وجدت علاقة موجبة وعالية المعنوية بين متانة الخصلة ومتانة الغزل وكل من (متوسط طول النصف الأعلى ومعامل الإنتظام لطول التيلة عدد الإلتواءات / سم بينما كانت العلاقة سالبة وعالية المعنوية بين متانة الخصلة وكل من عرض الشريط الجاف وقطر الشعرة المنتفخة وعدد الإنعكاسات التركيبية / سم.

كما تفوقت السلالة المبشرة علــى كــلا الصنفين جيزة ٨٩ ، جيزة ٨٦ فى صفات جودة خيوط الغزل وذلك يرجع إلى تفوقهــا فى كل الصفات التى سبق ذكرهــا وذلــك

يشيــر إلـى إمكانيــة إحلال هذه الســلالة المبشرة محـــل أبويهــا فـى منـــاطق زراعتهما بعد إكثارها وإعتمادها كصــنف تجارى.

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