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EVALUATION AND GENOTYPIC STABILITY FOR THE HYBRID (GIZA 89 X GIZA 86) AND SOME EGYPTIAN LONG STAPLE COTTON VARIETIES

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Abstract

The present investigation aimed to determine evaluation and genotypic stability for some Egyptian long staple cotton genotypes i.e.:- promising hybrid (Giza 89 x Giza 86) and three varieties i.e.:- Giza 85, Giza 86 and Giza 89 under twelve different environments. Each single carried trial was grown in a randomized complete block design with four replications. Nine characters were studied. All characters showed highly significant mean squares for environments and genotype x environment interaction> All characters except seed cotton yield k/f showed highly significant mean squares for genotypes.

The new hybrid (Giza 89 x Giza 86) surpassed Giza 89 in all studied characters, on Giza 85 except lint percentage and on Giza 86 seed cotton yield, lint percentage and 2.5% span length at most studied environments. Giza 86 gave the highest lint percentage and 2.5% S.L. more than the other genotypes it surpassed Giza 85 in all studied characters except S.C.Y. and seed index an on Giza 89 in all studied characters except S.C.Y. Giza 85 surpassed Giza 89 for seed index while Giza 89 surpassed Giza 85 in (2.5% and 50%) S.L.

Average genotypic stability degrees were recorded for seed cotton yield k/f for Giza 85; boll weight for Giza 89; seed index for Giza 86 and Giza 89; lint percentage for Giza 86; 2.5% S.L. for (Giza 89 x Giza 86) hybrid; 50% S.L. for Giza 86; L.U.R. for Giza 85 and Giza 86, while all genotypes under study were unstable for micronaire reading and yarn strength. It can be recommended by sowing Giza 86 at Kafr El-Sheikh and sowing (Giza 89 x Giza 86) hybrid as an alternate of Giza 85 and Giza 89 at the other studied regions.

INTRODUCTION

Cotton is greatly influenced by seasonal and environmental fluctuations. Stability of cotton cultivars over varied environmental conditions is critical in modern agriculture for productivity, quality and profit. Plant breeders prefer to develop varieties that have a wide adaptation. In this respect Awaad (1989) and Abou Zahra *et al.* (1989) showed that the relatively unpredictable component of variance for the genotype x environ-

ment interaction may be more important that the relative predictable component. Estimates of genotypic stability revealed varying degrees of stability for the different genotypes. Abo El-Zahab *et al.* (1992a) reported that the several stability estimates used, indicating that for selection of stability with the objective of incorporating this important trait in Egyptian cotton germplasm the following varieties may be considered as breeding stocks for specific traits; Giza 75 to seed index and lint percentage; Giza 80 for lint index; Giza 80; Giza 81; Giza 83 and Giza 68 x C.B.58 for seed cotton yield. Gutierrez *et al.* (1992), Buloch *et al.* (1994), El-Shaarawy *et al.* (1994) evaluated three cultivars and some strains of Egyptian cotton over some locations in the Nile Delta of Egypt. They showed that the genotypes variance were highly significant for all traits except seed index. The genotypes varied for the estimated, λ_i, while the estimated α did not differ from $\alpha = 0$ which may suggest that the relatively unpredictable component (deviation form linear, λ_i) of the genotype-environment interaction variance may be more important than the relatively predictable component (linear response, α_i). The best two strains were F_5 (514/90) and F_6 (557/90) which average level of stability for all traits. Awaad *et al.* (1994) reported information on genotype x environment interaction derived from data on six yield components in 28 genotypes grown at seven locations in Middle and Upper Egypt in 1992. The best three genotypes were F_5-148/90, F_5-160/90 and F_6-197/90 which were stable for all recorded traits. The new cultivar Giza 83 was the highest yielding and most stable commercial cultivar. El-Shishtawy *et al.* (1994) studied the average genotypic stability degrees for boll weight, for Giza 69 and the promising hybrid Giza 75 x (44 x C.B.58) and lint percentage for hybrid Giza 67 x C.B.58. Seyam *et al.* (1994) recorded average genotypic stability degrees for seed index and Micronaire reading for Giza 76, Giza 80, Giza 81 and, Giza 83, lint percentage for Giza 83 and lint index for Giza 81, while most varieties were unstable for seed cotton yield per plant, boll weight, lint percentage, and fiber strength traits. Abotour *et al.* (1996), based on data all over environmental means of Giza 85 cultivar, stated that the high yielding genetic potential and the recorded wide adaptability supported the evidence that the culltivar may be recommended to be included in any breeding program for improving lint yield and lint percentage. Bhatad *et al.* (1996), El-Shaarawy *et al.* (1998) studied some genotypes over some locations for six traits. The variance for genotypes was highly significant for all traits except seed index where it was insignificant. The best strain was F_6 (744/91) which was stable for lint yield and

all other traits. Moreover, it was highly productive. Badr (1999) showed average genotypic stability degrees were recorded for seed and lint cotton yield for Giza 86, Giza 88; boll weight for Giza 85 and Giza 87; seed index for Giza 85, Giza 86 and Giza 89, Micronaire reading for Giza 88; yarn strength for Giza 86, while all varieties under study were unstable for 2.5% and 50% span length. El-Harony (2000) showed that the genotypes Giza 75, Giza 83, and Giza 86 could be considered as breeding stocks for most yield and yield components traits, while Giza 45, Giza 85 and Giza 89 were the poorest varieties for these traits. Also, Giza 45, Giza 70 and Giza 77 were stable for most fiber properties. Abd El-Salam (2000) reported the average genotypic stability was recorded for seed index for Giza 85; for seed index, lint percentage, and seed cotton yield for Giza 86. Zeina (2001) showed highly significant mean squares for varieties, environments and variety x environment interaction. Average genotypic stability was recorded for seed cotton yield for Giza 85, Giza 86 and Giza 89, seed index for Giza 85, Giza 89 and Giza 89 x Giza 86 Micronaire reading and fiber length for Giza 89. El-Helow *et al.* (2002) reported that the variance for environment (E) genotypes (G) and GxE interaction highly significant and eight strains were exhibited average levels of stability for micronaire reading. The present study aims to determine the genotypic stability for some agronomic, fiber properties and yarn strength characters for the new Egyptian cotton varieties Giza 85, Giza 86 and Giza 89 and the hybrid (Giza 89 x Giza 86).

MATERIALS AND METHODS

Three Egyptian varieties of cotton namely Giza 85, Giza 86 and Giza 89 and one hybried (Giza 89 x Giza 86) were planted at six locations i.e., Kafr El-Sheikh, El-Behairah (Kafr El-Dawar) Damietta (Kafr Saad), El-Gharbia (Tanta), El-Menofia (Tala) and El-Sharkia (Abokber), in two successive seasons (2000 and 2001). A randomized complete block design with four replications was used at each location. Cotton genotypes seeds were planted in the first week of April plot size consisted of five rows four meter long, and 60 cm apart. Distance between hills was 25 cm and each hill was thinned to two plants after fourty days from planting. Cultural practices were carried out as recommended. Nitrogen fertilization was applied at the rate of 62 Kg N per fed. The phosphorus fertilizer was applied to the soil before planting in the form of superphosphate (15.5% P_2O_5) at the rate of 22.5 Kg P_2O_5/Fed. The characters studied were seed cot-

ton yield (S-C-Y. K/f) = Estimated as the weight of seed cotton yield in kentar per feddan.

- Boll weight (B.W.). The average boll weight in grams of 25 bolls picked at random from each plot.
- Lint percentage (L%): The weight of lint obtained from a seed cotton sample : L% =

$$\frac{\text{Weight of lint in the sample}}{\text{Weight of seed cotton in the sample}} \times 100$$

- Seed index (S.I.): The weight of.100 seeds in grams.
- 2.5% and 50% span length was measured by means of the digital Fibrograph 530, according to the standard method of (A.S.T.M.D. 1447.67).

The length uniformity ratio calculated: (L.U.R.) = $\frac{\text{50\% span length}}{\text{2.5\% span length}} \times 100$

- Micronare reading was carried out using micronaire apparatus (A.S.T.M.D. 1448).
- Yarn strength quoted as the product of lea strength in pounds x yarn count, 60'5 carded and twist multiplier 3.6.

Statistical analysis:

The genotypic stability analysis was performed done according to the method described by Tai (1971). A combined analysis of variance was carried out for each character with fixed variety effects and random replication and environmental effects.

Stability parameters α_i and λ_i were estimated for each variety separately by using the following equations:

$$\alpha_i \quad \frac{S1\ (gL)i}{(MSL - MSB) / Vr}$$

$$\lambda_i = \frac{S2\ (gL)i - \alpha_i\ S\ (gl)i}{(V-1)\ MSE/\ Vr}$$

where

α_i = The linear response of the ith variety to the environmental effect.

λ_i = The deviation from the linear response of the ith variety to the environmental effect.

S1 (gl)I = The sample covariance between the environment and interaction effects.

S2(gl)I = The sample variance at the interaction effect of the ith variety to the nth environment.

i = The environmental effects.

(Gl) i = The interaction effect of the ith variety.

MSL = Mean square of environments.

MSB = Mean square for replicates within environments.

MSE = The mean square for error.

r = Number of replication.

v = Number of genotypes.

A perfectly stable cultivar will not change its performance from one environment to another. This is equivalent to stating that alpha i = -1 and lambda i = 1. Perfectly stable cultivars probably do not exist and plant breeders will have to be satisfied with obtainable levels of stability, i.e. average stability (alpha i = 0 and lambda i = 1). Denoting the tabulated value of the probability level a (a = 1 -p) with (n-2) degrees of freedom, as ta the prediction limits for alpha i corresponded to alpha i = 0 can be shown to be

$$\pm t^2a = \left[\frac{\lambda_i\, 0(V-1)\ MSE.\ MSL}{(MSL - MSB)\ \{n-2)\ MSL - (t^2a + n-2)\ MSB]} \right] 1^{1/2}$$

Lambda 0 = 1 the confidence interval at the probability level P is $Fa\ (n_2, n_1) \leq , \leq Fa(n_1, n_2)$.

where

Fa (n2, n1)= 1/Fa(n1,n2)

n1 = n-2 degrees of freedom

n2 = n (v-1) (r-1) degrees of freedom

a = 1-P

and P = 0.90

RESULTS AND DISCUSSION

The results of the combined analysis of variance for all characters are shown in Table (1). The environment, genotype x environment interaction mean squares were highly significant for all studied characters. While, the genotype mean squares was highly significant for all studied characters except seed cotton yield K/f.

These results indicated that: (a) As an average over all tested environments, all characters showed significant difference among genotypes, and (b) for all characters, the genotypes responded differently at the different environments.

Table 1. Analysis of variance for stability of some characters for cotton genotypes under different environments.

Source of Variance	Seed cotton yield/K/F	Boll weight (g)	Seed index (g)	Lint percentage %	2.5% span length (mm)	50% span length (mm)	Length uniformity ratio %	Micro-naire reading	Yarn strength
Environment (E)	** 201.4395	** 1.4617	** 13.8452	** 14.4574	** 1.488	** 1.217	** 5.9922	** 1.2022	** 160230.5
Rep. Within Env.	* 3.8343	0.0468	0.4073	* 1.1472	0.2874	0.1024	1.2164	0.0606	11295.21
Genotypes (G)	4.7777	** 0.4504	** 5.8313	** 50.3626	** 23.0426	** 4.4094	** 10.5298	** 1.7863	** 883271.6
G x E	** 7.1288	** 0.092	** 0.7816	** 1.8966	** 0.9537	** 0.3925	** 3.2111	** 0.2822	** 54044.27
Pooled error	2.4776	0.0343	0.3181	0.6441	0.3665	0.1105	1.1506	0.0379	8711.467

Effect of genotypes x environments interaction: Data in Table (2) indicated that the new hybrid (Giza 89 x Giza 86) produced the highest values for S.C.Y k/f. (16, 16.5 k/f.) and B.W. (3.4, 3.5 g.) at El-Behirah in two years and El-Menofia in Y_1, for S.I. (11.53 g.) at El-Behaira in Y_2 and El-Menofia in Y_1. While, the lowest values for S.C.Y. (9.20 k/f), B.W. (2.5 g.), S.I.(8.63 g.) at El-Sharkia in Y_1. It gave L.P. ranged from 39.83% at Damietta in Y_2 to 36% at El-Gharbia in Y_1. It gave the highest values for 2.5% S.L. (32 m.m.) almost at El-Gharbia, El-Menofia and Kafr El-Sheikh in Y_1 and ranged from 31 m.m. to 31.5mm at the other environments, for 50% S.L. ranged from (16.2, 16.3 mm) at El-Gharbia, El-Beheira and Damietta and El-Menofia in Y_1 to (15.25 mm) at Kafr El-Sheikh in Y_2. It gave L.U.R. ranged from (51.85%, 51.11%) at all regions in Y_1 except El-Menofia to 49.2% at Kafr El-Sheikh in Y_2 for micronaire reading ranged from 3.6 mic. At El-Sharkia in Y_1 to 4.48 mic. At Damietta and Kafr El-Sheikh in

Y_2. It gave the highest values for yarn strength 2758, 2715 at El-Gharbia, Damietta in Y_1 and El-Menofia in Y_2, but the lowest was 2343 at El-Sharkia in Y_1. Also this hybrid surpassed Giza 85 for (2.5%, 50%) S.L. and yarn strength at all studied environments, for M.R. at Damietta and El-Gharbia in two years and Kafr El-Sheikh in Y_2, for L.P. in Y_2 at both Damietta, El-Gharbia and in Y_1 at El-Menofia, for S.I. at Kafr El-Sheikh in Y_2, for B.W. at Kafr El-Sheikh in Y_1, El-Behairah and El-Menofia in Y_2, for S.C.Y. at El-Menofia and El-Gharbia in the two years. (Giza 89 x Giza 86) surpassed Giza 86 for S.C.Y. at El-Gharbia and El-Sharkia in Y_1, for B.W. at Kafr El-Sheikh in Y_1, for S.I. at Kafr El-Sheikh in Y_2, for L.U.R. at Damietta in Y_2, El-Gharbia and El-Menofia in Y_2, for M.R. at Damietta in Y_2 , Kafr El-Sheikh in Y_2 and El-Gharbia in the two years, for yarn strength at all environments except Damietta in Y_1, Kafr El-Sheikh in the two years. It surpassed Giza 89 for S.C.Y. at El-Gharbia and El-Menofia in Y_1, for B.W. at Kafr El-Sheikh, El-Beheirah, El-Gharbia and El-Menofia in the two years, for seed index at Kafr El-Sheikh in Y_1, Y_2 and El-Beheirah in Y_1, for L.P. at Damietta, El-Beheirah, El-Menofia and El-Sharkia in the two years and El-Gharbia in Y_2, for 2.5% S.L. at Damietta in Y_1 and Y_2, for 50% S.L. at Damietta in Y_1, Kafr El-Sheikh in Y_1, El-Gharbia in Y_1 and Y_2, El-Menofia in Y_2 and El-Sharkia in Y_2, for L.U.R. at Damietta in Y_1, for M.R. at (Damietta, Kafr El-Sheikh, El-Gharbia) in Y_2 and El-Sharkia in Y_1, for yarn strength at all studied environments.

Giza 85, Giza 86 and Giza 89 varieties gave the highest values for S.C.Y., B.W. and S.I. at El-Beheirah in the two years then El-Menofia in Y_1, while the lowest values for S.C.Y. and seed index were at El-Sharkia in Y_1, for B.W. at El-Gharbia in Y_1 of Giza 85 and El-Sharkia of Giza 86 and Giza 89. Giza 85 gave the values for L.P. ranged from 40% at Kafr El-Sheikh and El-Beheirah in the two years to 36.2% at El-Gharbia in Y_2, for 2.5% S.L. ranged from (30.65 mm) at El-Garbia in Y_1, to 30.00 mm) at both Kafr El-Sheikh in the two years, El-Beheirah in Y_2 and El-Sharkia in Y_2, for 50% S.L. ranged from 15.7 mm at El-Beheirah in Y_1 to 14.8 mm at both Damietta and El-Menofia in Y_1, for L.U.R. ranged from 51.58% at El-Beheirah in Y_1 to 49.4% at El-Menofia in Y_1, for M.R. ranged from 4.4 mic. at El-Beheirah in Y_1 to 3.25 mic. at El-Gharbia in Y_2 and El-Sharkia in Y_1, for yarn strength ranged from 2388 at Damietta in Y_1 to 2168 at El-Sharkia in Y_1.

Giza 86 gave the values for lint percentage ranged from 41% at Kafr El-Sheikh in Y_1 to 38.15% at El-Beheirah in Y_1, for 2.5% S.L. (32, 32.5 mm) at both Kafr El-Sheikh

and El-Beheirah during the two years to 30.78 mm at El-Sharkia in Y_2, for 50% S.L. ranged from 16.0 mm almost at Kafr El-Sheikh and El-Beheirah in the two years, Damietta in Y_1 and El-Sharkia in Y_2 to 14.9 mm at Damietta in Y_2 and Gl-Gharbia in Y_1, for L.U.R. ranged from 51.95% at El-Gharbia in Y_1 to 47.75 % at Damietta in Y_2, for M.R. 4.68 mic. at El-Sharkia in Y_1 to 3.5 mic. at El-Gharbia in Y_2, for yarn strength 2609 at Kafr El-Sheikh in Y_1 to 2220 at El-Sharkia in Y_1.

Giza 89 gave the values for L.P. ranged from 39% at Kafr El-Sheikh in Y_1 to 35.5% at El-Gharbia in Y_1 and El-Menofia in Y_2, for 2.5% ranged from 32.5 mm at El-Beheirah in Y_2 to 30.45 mm. at El-Sharkia in Y_2, for 50% S.L. ranged from 16.3 mm. at El-Beheirah in Y_2 to 15.0 mm. at Damietta in two year and Kafr El-Sheikh in Y_1, for L.U.R. ranged from 50.2% at El-Beheirah in Y_2 and both El-Gharbia, El-Menofia, El-Sharkia during Y_1 to 48% at Damietta in Y_1 and Kafr El-Sheikh during the two years, for micronaire reading ranged form 4.55 mic. at El-Beheirah in Y_2 to 3.58 mic. at El-Gharbia in Y_2, for yarn strength ranged from 2490 at El-Beheirah in Y_1 to 2030 at El-Sharkia in Y_2.

Data indicated that the new hybrid (Giza 89 x Giza 86) surpassed Giza 85 and Giza 89 for the most studied characters at the most environments Giza 86 gave the highest quality at Kafr El-Sheikh. The results are in harmony with those obtained by El-Shaarawy *et al.* (1988, 1994 and 1998); Abo-Zahra *et al.* (1989); Awaad (1989), Abo El-Zahab *et al.* (1992 a,b), El-Shishtawy *et al.* (1994), Seyam *et al.* (1994) and Abd El-Salam (2000), they reported that the effect of genotype x environments interaction was significant on some cotton characters.

Effect of the environments on studied characters:

Data in Table (3) showed the average values of studied cotton characters as affected by different growing environments. El-Beheirah in the two years gave the highest values for S.C.Y. (16 k/f), for 2.5% S.L.(31.5 mm) but Damietta in Y_2 gave the lowest S.C.Y.(10.09 k/f). Also El-Sharkia in Y_2 gave the lowest 2.5% S.L.(30.51 mm). The average values of B.W. (3.42 g), S.I. (11.44 g) and M.R.(4.37 mic.) were highest at El-Menofia in Y_1 and were the lowest values of B.W.(2.57 g), S.I.(8.48 g) and M.R. (3.7 mic.) at El-Sharkia in Y_1 for lint percentage ranged from 39.49% at Kafr El-Sheikh in Y_1 to 36.72% at El-Gharbia in to 36.72% at El-Gharbia in Y_1. El-Beheirah in Y_1 gave

Table 2. Effect of genotypes x environments interaction on studied cotton characters.

Region	Damietta		Kafr El-Sheikh		El-Beheirah		El-Gharbia		El-Menofia		El-Sharkia		L.S.D. for GxE	
Year / Genotype	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	0.05	0.01
	Seed cotton yield k/f													
Giza 85	10.68	10.20	10.60	12.60	15.56	16.43	12.35	10.38	13.70	10.82	10.10	11.14	1.10	1.46
Giza 86	9.95	10.07	11.55	12.31	16.52	16.83	11.12	10.12	13.45	11.90	10.14	10.45	1.10	1.46
Giza 89	10.86	10.79	10.42	12.19	16.26	15.32	11.03	10.53	14.19	12.68	10.58	10.51	1.10	1.46
G.89xG.86	9.63	9.30	10.88	11.53	16.00	16.20	14.50	10.29	16.49	13.35	9.20	10.63	1.10	1.46
L.S.D.: 5%	-	-	-	-	-	-	2.05	-	1.76	1.64	-	-		
1%	-	-	-	-	-	-	2.94	-	-	-	-	-		
	Boll weight													
Giza 85	2.92	2.88	2.93	2.58	3.30	3.12	2.80	2.30	3.40	2.95	2.73	2.55	0.13	0.17
Giza 86	3.05	2.88	2.90	2.75	3.40	3.30	3.10	2.70	3.65	2.85	2.45	2.50	0.13	0.17
Giza 89	2.90	2.72	2.85	2.67	3.05	3.02	2.75	2.25	3.22	2.63	2.60	2.50	0.13	0.17
G.89xG.86	2.75	2.88	3.55	2.70	3.40	3.50	2.90	2.58	3.41	3.00	2.50	2.93	0.13	0.17
L.S.D.: 5%	-	-	0.37	-	0.13	0.26	-	0.26	0.24	-	-	0.21		
1%	-	-	0.53	-	0.19	-	-	0.37	0.35	-	-	-		
	Seed index													
Giza 85	10.35	10.55	10.88	9.35	11.38	10.70	10.73	8.45	11.48	10.53	9.15	10.15	0.04	0.52
Giza 86	10.45	9.48	10.38	9.48	11.62	11.95	11.53	8.78	11.73	10.55	7.95	9.90	0.04	0.52
Giza 89	9.25	9.00	9.63	8.80	10.50	10.43	10.28	9.23	11.05	9.55	8.18	9.85	0.04	0.52
G.89xG.86	9.63	9.13	10.80	10.02	11.45	11.53	11.48	10.05	11.53	10.30	8.63	10.20	0.04	0.52
L.S.D.: 5%	0.76	-	0.70	0.47	0.59	1.04	0.82	-	-	-	0.71	-		
1%	-	-	-	0.68	0.85	-	-	-	-	-	-	-		
	Lint percentage													
Giza 85	38.20	37.95	40.05	39.73	39.78	39.90	37.30	36.20	38.85	38.65	39.30	37.70	0.56	0.74
Giza 86	39.35	38.95	41.05	40.08	40.03	39.55	38.15	38.55	39.90	39.48	38.48	38.63	0.56	0.74
Giza 89	36.73	35.63	39.10	38.80	37.88	37.55	35.45	35.58	36.38	35.53	37.70	36.65	0.56	0.74
G.89xG.86	38.55	39.83	39.55	38.08	39.53	39.15	36.00	37.58	39.05	37.30	38.50	38.08	0.56	0.74
L.S.D.: 5%	1.73	1.64	0.96	-	1.50	1.52	1.42	1.06	0.54	0.84	0.78	1.22	-	-
1%	-	2.35	1.40	-	-	-	2.04	1.52	0.78	1.21	1.12	1.75	-	-
	2.5 span length													
Giza 85	29.18	30.50	30.00	30.00	30.60	30.00	30.65	30.25	30.10	30.35	30.70	30.00	0.43	0.57
Giza 86	31.46	31.63	32.48	32.25	32.10	31.98	31.28	31.65	31.48	31.25	31.20	30.78	0.43	0.57
Giza 89	30.63	30.60	31.38	31.53	31.75	32.48	31.68	31.00	31.48	30.80	31.65	30.45	0.43	0.57
G.89xG.86	31.25	31.10	31.70	31.50	31.48	31.50	31.93	31.00	32.08	31.40	31.08	30.80	0.43	0.57
L.S.D.: 5%	0.81	0.70	0.72	0.44	1.01	0.48	0.68	0.39	-	1.02	0.45	0.22		
1%	1.71	-	1.04	0.63	-	0.69	-	0.56	-	-	0.64	0.32		

Table 2. Cont.

Region / Year / Genotype	Damietta		Kafr El-Sheikh		El-Beheirah		El-Gharbia		El-Menofia		El-Sharkia		L.S.D. for GxE	
	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	0.05	0.01
	50% span length													
Giza 85	14.80	15.40	15.20	15.18	15.70	15.00	15.45	15.15	14.78	15.23	15.45	15.00	0.23	0.31
Giza 86	16.08	15.10	16.08	16.25	16.00	15.98	15.10	15.50	15.85	15.60	16.13	15.50	0.23	0.31
Giza 89	15.08	15.05	15.13	15.30	15.83	16.30	15.75	15.45	15.90	15.30	15.90	15.15	0.23	0.31
G.89xG.86	16.28	15.88	15.78	15.25	16.15	15.98	16.30	15.80	16.20	15.80	15.85	15.50	0.23	0.31
L.S.D.: 5%	0.64	-	0.80	-	-	0.34	0.49	0.27	0.70	0.43	-	0.25		
1%	0.91	-	-	-	-	0.49	-	0.40	1.01	-	-	0.37		
	Length uniformity ratio													
Giza 85	50.75	50.50	50.68	50.58	51.58	49.98	50.40	49.90	44.40	50.35	50.33	50.00	0.75	0.99
Giza 86	51.08	47.75	48.20	48.48	50.03	49.70	51.95	48.98	51.53	48.60	51.68	49.60	0.75	0.99
Giza 89	48.25	49.63	48.45	48.03	49.83	50.20	50.25	49.85	50.25	49.70	50.23	49.78	0.75	0.99
G.89xG.86	51.85	49.55	51.33	49.20	51.30	49.18	51.11	50.98	50.50	50.33	51.83	50.30	0.75	0.99
L.S.D.: 5%	1.80	1.83	-	-	-	-	-	1.18	-	1.16	-			
1%	2.60	-	-	-	-	-	-	-	-	-	-			
	Micronaire reading													
Giza 85	3.85	3.78	4.00	3.40	4.40	4.18	3.98	3.15	4.13	3.30	3.20	3.93	0.14	0.18
Giza 86	4.28	3.80	4.35	3.70	4.30	4.13	3.80	3.50	4.68	4.00	4.28	4.20	0.14	0.18
Giza 89	4.18	3.88	4.15	3.68	4.25	4.55	4.18	3.53	4.15	3.78	3.63	3.85	0.14	0.18
G.89xG.86	4.35	4.48	4.30	4.48	4.28	4.30	4.43	4.30	4.53	4.00	3.60	3.78	0.14	0.18
L.S.D.: 5%	0.23	0.28	-	0.24	0.32	-	0.40	0.35	0.26	0.32	0.29	0.27		
1%	0.32	0.40	-	0.34	-	-	-	0.50	0.37	0.46	0.42	-		
	Yarn strength													
Giza 85	2388	2278	2305	2329	2226	2100	2198	2203	2265	2215	2168	2195	65.37	86.52
Giza 86	2522	2548	2609	2440	2470	2439	2465	2393	2365	2405	2220	2251	65.37	86.52
Giza 89	2388	2336	2290	2230	2490	2393	2455	2045	2165	2133	2250	2030	65.37	86.52
G.89xG.86	2715	2694	2589	2485	2540	2490	2758	2610	2533	2715	2343	2490	65.37	86.52
L.S.D.: 5%	46.85	194	36.07	79	27.58	38	331	60	247	80	-	145		
1%	67.31	-	51.82	113	39.63	55	-	86	-	115	-	208		

- = Not significant

the highest 50% S.L. (15.92 mm) but El-Sharkia in Y_2 gave the lowest (15.29 mm), but the highest L.U.R. 50.56% was at Damietta in Y_1. Damietta surpassed all the studied environments for yarn strength it recorded (2503) in Y_1. However El-Sharkia gave the lowest values 2253 in Y_1 and 2242 in Y_2. These results are in harmony with those obtained by El-Shaarawy *et al.* (1988, 1994 and 1998), Abo Zahra *et al.* (1989); Awaad (1989), Abo El-Zahab *et al.* (1992 a,b), Awaad *et al.*; Seyam *et al.* and El-Shishtawy *et al.* (1994); Badr (1999) and Abd El-Salam (2000), they reported that the effect of environments was significant on some cotton characters.

Effect of genotype on cotton characters: Giza 85, Giza 86 and Giza 89 are used as a standard for comparison with the new cotton hybrid (Giza 89 x Giza 86). The data in Table (4), indicated that the hybrid (Giza 89 x Giza 86) surpassed Giza 89 for all studied characters and on Giza 85 for all studied characters except lint percentage and lint fineness, also on Giza 86 for studied characters except lint percentage and 2.5% span length.

Giza 86 surpassed the other genotypes for lint percentage and 2.5% span length. The hybrid (Giza 89 x Giza 86) may be recommended to be included in any breeding program for improving the long staple cotton of boll weight, seed index, 50% span length, length uniformity ratio and yarn strength. While, Giza 86 was the best for the improvement of lint percentage and 2.5% span length. However Giza 85 was to improvement the lint fineness. They results are in agreement with those obtained by El-Shaarawy *et al.* (1988, 1994 and 1998), Abo-Zahra *et al.* (1989); Awaad (1989), Abo El-Zahab *et al.* (1992 a,b), Awaad *et al.* (1949), Seyam *et al.* (1994), Badr (1999), Abd El-Salam (2000) and Zeina (2001), they reported that the effect of genotype was significant on some cotton characters.

Genotypic stability for different genotypes: For all characters, genotype means in addition to the estimates of the parameters α_i and λ_i for each genotype are presented in Table (4). It is clearly shown that: (a). The relative ranking of genotypes according to their mean performance over the environments were not the same for all characters; and (b) the estimated α_i statistics ranged from –1 to +1 for all characters except length uniformity ratio for Giza 86 which was 1.509%.

Table 3. Effect of the environments on studied cotton characters.

Region / Year / Characters	Damietta		Kafr El-		El-Beheirah		El-Gharbia		El-Menofia		El-Sharkia		L.S.D.	
	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	Y_1	Y_2	5%	1%
Seed cotton yield (k/f)	10.28	10.09	10.86	12.26	16.06	16.20	12.24	10.30	14.46	12.18	10.33	10.93	0.28	0.36
Boll weight (g)	2.91	2.84	3.06	2.61	3.29	3.23	2.90	2.46	3.42	2.86	2.57	2.69	0.03	0.04
Seed index (g)	9.92	9.54	10.39	9.41	11.24	9.05	11.00	9.13	11.44	10.23	8.48	10.03	0.10	0.13
Lint percentage (%)	38.21	38.09	39.94	39.17	39.30	39.04	36.72	36.98	38.54	37.74	38.49	37.76	0.14	0.19
2.5% span lenth (mm)	30.63	30.96	31.39	31.28	31.52	31.49	31.38	31.00	31.29	30.93	31.16	30.51	0.11	0.14
50% span length(mm)	15.56	15.36	15.55	15.50	15.92	15.82	15.65	15.48	15.63	15.48	15.83	15.29	0.06	0.08
Length uniformity ratio (%)	50.56	49.36	49.66	49.07	50.68	49.76	50.93	49.93	50.42	49.74	51.01	49.92	0.20	0.25
Micronaire reading (Mic.)	4.16	3.98	4.20	3.81	4.31	4.29	4.08	3.69	4.37	3.75	3.70	3.94	0.03	0.05
Yarn strength	2503	2464	2448	2371	2432	2355	2469	2313	2332	2367	2253	2242	16.34	21.63

Table 4. Genotype means over environments and estimates of stability parameters (α_i and λ_i).

Traits \ Genotype		Giza 85	Giza 86	Giza 89	Giza 89 x Giza 86
Seed cotton yield (K/F)	χ	12.07 a	12.02 a	12.11 a	12.33 a
	α_i	-0.0253	0.0409	-0.1088	0.0933
	λ_i	0.648	3.0003	2.5658	4.6872
Boll weight (g)	χ	2.88 c	2.96 b	2.77 d	2.99 a
	α_i	0.0393	0.136	-0.1996	0.0243
	λ_i	1.8102	2.4915	1.1145	4.4661
Seed index (g)	χ	10.31 b	10.31 b	9.64 c	10.39 a
	α_i	-0.1631	0.3392	-0.1603	-0.0158
	λ_i	3.418	0.9403	0.9014	2.2076
Lint percentage %	χ	38.61 b	39.35 a	36.91 d	38.45 c
	α_i	0.1503	-0.2556	0.2166	-0.1113
	λ_i	1.7689	1.4835	2.9144	4.5974
2.50% Span length (mm)	χ	30.19 d	31.65 a	31.29 c	31.41 b
	α_i	-0.1728	0.0673	0.6621	-0.5566
	λ_i	3.4398	2.4519	1.8628	1.5462
50% Span length (mm)	χ	15.20 d	15.75 b	15.51 c	15.9 a
	α_i	-0.6428	0.4843	0.2568	-0.0982
	λ_i	2.5463	1.6503	4.5512	3.0281
Length Uniformity ratio	χ	50.34 b	49.80 c	49.61 d	50.61 a
	α_i	-1.2126	1.509	-0.4464	0.15
	λ_i	0.707	0.8312	2.2324	1.9003
Micronaire Reading	χ	3.77 d	4.09 b	3.99 c	4.23 a
	α_i	0.4676	-0.23	0.3127	-0.5503
	λ_i	1.8819	9.1351	2.6368	9.3609
Yarn strength	χ	2339 c	2427 b	2267 d	2580 a
	α_i	0.0627	-0.3197	0.3845	-0.1276
	λ_i	4.2825	5.5585	8.8865	4.5477

The distribution of α_i and values are shown in Figs 1 to 9. For boll weight, seed cotton yield K/f, lint percentage, seed index, micronaire reading, 2.5% span length, 50% span length, length uniformity ratio, and yarn strength, respectively. From the distribution of α_i and λ_i statistics, it could be observed that (a) mostly, the estimated α_i statistics for different genotypes, do not differ significantly from $\alpha = 0$, and b. the genotypes varied greatly in the estimated λ_i statistics. Therefore, it could be concluded that relatively unpredictable component (the deviation from the linear response, λ_i) of the genotype x environment interaction variance may be more important than the relatively predictable component (the linear response, α_i). The varieties showed different degrees of genotypic stability for different characters as follows:

1. (Giza 89 x Giza 86) showed average degrees of 2.5% span length, while it was unstable for the other characters.
2. Giza 85 showed average degrees of stability for seed cotton yield K/f and length uniformity ratio but it was unstable for the other characters.
3. Giza 86 showed average degrees of stability for lint percentage, seed index, 50% span length and length uniformity ratio. It was unstable for the other characters.
4. Giza 89 showed average degrees of stability for boll weight and seed index. It was unstable for the other characters.

The stability used indicated that for selection for stability the objective of incorporating this important trait the Egyptian cotton germplasm the following genotypes may be considered as breeding stocks for specific traits. These results in agreement with those obtained by Awaad (1994), El-Shishtawy *et al.* (1994); Seyam *et al.* (1994); Abou Tour *et al.* (1996); Badr (1999); El-Haroney (2000); Abd El-Salam (2000) and Zeina (2001). They reported that cotton genotypes showed different degrees of genotypic stability for some agronomic and fiber characteristics.

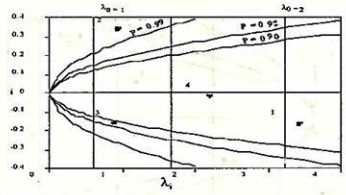

Fig 1. Distribution of estimated genotypic stability statistics of seed cotton yield (k/f) of 4 genotypes where[z].

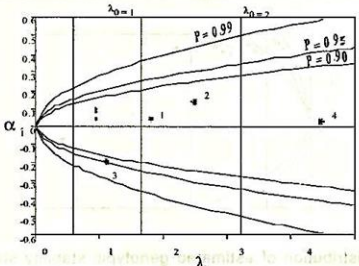

Fig 2. Distribution of estimated genotypic stability statistics of boll weight (grams) of 4 genotypes where[z].

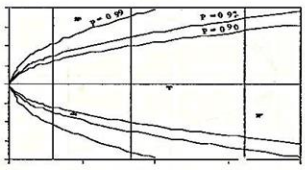

Fig 3. Distribution of estimated genotypic stability statistics of seed index (grams) of genotypes where[z].

Z:

1. Giza 85
2. Giza 86
3. Giza 89
4. Giza 89 x Giza 86

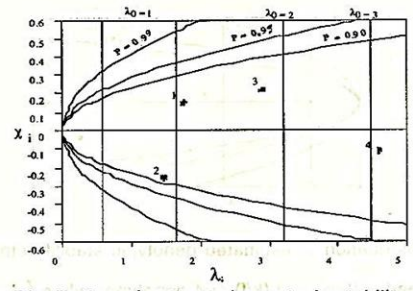

Fig 4. Distribution of estimated genotypic stability statistics of lint percentage of 4 genotypes where[Z].

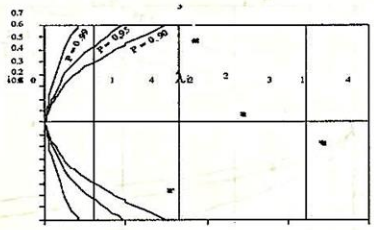

Fig 5. Distribution of estimated genotypic stability statistics of 2.5% span length of 4 genotypes wherez.

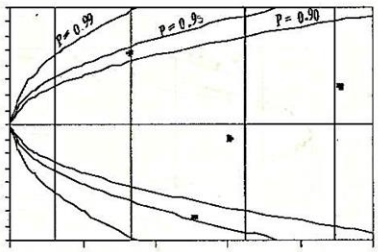

Fig 6. Distribution of estimated genotypic stability statistics of 50 % span length of 4 genotypes wherez.

Z:

1 - Giza 85 3 – Giza 89

2 - Giza 86 4 – Giza 89 x Giza 86

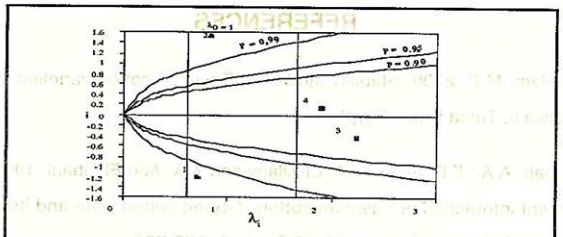

Fig 7. Distribution of estimated genotypic stability statistics of length uniformity ratio of 4 genotypes where[Z].

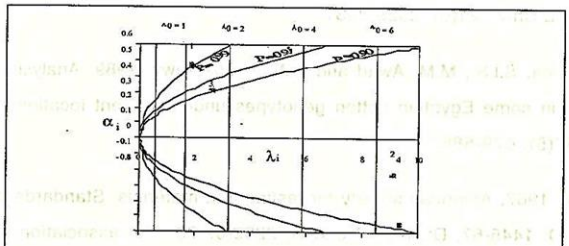

Fig 8. Distribution of estimated genotypic stability statistics of Micronaire reading of 4 genotypes where[Z].

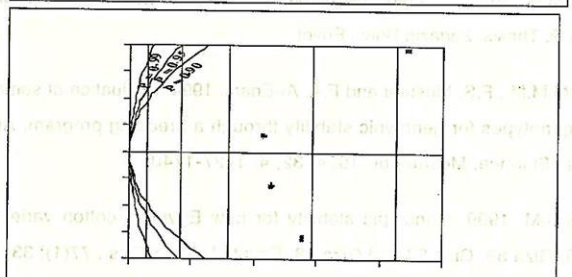

Fig 9. Distribution of estimated genotypic stability statistics of yarn strength of 4 genotypes where[Z].

Z:

1. Giza 85
2. Giza 86
3. Giza 89
4. Giza 89 x Giza 86

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تقييم ودراسة الثبات الوراثى للهجين (جيزة ٨٩ × جيزة ٨٦) وبعض أصناف القطن المصرى طويلة التيلة

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أجرى هذا البحث لتقييم الهجين المبشر جيزة (٨٩ × جيزة ٨٦) مقارناً بأصناف القطن المصرى طويلة التيلة (جيزة ٨٥ وجيزة ٨٦ وجيزة ٨٩) وشملت الدراسة تأثير التركيب الوراثى والبيئة والتفاعل بينهما على سلوك هذه التراكيب الوراثية وتقدير درجة الثبات الوراثى لها فى اثنتى عشرة تجربة فى ستة محافظات بالوجه البحرى بجمهورية مصر العربية (دمياط -كفر الشيخ - البحيرة - الغربية - المنوفية - الشرقية) خلال موسمى ٢٠٠٠ و ٢٠٠١ مع استخدام تصميم القطاعات الكاملة العشوائية فى أربع مكررات لكل بيئة من هذه البيئات ، وكانت الصفات التى تم دراستها هى: محصول القطن الزهر ق/ف - وزن اللوزة بالجرام - معامل البذرة بالجرام - معدل الحليج ٪- طول التيلة عند نسبتى توزيع (٢,٥٪ و ٥٠٪) - درجة انتظام طول التيلة - قراءة الميكرونير ومتانة الشلة.

ويمكن تلخيص النتائج المتحصل عليها فيما يلى:

- **تأثير التفاعل بين التركيب الوراثى والبيئة** كان عالى المعنوية فى جميع الصفات المدروسة حيث تفوق الهجين المبشر (جيزة ٨٩ × جيزة ٨٦) على الصنف جيزة ٨٩ فى جميع الصفات تحت الدراسة، وعلى الصنف جيزة ٨٥ فيما عدا معدل الحليج، وعلى الصنف جيزة ٨٦ فيما عدا محصول القطن الزهر ومعدل الحليج وطول التيلة عند نسبة توزيع ٢,٥ ٪ بمعظم البيئات الى تم دراستها.

- **تأثير البيئة** كان عالى المعنوية على جميع الصفات تحت الدراسة وأوضحت النتائج ما يلى: تفوقت البحيرة على كل البيئات فى قيم متوسطات محصول القطن الزهر ق/ف ووزن اللوزة وطول التيلة عند نسبة توزيع (٢,٥٪ و ٥٠٪). وتفوقت المنوفية خلال الموسم الأول فى صفات وزن اللوزة ومعامل البذرة وقراءة الميكرونير ، وتفوقت كفر الشيخ فى الموسم الأول فى معدل الحليج أما الغربية والشرقية خلال الموسم الأول تفوقتا فى درجة انتظام طول التيلة بينما دمياط خلال الموسم الأول فقد تفوقت فى متانة الشلة عن البيئات الأخرى.

- **تأثير التركيب الوراثى** كان عالى المعنوية على جميع الصفات التى تم دراستها فيما عدا محصول القطن الزهر ق/ف. وأوضحت النتائج تفوق الهجين المبشر (جيزة ٨٩ × جيزة ٨٦) على كل الأصناف تحت الدراسة فى صفات وزن اللوزة ومعامل البذرة وطول التيلة عند نسبة توزيع ٥٠٪ ومتانة الشلة ، وبالتالى يمكن التوصية بإستخدامه فى برامج التربية لتحسين طبقة القطن طويل التيلة من حيث زيادة قيم هذه الصفات أو المحافظة عليها، كما تفوق على الصنف جيزة ٨٥ فى جميع الصفات تحت الدراسة ماعدا معدل الحليج ونعومة التيلة وتفوق على الصنف جيزة ٨٩ فى جميع

الصفات تحت الدراسة.

- تفوق الصنف جيزة ٨٦ على كل من جيزة ٨٥ وجيزة ٨٩ فى معدل الحليج ووزن اللوزة وطول التيلة عند نسبتى توزيع (٢,٥٪ و ٥٠٪) وقراءة الميكرونير ومتانة الشلة وتفوق على الهجين المبشر (جيزة ٨٩ × جيزة ٨٦) فى صفتى معدل الحليج وطول التيلة عند نسبة توزيع ٢,٥٪، ويمكن استخدامه فى برامج التربية لتحسين قيم هاتين الصفتين أو المحافظة عليهما. وأشترك مع جيزة ٨٥ فى التفوق على جيزة ٨٩ فى معامل البذرة بينما تفوق جيزة ٨٩ على جيزة ٨٥ فى طول التيلة عند نسبتى توزيع (٢,٥٪ ، ٥٠٪).

- **من دراسة الثبات الوراثى : أوضحت النتائج ما يلى:**

١- كان الهجين المبشر (جيزة ٨٩ × جيزة ٨٦) متوسط فى الثبات الوراثى لصفة التيلة عند نسبة توزيع ٢,٥٪.
٢- كان الصنف جيزة ٨٥ متوسط فى الثبات الوراثى لصفات محصول القطن الزهر ق/ف ودرجة انتظام طول التيلة.
٣- كان الصنف جيزة ٨٦ متوسط فى الثبات الوراثى لصفات معدل الحليج ووزن ١٠٠ بذرة وطول التيلة عند نسبة توزيع ٥٠٪ ودرجة انتظام طول التيلة.
٤- كان الصنف جيزة ٨٩ متوسط فى الثبات الوراثى لصفتى وزن اللوزة ووزن ١٠٠ بذرة.

بالتالى يمكن لمربى القطن استخدام أى من هذه التراكيب الوراثية فى برامج التربية لتحسين درجة الثبات الوراثى للصفات التى سجل فيها ثبات متوسط كما سبق. كما أوضحت نتائج هذا البحث انه يمكن التوصية بزراعة الصنف جيزة ٨٦ بمنطقة كفر الشيخ وزراعة الهجين المبشر جيزة ٨٩ × جيزة ٨٦ كبديل للصنفين جيزة ٨٥ وجيزة ٨٩ فى باقى المناطق تحت الدراسة.