J. Plant Production, Mansoura Univ., Vol. 4 (6): 957 - 972, 2013

EVALUATION OF SOME EGYPTIAN COTTON GENOTYPES UNDER DIFFERENT ENVIRONMENTS

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ABSTRACT

Thirty-six new cotton strains descending from fourteen Egyptian cotton crosses were included in trial A, and sixteen strains descending from ten crosses were included in trial B in 2009 season using three promising crosses and the commercial variety Giza 86 as checks. All the genotypes belong to *Gosssypium barbadense* L. Trial A was conducted at Kafr El-Sheikh, whereas trial B was out lined at five locations (Kafr El-Sheikh, El-Dakahleia, El-Monofeia, El-Sharkeia and El-Gharbeia) in Lower Egypt. The results of trial A showed that most of the genotypes belong to crosses significantly surpassed the check variety Giza 86 in both yield and its components. While, trial B showed that the seven strains were superiority across five locations. High heritability estimates in broad sense were recorded for most studied traits in trials A & B indicating that phenotypic selection for these strains could be highly effective.

The present study aimed to evaluate some of Egyptian cotton genotypes using stability statistic analysis which were applied to seed cotton yield, lint cotton yield, boll weight and earliness index.

The studied traits showed highly significant mean squares for, genotypes, environments and genotype x environment. The genotypes no. 10, 11, 13, 16 and the two promising crosses 10229 x Giza 86 and Giza 89 x Giza 86 observed average level of stability and surpassed mean performance for seed and lint cotton yield. The genotypes no. 10, 12, 13, 15 and the two promising crosses 10229 x Giza 86 and Giza 75 x Sea behaved the same way for boll weight and the genotypes no. 1, 5, 6, 8, 9, 10, 14, 15 and the three promising crosses 10229 x Giza 86, Giza 75 x Sea and Giza 89 x Giza 86 for earliness index.

Therefore, these genotypes may be recommended to be released as a commercial stable high yielding cultivar and / or incorporated to be as a breeding stock in any future breeding program aiming for producing stable high yielding lines for seed cotton yields, lint cotton yield, boll weight and earliness index.

Keywords: *Gosssypium barbadense,* L., Promising lines, Seed cotton yield, Fiber characters, Heritability, Stability statistic analysis, Trial A and Trial B.

INTRODUCTION

Hybridization among genotypes, followed by conventional pedigree selection is a predominant method utilized for cotton breeding. In such pedigree system the best F_2 plants and the best plants within the best lines in the following segregating generations are selected. Many investigations stated that visual selection in early segregating generations for yield is inefficient and that the evaluation of some strains in such programmes begins from F_6 generation. Many investigators including, Mohamed *et al*., (2003), Ali *et al*., (2012), El_Adly and Eissa (2012), Sultan (2012) and Orabi (2013) evaluated some strains via two tests, the first test is called preliminary strain test (trial A), and the second test is the advanced trial which called (trial B) in the next season. It should be noted that the trial B is carried out at several locations to study the interaction of these genotypes with different environments.

Studying of stability and variability are very important for breeders which the choice of genotypes that possess the high level of stability and high performances for yield and most of the economic traits are is a very important objective of the Egyptian cotton breeding program. Also the choice of parents which have a high level of stability in the beginning of the breeding program is a very important step to the success of this program. So understanding the nature of genotype x environment empower breeders to test and select the more efficient genotypes. Breeding genotypes with wide adaptability has long been a universal goal to the plant breeders. Bilbro and Ray (1976) showed that a successful breeding program should focus effort on genotype yield level (average yield compared to standards), adaptation (what environment does the genotype best perform in), and stability (how consistent does the genotype yield compare to others). Campdell and Jones (2005) indicated that genotype stability for trait performance use a direct measure of the presence and effect of genotype. To achieve this goal, evaluating breeding lines over time and space has become an integral part of any plant breeding program.

The techniques have been proposed to characterize the stability of yield performance when the genotypes are tested at a number of environments. Tai (1971) suggested partitioning the genotype x environment interaction into two components namely: α statistic that measures the linear response to environmental effect and λ that measures the deviation from linear response in terms of magnitude of error variance.

Badr (2003) found that average genotype stability degrees were recorded for seed cotton yield for Giza 85 and boll weight for 89. Using of AMMI model, EL-Shaarawy *et al*., (2007) studied stability for the thirty six genotypes over five locations and found that the best genotypes were F_6 661/03 (12), F_{12} 854/03 (28), F_{12} 865/03 (29), and G.89/G.86 (32) which exhibited high yield with high stability level for all studied traits. Rahoumah *et al*., (2008) found that the nine genotypes no. 1, 2, 3, 4, 6, 15, 17, 19 and the promising cross Giza 89/Giza 86 exhibited high average level of stability.

The present investigation was carried out to evaluate thirty-six strains of fourteen crosses in trial A and sixteen strains descending from ten crosses in trial B at different locations in order to select the best lines for developing new cotton varieties of high lint yield with high stability level and desirable fiber characters.

MATERIALS AND METHODS

In 2009 season, the Cotton Research Institute carried out two field experiments. Trial A and the advanced trial B. Trial A consisted of forty genotypes, thirty-six lines descending from fourteen crosses, the three promising crosses (10229 x Giza 86), (Giza 75 x Sea) and (Giza 89 x Giza 86) and the check variety Giza 86, Table 1. It was cultivated at Sakha Experimental Station, Agricultural Research Center, Kafr El-Shekh governorate, Egypt. While trial B was cultivated at five locations in Lower Egypt i.e. Kafr El-Shekh, El-Dakahlia, El-Monofeia, El-Sharkia and El-Gharbia. Each trial consists of sixteen lines descending from ten crosses, the three promising crosses (10229 x Giza 86), (Giza 75 x Sea) and (Giza 89 x Giza 86) and the check variety Giza 86, Table 2. Experimental design in trials A and B was randomized complete blocks design with six replications; each plot consisted of five rows. The row was four meters long, 70 cm apart, and 25 cm between hills. Each hill was thinned to two plants per hill.

Table 1: Origin and pedigree of the studied cotton genotypes (trial A)

No.	Family	Parent	Origin
1	F_5 548 / 08	F_4 479 / 07	G85//G89/G86
2	F_5 554 / 08	F_4 483 / 07	
3	F_5 555 / 08	"	
4	F_5 557 / 08	F_4 501 / 07	G85//G89/ Kar.
5	F_5 561 / 08	F_4 504 / 07	
6	F_5 566 / 08	F_4 525 / 07	G85/G86//G89
7	F_5 572 / 08	F_4 530 / 07	
8	F_5 577 / 08	F_4 534 / 07	G89/ Kar.//G89
9	F_6 590 / 08	F_5 552 / 07	G89/ Pima S_6 /// BBB //(G81/ G83)m
10	F_6 593 / 08	F_5 554 / 07	"
11	F_6 594 / 08	"	"
12	F_6 598 / 08	F_5 561 / 07	G83 // G85 / Pima S_6///BBB//(G81/G83)m
13	F_6 599 / 08	"	"
14	F_6 601 / 08	F_5 566 / 07	"
15	F_6 608 / 08	F_5 572 / 07	G83 // G85 / Pima S_6///G89
16	F_6 613 / 08	F_5 573 / 07	"
17	F_6 615 / 08	F_5 575 / 07	"
18	F_7 636 / 08	F_6 640/ 07	G89/ Kar.//G86
19	F_7 637 / 08	"	"
20	F_7 643 / 08	F_6 658 / 07	Pima S_6/ 24202//G85/Pima S_6 /// G89/ Kar.
21	F_7 644 / 08	"	"
22	F_8 676 / 08	F_7 676 / 07	G89/ Pima S_6//G86
23	F_8 649 / 08	"	"
24	F_8 680 / 08	F_7 680 / 07	"
25	F_8 656 / 08	"	"
26	F_8 661 / 08	F_7 682 / 07	G81//G89/ Pima S_6///G86
27	F_8 663 / 08	F_7 685 / 07	"
28	F_8 664 / 08	"	"
29	F_8 667 / 08	F_7 687 / 07	G89/ Pima S_6//G89
30	F_8 668 / 08	"	"
31	F_9 675 / 08	F_8 713 / 07	G89//G86/G75
32	F_9 676 / 08	"	"
33	F_{11} 704 / 08	F_{10} 735 / 07	6022 Russ./G 86
34	F_{11} 705 / 08	"	"
35	F_{11} 706 / 08	"	"
36	F_{11} 707 / 08	"	"
37	10229/G86		
38	G.75/Sea		
39	G.89/G.86		
40	G86		

Table 2: Origin and pedigree of the studied cotton genotypes (trial B)

No.	Family	Parent	Origin
1	F_5 552 / 07	F_4 474 / 06	G89/ Pima S_6/// BBB //(G81/ G83)m
2	F_5 554 / 07	"	"
3	F_5 561 / 07	F_4 483 / 06	G83 // G85 / Pima S_6///BBB//(G81/G83)m
4	F_5 566 / 07	F_4 487 / 06	"
5	F_5 572 / 07	F_4 490 / 06	G83 // G85 / Pima S_6///G89
6	F_5 573 / 07	F_4 491 / 06	"
7	F_5 575 / 07	"	"
8	F_6 640 / 07	F_5 553 / 06	G89/ Kar.//G86
9	F_6 658 / 07	F_5 574 / 06	Pima S_6/ 24202//G85/Pima S_6/// G89/ Kar.
10	F_7 676 / 07	F_6 593 / 06	G89/ Pima S_6 // G86
11	F_7 680 / 07	F_6 597 / 06	"
12	F_7 682 / 07	F_6 600 / 06	G81//G89/ Pima S_6///G86
13	F_7 685 / 07	F_6 602 / 06	"
14	F_7 687 / 07	F_6 615 / 06	G89/ Pima S_6//G89
15	F_8 713 / 07	F_7 648 / 06	G89//G86/G75
16	F_{10} 735 / 07	F_9 702 / 06	6022 Russ./G 86
17	10229/G86		
18	G.75 / Sea		
19	G.89/G.86		
20	G86		

The three central rows of each plot were hand-pick twice to determine seed cotton yield (S.C.Y.), lint cotton yield (L.C.Y.) in kentar/ feddan and random sample of 50 bolls, picked from the outer two rows, was used to obtain average boll weight (B.W.), earliness index (E.I.) expressed as (yield of the first pick /total of seed cotton yield) x 100, Lint percentage (L.%): calculated from the formula: (Weight of lint cotton yield in sample/ Weight of seed cotton yield) x 100, Fiber fineness (F.F.): measured by Micronaire apparatus in Micronaire units, Fiber strength (F.S.): expressed as g/tex., Fiber length (U.H.M): upper half mean in mm. measured by high volume instrument (H.V.I), Hair weight (H.W.): expressed as millitex, Yarn strength (Y.S.): expressed as Lea product of "Lea strength x Yarn Count" for 60s carded yarn with 3.6 twist multiplier measured by the Good Band Lea strength tester and Color as degree of yellowness (+b): Measured by H.V.I. All fiber properties tests were performed in the Laboratory of the Cotton Technology Research Section, Cotton Research Institute, Agricultural Research Center, Giza, according to ASTM (1961).

Statistical analysis

1- Analysis of variance was carried out for the one and five locations with fixed genotypes effects and random replicate of environmental effects according to Le Clerge *et al.,* (1962) and Sendecor (1965).

2- Heritability estimated, in broad sense (h^2_{bs} %) was calculated by using the formula as follows Sakai (1960) :

h^2_{bs} % = (б^{2}g / (б^{2}g + б^{2}ge + б^{2}e)) x 100

3 - The genotypic stability analysis was done according to the method described by Tai (1971). Stability parameters Alfa (α_i) and Lambda (λ_i) were estimated for each variety separately. Parameters Alfa (α) measures the linear response to environmental effects and Lambda (λ)

measures the deviation from linear response in terms of magnitude of error variance. The two statistics in the regression method which equivalent meaning to α and λ are (b-1) and MSE/P, respectively. The value (α = -1, λ = 1) refer to the perfect stability. However, the value (α < 0, λ = 1) refer to the above average stability, whereas, the value (α = 0, λ = 1) refer to the average stability and the value (α > 0, λ = 1) refer to the below average stability.

RESULTS AND DISCUSSION

The present investigation included the evaluation of 36 genotypes descending from 14 crosses in trial A, and 16 genotypes descending from 10 crosses in trial B, the check variety was Giza 86 and three promising crosses as control through trial A and trial B. Significant differences between the tested genotypes were detected for yield, yield components compared with the check variety and the three promising crosses as shown in Table 3.

The preliminary strain test (Trial A):-

The analysis of variance indicated significant differences among genotypes, suggesting that detailed comparisons could be pursued as reported by Ali *et al*., (2012), El-Adly and Eissa (2012) and Orabi (2013).

A. Yield and yield components

Table 3 shows that 26 genotypes out of 39 genotypes exceeded the check variety Giza 86 in seed cotton yield and the mean values of the strains ranged from 7.79 to 12.61 Kan/fed. The increments were significant for eight genotypes; 6 strains belonging G89 /PimaS_6///BBB// (G81/G83) m, G83//G85/PimaS_6///BBB// (G81/G83) m and G89/PimaS_6//G86 as well as the two promising crosses 10229/G86 and G89/G86.

The highest yield was achieved by the cross G.89/PimaS_6//G86, which exceeded the control variety Giza 86 by 3.28 Kan/fed. The increments in seed cotton yield ranged from 0.59-0.75 Kan/fed for the strains of cross G85//G89/G86, while it ranged from 0.65 to 0.78 Kan/fed for the strains of cross G85/G86//G89. On the same time, the cross G89/Pima S_6///BBB// (G81/G83) m, the increments in seed cotton yield ranged from 1.66 to 2.97 Kan/fed.

The strains of the crosses G83//G85/PimaS_6///BBB//(G81/G83)m, G81//G89/Pima S_6///G86, G89//G86/G75 and 6022 Russ./G86, the increments ranged from 1.51-1.78 Kan/fed, 0.33-1.67 Kan/fed, 0.95-1.25 Kan/fed and 0.42-1.02 Kan/fed, respectively. The increases were 0.38 Kan/fed, 0.60 Kan/fed, 0.95 Kan/fed. 1.80 Kan/fed and 2.55 Kan/fed for the crosses Pima S_6/24202//G85/Pima S_6///G89/Kar., G89/PimaS_6//G89, G.75/Sea and G.89/G.86, 10229/G86, respectively. The commercial cotton variety Giza 86 had 9.33 Kan/fed. On the other hand, the strains of the cross G85//G89/Kar were possessed the lowest mean values (7.79-7.95 Kan/fed) in seed cotton yield compared with other genotypes. Heritability value was (73.02%), which indicated low environmental effect on this character. Ismail *et al*., (1989) found high heritability value of 76.00 for seed cotton yield.

Concerning lint cotton yield, data in Table 3 showed that the mean values of the lint yield of the strains ranged from 9.04 to 15.52 Kan/fed.

Table 3: Mean performance for yield and its component and fiber properties of genotypes in Trial A in Sakha.

Genot-ype	S.C.Y.	L.Y.	L. %	B.W.	E. %	F.F.	F.S.	F.L.	H.W.	Y. St.	+b
1	9.92	12.13	38.83	2.7	56.4	4.0	42.9	31.9	143	2490	7.3
2	10.08	12.17	38.36	3.1	63.7	4.1	46.8	33.1	145	2570	7.6
3	9.06	10.91	38.22	3.2	58.5	4.2	42.6	31.5	150	2405	8.3
4	7.79	9.37	38.16	2.9	43.5	4.1	46.2	33.6	145	2595	7.9
5	7.95	9.04	36.11	3.0	49.8	4.0	45.1	33.4	143	2605	7.9
6	10.11	11.42	35.86	2.9	58.3	4.1	46.8	33.6	143	2680	8.0
7	9.98	11.89	37.82	3.0	57.4	4.2	47.7	33.1	150	2695	7.8
8	8.42	9.84	37.13	3.2	55.9	4.1	46.0	31.2	142	2505	8.9
9	12.30	13.72	35.40	3.0	68.8	4.0	44.0	33.6	141	2575	10.3
10	9.62	10.80	35.62	2.8	67.8	4.0	44.6	33.0	142	2570	10.3
11	10.59	12.26	36.75	2.7	67.5	4.0	41.5	31.3	141	2400	10.3
12	11.11	12.67	36.21	3.5	75.7	4.0	41.4	30.3	140	2190	7.8
13	10.93	11.62	33.73	3.2	64.5	4.3	43.7	32.2	152	2460	8.4
14	10.84	11.84	34.67	3.2	73.0	4.2	42.0	32.2	148	2440	7.2
15	8.58	9.41	34.83	3.3	59.9	4.1	45.6	31.8	142	2480	8.5
16	9.14	10.39	36.09	3.2	66.7	4.4	42.8	30.9	153	2230	8.1
17	9.32	11.10	37.81	3.4	58.8	4.3	44.2	31.8	151	2490	7.5
18	8.70	10.01	36.52	3.0	55.6	4.2	44.8	32.8	150	2630	7.2
19	8.70	10.45	38.13	2.8	56.9	4.1	47.5	33.7	148	2745	7.7
20	9.71	11.51	37.61	3.0	56.9	4.2	46.0	33.7	150	2700	8.0
21	8.80	10.13	36.53	3.1	51.2	4.3	46.0	32.4	154	2420	8.3
22	12.28	14.82	38.33	3.2	62.5	4.2	40.6	32.8	148	2340	7.5
23	11.50	14.10	38.93	3.2	64.0	4.3	40.5	33.2	153	2480	7.9
24	11.65	14.53	39.59	3.3	54.9	4.3	45.4	33.6	152	2565	7.8
25	12.61	15.52	39.08	3.2	55.5	4.4	44.0	31.2	158	2410	7.5
26	11.00	12.75	36.80	3.3	52.1	4.3	47.0	32.5	154	2600	8.5
27	8.96	10.64	37.69	3.5	48.0	4.2	43.4	32.9	148	2490	8.3
28	9.66	11.31	37.15	3.2	52.8	4.2	45.8	32.7	147	2555	8.5
29	9.93	11.82	37.77	3.2	50.3	4.3	39.5	31.8	152	2230	8.3
30	8.83	10.14	36.46	3.2	63.2	4.3	46.5	31.6	153	2560	8.4
31	10.58	12.30	36.92	3.2	57.8	4.6	47.5	32.6	160	2625	8.7
32	10.28	11.63	35.90	3.5	50.1	4.2	48.0	31.8	148	2605	9.1
33	9.75	11.83	38.53	3.5	52.2	4.3	45.6	33.0	151	2545	7.7
34	9.59	11.24	37.20	3.2	45.9	4.3	42.1	31.9	152	2400	7.4
35	10.35	12.60	38.62	3.4	52.7	4.4	46.0	33.5	156	2650	7.7
36	8.97	10.84	38.34	3.2	43.9	4.3	42.4	31.7	152	2345	7.6
37	11.88	14.88	39.79	3.3	62.3	4.3	44.7	32.7	153	2490	7.8
38	10.28	11.80	36.44	3.1	63.5	4.2	41.1	33.4	148	2455	7.7
39	11.13	12.92	36.86	3.3	57.0	4.3	46.8	33.2	154	2645	9.3
40	9.33	11.22	38.16	3.4	44.0	4.5	46.4	32.1	158	2510	7.4
Mean	10.01	11.74	37.22	3.0	57.5	4.2	44.5	32.5	149	2509	8.2
L.S.D. 5%	2.29	2.70		0.205	10.352						
L.S.D. 1%	0.89	1.05		0.105	13.606						
h^2_{bs}	73.02	77.32		87.29	78.51						
Geno.	637879.9**	106746.3**		0.2583**	389.38**						

The results indicated that most of genotypes (22 strains and the three promising crosses (10229/G86), (G86 /Sea) and (G89/G86) surpassed the check variety Giza 86 in lint cotton yield. The significant increments ranged from 2.50 to 4.30Kan/fed (22.28%-38.32%). The differences in this trait were desirable and significant for 6 genotypes belonging 2 crosses and the promising cross 10229/G.86.

The highest mean value of lint cotton yield was achieved by the cross G.89/PimaS$_6$//G.86, which exceeded the control variety Giza 86 by 4.30 Kan/fed and the increments ranged from 2.88-4.30 Kan/fed for the four strains of the same previous cross, while it ranged from 1.04 to 2.50 Kan/fed for the strains of cross G89/Pima S$_6$///BBB// (G81/G83) m. As for the cross 10229/G.86, the increase in lint cotton yield was 3.66 Kan/fed.

On the other hand, the strains of the cross G85//G89/Kar were possessed the lowest mean values (9. 04 -9. 37 Kan/fed) in lint cotton yield compared with other genotypes. The commercial cotton variety Giza 86 gave the 11.22 mean value of lint cotton yield. Heritability value of 77.32% was found for lint cotton yield. Similar finding were recorded by Abou-Zahra *et al.,* (1989).

With respect to boll weight (B.W), genetic differences between all studied genotypes are shown in Table (3) which ranged from 2.90 to 3.66 gm. It is obvious that 4 genotypes surpassed the check variety Giza 86. These genotypes were F_{11} 704/08 belong to cross ((6022Russ./G86), F_8 663/08 from cross G81//G89/PimaS$_6$///G86, F_9 676/08 which descending to the cross G89//G86/G75 and F_6 598/08 belong to cross G83// G85/ Pima S$_6$///G89. The heritability value was 87.29% indicating that this trait was slightly affected by the environmental condition. The present results somewhat varied with the finding of Sallam *et al.*, (1987) who reported that the low heritability estimates were obtained for boll weight.

Considering lint percentage (L %), data in Table 3 revealed that mean values of this trait ranged from 33.73% to 39.79%, 12 strains surpassed the check variety Giza 86. The highest mean value of lint percentage was achieved by the cross 10229 // G.86, which exceeded the control variety Giza 86 by 1.63%.

Respecting earliness index (E%), shown in Table 3, it is clear that most families were earlier than the check variety Giza 86 and earliness index ranged from 45.90% to 75.70%. Generally, earliness index is very important character for cotton breeder to produce early maturity varieties, which can escape from the boll worm infection and can be cultivated after the wheat crop in the newly reclaimed lands.

B. Fiber properties:

All the genotypes under study could be considered in long staple category, Table 3. These genotypes ranged from 31.0 to 33.7 mm for upper half mean (UHM), from 39.5 to 48.0 for the fiber strength and from 4.0 – 4.6 for Micronaire reading. Values of yarn strength ranged from 2195 to 2745. All genotypes were of white color.

The advanced strain test (Trial B):

Trial B in 2009 is the advanced strain test for the promising genotypes that were selected from trial A 2008. Trial B was carried out at five locations in Lower Egypt in order to evaluate the genotypes stabilities in different locations. Means of combined data across five locations are presented in Table 4 and indicated that the strains differed significantly. Mean squares of the interaction between genotypes and environment (G x E) was significant. Abdel-Rahman *et al*., (1994), Bader *et al*., (1999), EL-Shaarawy *et al*., (2007), Rahoumah *et al*., (2008), Sultan (2012) and Orabi (2013) studied some Egyptian cotton genotypes and commercial varieties at different locations and found high significant (G x E) interactions for yield and its components.

Seed cotton yield (S.C.Y):

Data in Table 4 showed that 15 out of 19 genotypes included in trial B surpassed the check variety Giza 86 in seed cotton yield. These genotypes were F_5 552/07 and F_5 554/07 which belong to cross G89/ PimaS_6///BBB//(G81/G83)m, F_5 561/07 and F_5 566 / 07 from the cross G83//G85/PimaS_6///BBB//(G81/G83)m, F_5 572 / 07 which descended from the cross G83//G85/PimaS_6///G89, F_6 658 / 07 from cross Pima S_6/24202//G85/PimaS_6/// G89/Kar., F_7 676 / 07, F_7 680 / belong to cross G89/Pima S_6//G86, F_7 682 / 07 and F_7 685 / 07 from cross G81//G89/ Pima S_6///G86, F_7 687 / 07 which descending from the cross G89/Pima S_6//G89, F_{10} 735 / 07 from cross 6022 Russ./G 86, and the three promising crosses (10229/G86), (G75/Sea) and (G89/G860.

The highest seed cotton yield was achieved by the cross 10229 x G.86 which surpassed the control variety Giza 86 by 1.73 Kan/fed. Heritability value for seed cotton yield was 75.23% which indicated low environmental effect on this character.

Degree of stability for each genotype and two stability parameters (α and λ) were shown in Table 5. Also the distribution of alfa and lambda are shown in figure (1- 4).

Measurements of genotypic stability α and λ for seed cotton yield as estimated by Tai (1971) are displayed in Table 5 and graphically illustrated in Fig. 1, the genotypes no. 1, 2, 7, 8, 10, 11, 12, 13, 15, 16 and the three promising crosses and Giza 86 showed average level of stability. The distribution of α and statistic for genotype no 3 was negative and significantly differed from zero suggesting that this genotype was responsive to poor environment. Genotype no. 14 had positive α which did not significantly differ from zero indicating that it was more responsive to the environmental change and therefore, more adaptive. Unpredictable component, λ was more important than the predictable component, α for the genotypes no. 6, 5 and 4 which were considered unstable genotypes. These finding agreed with those obtained by Abou-Zahra *et al*., (1989) and El-Helow *et al.,* (2002).

Lint cotton yield (L.Y.):

Four genotypes increased significantly in lint cotton yield compared with Giza 86. These genotypes were F_7 676/07 and F_7 680/07 which descended from the cross G89/Pima S_6//G86, F_7 682/ 07 belong to cross G81//G89/ Pima S_6///G86 as well as the two promising crosses 10229 x G.86 and G89/G86. The increases were ranged from 0.92 to 2.26 Kan / fed. The highest lint yield was achieved by the cross 10229 x G.86 which surpassed the control variety Giza 86 by 2.26 Kan/fed. Heritability value estimated from combined data for this trait was 48.17% which indicating high environmental effect on this trait. Moreover, the genotype x environment interaction for lint cotton yield was highly significant. The same results were obtained by Abdel-Rahman *et al*., (1994) and Ali (2012). Figure 2, showed that thirteen genotypes had average level of stability, meanwhile the genotypes no. 1, 2, 7, 8, 10, 11, 13, 14, 15 and the two promising crosses 10229 x Giza 86 and Giza 89 x Giza 86 and Giza 86 were possessed average level of stability. The distribution of α for genotype no. 9 was positive which significantly differ from zero indicating that it was more responsive to the environmental change, while genotype no. 3 was negative and significantly differed from zero suggesting that this genotype was responsive to poor environment. Either, genotypes no. 4, 5, 6, 12 and G75/Sea were considered unstable.

Lint percentage (L %):

With respect to lint percentage, Table 4 showed that two strains F_7 676/07 and F_7 680/07 which descended from the cross G89/Pima S_6//G86 and the promising cross 10229 x G.86 exceeded the commercial variety Giza 86. The increases were ranged from 0.93 to 1.09 % compared with Giza 86.

Boll weight (B.W):

Considering boll weight, Table 4 showed some sort of genetic differences between all studied genotypes which ranged from 2.90 to 3.30 gm. The broad sense heritability estimate of (53.75) was obtained for this trait indicating that the environmental factor had higher effect on boll weight than seed cotton yield. Highly significant genotype x locations interaction at different locations was recorded for this trait. On the other hand, Hassan *et al.,* (2001) reported that the boll weight for Giza 80 and Giza 83 were higher than the other genotypes under study. Results in Figure 3 showed that fifteen strains had average level of stability, meanwhile the genotypes no. 11, 13, 15, 16 and 17 had the two advantages (average stability and surpassed mean performances). The distribution of statistic α and λ indicated that statistic λ was greater than unit for 17 genotypes suggesting the importance of unpredictable (GE) component of interaction. Similar results were obtained by Badr (2003).

Table 4: Mean performance of yield and its components and fiber properties of genotypes in Trial B at five locations

No.	S.C.Y.	L.Y.	L. %	B.W.	E. %	F.F.	F.S.	F.L.	H.W.	Y. St.	+b
1	12.60	13.97	35.14	3.0	76.6	4.0	41.4	33.2	143	2494	8.9
2	12.62	14.04	35.30	2.9	80.0	4.1	41.9	32.4	145	2448	9.0
3	12.19	13.82	35.98	3.1	76.9	4.0	41.5	32.7	142	2387	8.2
4	12.27	13.40	34.67	3.0	80.4	4.0	40.5	32.7	144	2320	8.0
5	11.89	13.86	36.94	3.1	74.8	4.3	41.1	32.8	151	2471	8.2
6	11.54	13.64	37.40	3.0	75.5	4.2	41.9	32.3	150	2460	7.9
7	11.49	13.63	37.74	3.0	76.3	4.1	42.2	32.8	148	2502	8.5
8	10.74	12.53	37.03	2.9	73.1	4.1	42.9	33.4	146	2534	7.6
9	11.84	13.93	37.27	3.0	76.3	4.2	42.1	33.2	149	2504	8.1
10	13.47	16.54	39.00	3.2	76.6	4.3	42.0	32.0	151	2346	8.1
11	12.98	15.96	39.05	3.2	72.6	4.3	42.9	32.2	151	2504	7.7
12	13.16	15.45	37.23	3.1	74.8	4.3	43.9	32.9	152	2569	8.1
13	12.75	15.15	37.68	3.2	70.3	4.3	44.2	32.3	150	2511	8.4
14	12.48	15.03	38.13	3.1	71.9	4.3	42.8	32.7	153	2513	7.8
15	11.70	13.48	36.51	3.2	73.4	4.4	45.0	31.6	155	2511	8.3
16	12.50	15.16	38.52	3.3	67.4	4.2	40.9	31.8	148	2354	8.2
17	13.55	16.67	39.06	3.3	76.4	4.3	41.3	33.3	151	2526	7.9
18	12.61	14.48	36.41	3.2	77.6	4.2	41.1	33.8	146	2483	7.6
19	13.06	15.34	37.29	3.1	71.5	4.3	43.5	32.1	150	2499	8.1
20	11.82	14.41	38.64	3.2	64.9	4.5	44.1	32.3	157	2498	8.4
Mean	12.36	14.53	37.25	3.1	74.4	4.2	42.4	32.6	149	2472	9.0
L.S.D. 5%	0.806	0.946		0.086	2.523						
L.S.D. 1%	1.059	1.244		0.113	3.315						
h^2_{bs}	75.23	48.17		53.75	79.49						
G	1135271.0**	267915**		0.4248**	203.03**						
G*Loc.	392346.1**	64357**		0.0822**	23.947*						

Earliness index (E %):

The data present in Table 4 emphasized that all studied strains and the three promising crosses were earlier than the commercial variety Giza 86. The range of this trait was from 67.4% to 80.4%. The broad sense heritability estimate of (79.49%) was obtained for this trait indicating that the environmental factor had lower effect. Meanwhile, stability measurements are shown in Table 5 and graphically illustrated in Fig. 4. Results indicated that 11 genotypes had average level of stability. The genotypes no. 1, 5, 6, 8, 9, 10, 14, 15, 16, 17, 18 and 19 observed average level of stability and above mean performance. While the other genotypes, no. 2, 3, 4, 7, 11, 12 and 13 had above average mean performances but unstable.

Fiber properties:

The results in Table 4 indicated that the fiber quality traits of all studied genotypes were desirable. The ranges of upper half mean (U.H.M) were from 31.6 to 33.8 mm, the fiber strength ranged from 40.5 to 45.0. Values of yarn strength were ranged from 2320 to 2569. Micronaire reading were from 4.0 – 4.5. In general, most of the strains had finer fiber than the check variety Giza 86. All genotypes were of white color.

From these results it could be concluded that most of the genotypes and the three promising crosses were surpassed the commercial variety with respect of seed cotton yield, lint cotton yield and earliness index beside it had desirable fiber quality.

Table 5: Stability parameters for different genotypes studied over five locations in 2009.

G	S.C.Y.		L.Y.		BW		E%	
	α	λ	α	λ	α	λ	α	λ
1	0.210	1.277	0.184	0.897	-0.211	1.724	-0.049	1.285
2	-0.100	1.179	-0.218	1.889	-0.599	2.914	-0.093	0.298
3	-0.559	0.105	-0.582	0.291	0.263	1.347	-0.040	0.130
4	-0.001	4.192	-0.148	4.288	-0.001	2.983	-0.166	0.328
5	-0.209	3.758	-0.122	4.131	-0.650	1.812	0.039	0.897
6	-0.067	2.870	0.083	3.311	-0.024	2.486	0.071	1.338
7	0.189	0.473	0.091	0.588	0.351	0.386	0.178	0.243
8	-0.302	0.838	-0.303	1.173	-0.499	5.787	-0.046	1.539
9	0.423	0.100	0.464	0.215	-0.153	1.316	0.271	0.619
10	-0.254	1.143	-0.211	0.862	0.273	2.322	-0.188	0.631
11	-0.125	0.737	-0.133	0.788	0.199	2.760	-0.069	1.687
12	-0.023	2.214	0.002	3.045	0.431	1.142	0.002	0.110
13	0.691	0.529	0.672	1.033	0.065	1.663	-0.088	0.055
14	0.189	0.261	0.297	0.708	0.209	0.828	0.058	1.186
15	0.145	0.519	0.150	0.547	-0.097	1.660	-0.067	0.104
16	0.129	2.213	0.067	2.464	-0.026	3.590	0.054	0.719
17	-0.192	2.621	-0.253	3.961	0.317	0.245	-0.030	0.846
18	-0.380	2.546	-0.335	3.327	0.233	1.697	0.019	0.664
19	-0.109	1.085	-0.152	1.034	-0.018	1.142	-0.098	0.500
20	0.344	1.074	0.446	1.120	-0.063	1.767	0.240	0.396

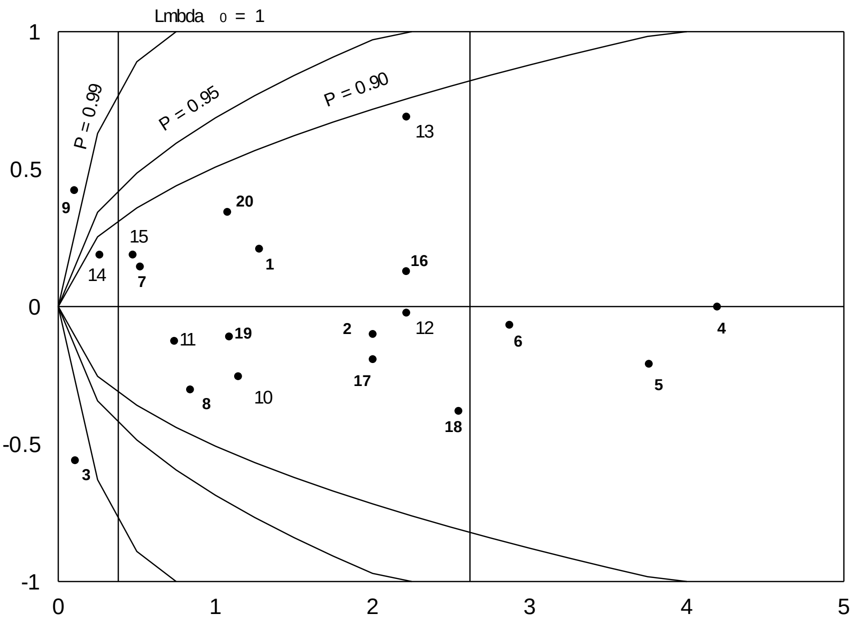

Fig. 1: Distribution of stability parameters for seed cotton yield

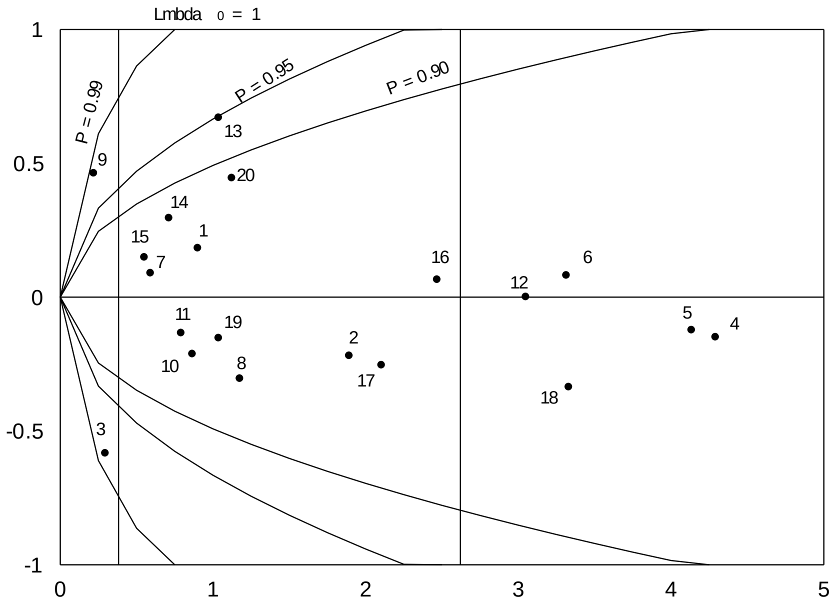

Fig. 2: Distribution of stability parameters for lint cotton yield

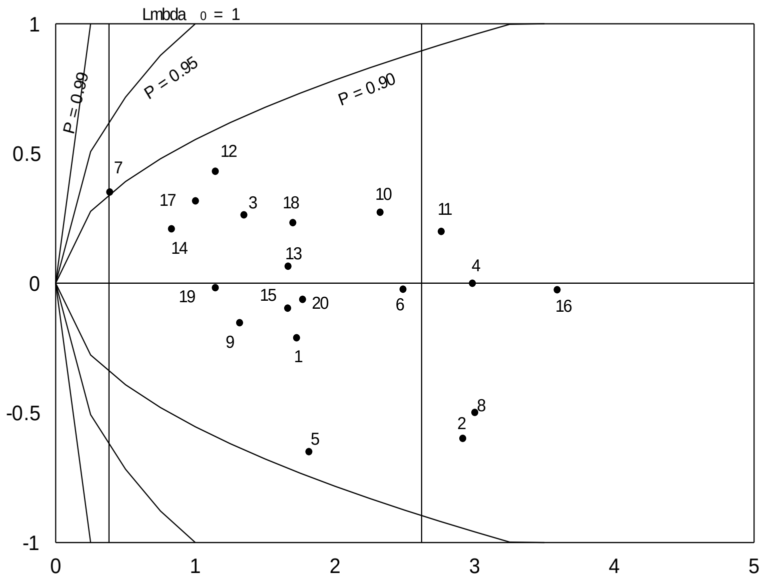

Fig. 3: Distribution of stability parameters for boll weight

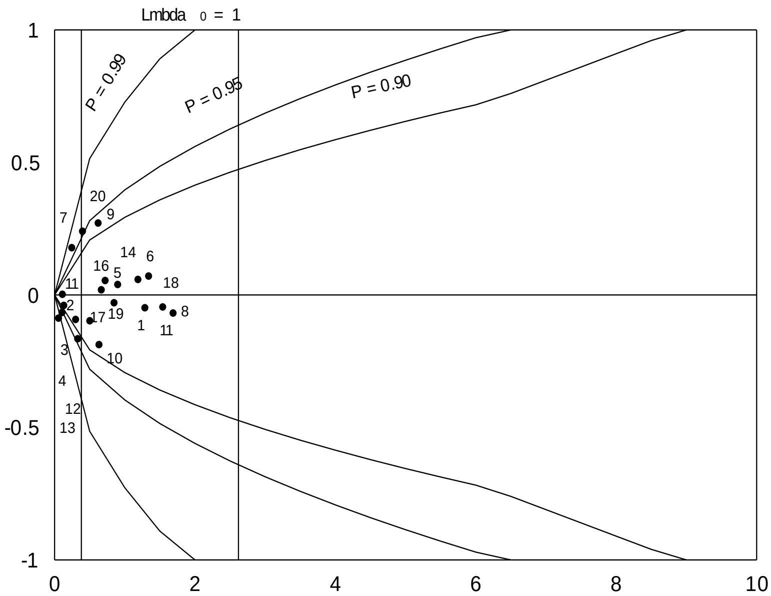

Fig. 4: Distribution of stability parameters for earliness index

Concerning heritability estimates, the results revealed low moderately estimates of heritability for boll weight 53.75 % and lint yield 48.17. This indicated that the environment participate in the inheritance of these character. The high estimates of heritability for SCY and E. %. This indicates that environmental play a minor role in the inheritance of these traits. Similar result was found by Killi *et al*., (2005) which found that the broad sense heritability estimates ranged from low to high heritability. El-Adly *et al*., (2006) reported that a high heritability estimates for boll weight, seed cotton yield and lint percentage while moderately heritability estimates in broad sense were obtained for lint cotton yield.

Generally, the breeder could be select the genotypes that had average level of stability and high performance from the breeding program to increase the percent of segregating in the F_2 and producing stable high yielding lines. Subsequently from the pervious results, it is evident that genotypes 10, 11, 13, 16, 17, and 19 met the assumption of the stable genotype describe by Tai (1971), they had above mean performances for most traits. Therefore, these genotypes may be recommend to be released a commercial stable high yielding cultivar and / or incorporated to be as a breeding stock in any future breeding program aiming for producing stable high yielding lines for seed cotton yields, lint cotton yield, boll weight and earliness index**.**

Acknowledgement

The writer expresses his deep gratitude to the staff of Long Staple Branch for their fruitful co-operation and assistance, Cotton Breeding Research Section, Cotton Research Institute.

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تقييم بعض التراكيب الوراثية للقطن المصرى تحت بيئات مختلفة

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يهدف هذا البحث الى تقييم بعض سلالات القطن طويل التيلة ومقارنتها بالهجن المبشرة والصنف المنزرع جيزة ٨٦ وذلك من النتائج المتحصل عليها من تجربة المحصول الاولية (أ) المنزرعة بسخا والتي تضم ٣٦ سلالة تتبع ١٤هجين من جنس القطن الباربادنس وذلك في الموسم الزراعي ٢٠٠٩ و دراسة الثبات الوراثي لهجن تجربة المحصول المتقدمة (ب) والتى تضم ١٦سلالة تتبع ١٠ هجن مختلفة تابعة لجنس القطن الباربادنس ايضا والمنزرعة فى خمس مناطق مختلفة من محافظات الدلتا للموسم الزراعى ٢٠٠٩وهي كفر الشيخ , الدقهلية , المنوفية , الشرقية و الغربية وقد استخدمت طريقة (Tai 1971) لدراسة الثبات الوراثي .

- تشير النتائج المتحصل عليها من التجربة الاولية (أ) الي تفوق معظم السلالات تفوقا معنويا في كل من صفات المحصول ومكوناته مقارنة بالصنف التجاري جيزة ٨٦ وقد كان معدل الزيادة في صفة

محصول القطن الزهر يتراوح ما بين ١,٨٠- ٢,٣٨ قنطار/فدان و صفة محصول القطن الشعر ٢,٥٠ –٤,٣٠ قنطار/ فدان مقارنة بالصنف التجاري جيزة ٨٦ .

- كان تأثير الصنف والبيئة والتفاعل بينهما عالي المعنوية على جميع الصفات تحت الدراسة.
- أظهرت تقديرات الثبات الوراثي أن معظم السلالات كان سلوكها متوسط الثبات وكان أدائها أعلى من المتوسط العام وهذه السلالات هي ١٠ و ١١ و ١٣ و ١٦ والهجين المبشر (١٠٢٢٩ × جيزة٨٦) والهجين(جيزة ٨٩ × جيزة٨٦) لكلا من صفتي محصول القطن الزهر والشعر بينما أظهرت التراكيب الوراثية ١٠و ١٢ و ١٣ و ١٥ و والهجين المبشر (١٠٢٢٩ × جيزة٨٦) والهجين (جيزة ٧٥ × سى) نفس السلوك لصفة وزن اللوزة والتراكيب الوراثية ١ و ٥ و ٦ و ٨ و ٩ و ١٠ و ١٤ و ١٥ والهجن المبشرة (١٠٢٢٩ × جيزة٨٦) و (جيزة ٨٩ × جيزة٨٦) و (جيزة ٧٥ × سى) أظهرت نفس السلوك لصفة دليل التبكير.
- اظهرت النتائج تفوق الهجين المبشر ١٠٢٢٩/ جـ ٨٦ حيث كان ترتيبه الاول فى جميع الصفات المحصولية على جميع السلالات والهجن ، كما اوضحت النتائج ان الصنف التجارى جـ ٨٦ كان متوسط الثبات لجميع الصفات المدروسه .
- اعطت درجة التوريث في المدي الواسع قيم عالية لمعظم صفات المحصول ومكوناته فى تجربة المحصول الاولية (أ) و تجربة المقارنة المتقدمة (ب) مما يعني أن هناك كفاءة عالية للانتخاب المظهري.

مما سبق يتضح أن على مربى القطن اختيار السلالات الأكثر ثباتا والأعلى محصولا والأفضل فى التيلة لاستخدامها كأصناف تجارية. وباستعراض النتائج يمكن الاستدلال على أن الهجين المبشر ١٠٢٢٩ × جيزة ٨٩ يمكن أن يكون بديل للصنف جيزة ٨٦ كما توجد سلالات أخرى تابعة للهجين جـ ٨٩ / بيما س٦// جـ ٨٦ و الهجين جـ ٨١ //جـ ٨٩ / بيما س٦/// جـ ٨٦ يمكن أن تكون بديلا جيدا للصنف جيزة ٨٦ بجانب الهجين المبشر ١٠٢٢٩ × جيزة ٨٩ .

قام بتحكيم البحث

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