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GENETICAL ANALYSIS OF YIELD AND YIELD COMPONENT TRAITS IN COTTON (*Gossypium barbadense*, L.).

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ABSTRACT

In this study, ten cotton varieties were setup in a partial diallel crosses. These varieties were G. 45 (P_1), G. 70 (P_2), G. 86 (P_4), G. 88 (P_5), G. 89 (P_6); G. 90 (P_7), G. 77 (P_{10}) were Egyptian cotton varieties, Pima 62 (P_3) and Pima S_6 (P_8) were American varieties, as well as, Kar. (P_9) was Russian variety, all these varieties belonging to the species *Gossypium barbadense* L.

In the growing season of 2006, the ten parental varieties were planted and crossed in a half diallel mating design to obtain 45 F_1 single crosses. The all genetic materials used in this investigation included ten parental varieties and their 45 F_1 single crosses were evaluated in the 2007 growing season at Sakha Agriculture Research Station at a randomized complete blocks design with three replications. Gene action, general and specific combining abilities and heritability in broad and narrow senses were estimated for boll weight, seed cotton yield per plant, lint cotton yield per plant, lint percentage, number of bolls per plant, seed index, lint index and number of seeds per boll.

The results showed that highly significant differences among all evaluated genotypes for all the studied yield and yield component traits.

The mean performances of genotypes revealed that G. 86 (P_4) had the highest mean values for boll weight, seed cotton yield per plant, lint cotton yield per plant and lint percentage. While, the Kar. (P_9) was the best and had the highest means for seed index, lint index and number of seeds per boll. The results also indicated that, the mean performances of most the 45 crosses were better than their both parents. Such as, the crosses G. 90 x Kar., Pima S_6 x G. 77, G. 88 x Kar., G. 45 x Kar., Pima S_6 x G. 77, G. 70 x Pima S_6, Pima 62 x G. 86 and G. 90 x Kar. for boll weight, seed cotton yield per plant, lint cotton yield per plant, lint percentage, number of seeds per boll, respectively.

The Kar. variety (P_9) was the best combiner and desirable for all the studied traits with except G. 77 (P_{10}) was the best combiner for lint percentage, and the results also, cleared that most of studied crosses had highly significant and positive (desirable) specific combining ability effects.

The results revealed that the magnitudes of non additive genetic variance including dominance (σ^2D). Which were positive and larger than those of additive genetic variance (σ^2A) for all the studied traits. This finding indicated the importance of dominance genetic variance in the inheritance of all the studied traits.

These results cleared that could be utilized these superior crosses in breeding programes for improve yield and its component traits or a lines as through the selection in segregation generation.

INTRODUCTION

Cotton is an important source in the Egyptian Economy. Accordingly, improving cotton is of great significance for plant breeder who need more information about the genetic behavior of the economical traits of cotton.

Cotton breeders usually seek variation, which it not present they have to create it hybridization programs. At the same time the production of promising hybrids depends on the choice of parental lines as well as their order in hybridization which yielded the useful heterosis when crossed together. Therefore, the main objectives of this study were to evaluated ten cotton parental varieties and their 45 F_1 crosses to estimate the amount of variations. Further partition of genetic variance to its components in order understand the nature of gene action of some yield and yield components traits ad sub-quantities determine which breeding program is proper for improving the Egyptian cotton.

Many investigations studied general and specific combining abilities and gene action among them, Jagtab and Kolhe (1987), Abd El-Maksoud *et al.* (2000), Khorgade *et al.* (2000), Abd El-Bary (2003), Lasheen (2003), El-Hoseiny (2004), Abd El-Hadi *et al.* (2005) and Abd El-Bary *et al.* (2008).

MATERIALS AND METHODS

This experiment was carried out at the Sakha Agriculture Research Station Farm, Agriculture Research Center during the two successive seasons 2006 and 2007. The following ten cotton varieties were used to establish the experimental materials for this investigation G. 45 (P_1); G. 70 (P_2); Pima 62 (P_3); G. 86 (P_4); G. 88 (P_5); G. 89 (P_6); G. 90 (P_7); Pima S_6 (P_8); Kar. (P_9) and G. 77 (P_{10}) all the ten varieties belong to *Gossypium barbadense*, L. Seven of these varieties are Egyptian varieties i.e.; P_1, P_2, P_4, P_5, P_6, P_7 and P_{10}, while, the other two varieties P_3 and P_8 were American varieties as well as, the P_9 (Karshensky) was Russian variety.

In the growing season of 2006, the ten parental varieties were planted and crossed in a half diallel mating design to obtain 45 F_1 single crosses. The parental varieties were also self pollinated to obtain enough seeds for further investigation.

The genetic materials used in the experiment consisted of 55 genotypes (the ten parental varieties and their 45 F_1 crosses). In the growing season of 2007. The genetic materials obtain from hybridization and their parental varieties were evaluated in field trial experiments at Cotton Research Experimental at Sakha Agric. Research Station. The experimental design used was randomized complete blocks design with three replications.

Each plot comprised one row 4 meters long with 60 cm, between rows hills were spaced at 40 cm and the seedlings were later thinned to one plant per hill. Normal agricultural cotton practices were applied as usual for the ordinary cotton fields in the area.

Data were only recorded on eight individual guarded plants of the 55 genotypes studied for subsequent measurements as follows:

Boll weight (B.W), seed cotton yield per plant (S.C.Y./P.), lint cotton yield per plant (L.C.Y./P.), lint percentage (L. %), number of bolls per plant (No.B./P.). seed index (S.I), lint index (L.I) and number of seeds per boll (No.S./B.).

The procedure of this analysis was described by Griffing's method 2 (1956) and outlined b Singh and Chaudhary (1985). The form of the analysis of combining ability and the expectations of mean squares are presented in Table 1.

Table 1: The form of the analysis of variance of the half diallel crosses mating design and the expectations of the mean square.

S.V.	d.f.	M.S.	E.M.S.
G.C.A.	P-1	Mg	$\sigma^2e + \sigma^2s + (P + 2)\ \sigma^2g$
S.C.A.	P (P-1)/2	Ms	$\sigma^2e + \sigma^2s$
Error	(g-1)(r-1)	Me	σ^2e

p, g and r, are number of parents, genotypes and replications, respectively.
Me; is the error mean squares by number of replications Ms and Mg are the mean squares of SCA and GCA, respectively.

In general, GCA of a line is the average value of the line in all other combinations and it is a measure of additive genetic variance, SCA is the ability of a line to do better or worse than the average value in a specific cross and it is a measure of non-additive genetic variances including dominance. These components could be obtained through the evaluation of the diallel crosses.

The mathematical model for the combining ability analysis is:

$$Y_{ij} = \mu + g_i + g_j + s_{ij} + e_{ijk}$$

Where:

Y_{ij} : is the value of a cross between parents (i) and (j)
μ : is population mean
g_i and g_j : are the GCA effect
S_{ij} : is the SCA effect
e_{ijk} : is the mean error effect.

Using plot means the various sum of squares are obtained as follow:

S.S. due to GCA (S_g) = $1/(P + 2)\ [\sum(Y_i + Y_{ii})^2 - 4\ Y^2/P]$

S.S. due to SCA (S_s) = $\sum\sum Y^2_{ij} - 1/(P + 2) \sum (Y_{i.} + Y_{ii})^2 + 2\ Y^2/(P + 1)(P + 2)$

Estimation of variance components and their genetic interpretations from ANOVA (Table 1) could be explained as follows:

$\sigma^2g = (Mg - Ms)/(P + 2)$

$\sigma^2s = Mg\text{-}Me^-$

$\sigma^2e = Me^-$

The components may be translated into genetic variance components using the following equations:

$$\sigma^2g = ½\ \sigma^2A \qquad \sigma^2s = \sigma^2D$$

In addition, the estimates of combining ability effects were determined using the following equations:

1. General combining ability effects (g_i) for each line
   $g_i = 1/(P + 2)\ [\sum(Y_{i.} + Y_{ii}) - 2\ Y_{...}/(P)]$
2. Specific combining ability effects (Sij) for each cross:
   $S_{ij} = Y_{ij} - 1/(P+2)\ [Y_{i.} + Y_{ii} + Y_{j.} + Y_{jj}] + 2\ Y_{..}/(P + 1)(P + 2)$

To test the significance of general as well as specific combining abilities effects, the critical differences were calculated as follows:

$$C.D = SE. xt$$

Where: S.E. is standard error of effects and t: is (t) tabulated with the degree of freedom of error at 5% or 1% levels of probability.

Estimates of standard errors:

$$S.E.(g_i) = [(P-1)\,\sigma^2e/P\,(P+2)]^{½}$$

$$S.E.(s_{ij}) = [(P-1)\,\sigma^2e/(P+1)\,(P+2)]^{½}$$

RESULTS AND DISCUSSION

The results of the analysis of variance for all studied traits are presented in Table 2. The results cleared that the mean squares of the genotypes showed highly significant differences among all genotypes for all studied traits. This finding indicated the presence of genetic variability among all the evaluated genotypes. This variability mainly due to the different sources of the parental varieties.

Table 2: Analysis of variance and the mean squares for yield and yield component traits.

S.V.	Yield and yield component traits.							
	B.W	**S.C.Y./P**	**L.C.Y./P**	**L. %**	**No.B./P**	**S.I.**	**L.I.**	**S./B.**
Replications	0.176**	5518.2**	227.6**	170.52**	97.69**	1.529	5.947**	13.303**
Genotypes	0.106**	1775.7**	282.4**	15.40**	241.37**	1.248**	0.652**	5.943**
Error	0.023	0.024	0.511	5.77	9.09	0.659	0.146	1.754

***,** Significant at 0.05 and 0.01, levels of probability, respectively.**

The means of the ten parental varieties and their 45 F_1 hybrids were estimated for all the studied traits and the results are presented in Table 3. The results showed that the (P_4) G. 86 was the superior and had the highest means for boll weight (B.W.), seed cotton yield per plant (S.C.Y./P.), lint cotton yield per plant (L.C.Y/P.) and lint percentage L. %. In addition the Kar. variety (P_9) was the highest and superior parent for seed index (S.I), lint index (L.I) and number of seeds/boll No.S./B., as well as, the highest parental mean for number of bolls per plant was the Pima S_6 (P_8) variety.

The results also indicated that the lowest variety mean value was (P_1) G. 45 for all the studied traits with except of seed index and number of seeds per boll. On the other hand, the varieties (P_5) G. 88 and (P_7) G. 90 were the lowest mean values for seed index and number of seeds per boll, respectively.

The means of F_1 hybrids showed that the hybrids G. 90 x Kar. was the best cross for boll weight (B.W.) and number of seeds per boll (No. S./B) with mean values of 3.09 g. and 17.87, respectively.

Concerning seed cotton yield per plant (S.C.Y/P.) and number of bolls per plant (No. B/P), the cross Pima S_6 x Kar. was the superior and had the highest means for the above two traits with the mean values of 171.53 (g) and 67.85. On the other hand, the lowest mean values for the same traits were the crosses G. 89 x G. 77 and Pima 62 x G. 77 with the mean values. 77.73 (g) and 29.23, respectively.

Table 3: The mean performances of parental varieties and F_1 their hybrids for yield and yield component traits.

Genotypes		B.W	S.C.Y./P.	L.C.Y./P.	L. %	No.B./P	S.I.	L.I.	No.S./B.
G. 45		2.43	71.33	24.04	33.70	29.37	8.19	4.17	13.20
G. 70		2.57	112.33	40.78	36.40	43.76	8.20	4.70	13.39
Pima 62		2.61	126.03	47.16	37.50	48.34	7.78	4.67	12.68
G. 86		2.80	140.83	55.52	39.50	50.24	7.45	4.86	12.67
G. 88		2.59	132.03	50.07	38.00	51.03	7.21	4.62	12.12
G. 89		2.58	128.33	48.40	37.80	49.82	7.30	4.44	11.71
G. 90		2.46	139.33	53.40	38.40	57.23	7.58	4.75	11.50
Pima S_6		2.63	133.73	50.58	37.90	59.87	8.66	5.29	14.12
Kar.		2.60	132.33	50.18	38.00	50.99	9.20	5.65	14.80
G. 77		2.46	101.53	37.97	37.50	41.52	8.30	4.89	12.50
G. 45	x G. 70	2.60	109.82	38.00	34.70	42.34	8.92	4.75	15.15
	x Pima 62	2.66	138.02	49.44	35.90	51.79	7.83	4.39	13.37
	x G. 86	2.66	166.90	61.15	36.70	62.91	7.75	4.51	13.08
	x G. 88	2.49	105.67	35.19	3340	42.38	8.23	4.13	13.67
	x G. 89	2.52	144.83	56.23	38.90	58.37	8.12	5.17	12.61
	x G. 90	2.47	118.02	44.50	37.80	47.72	8.51	5.17	13.40
	x Pima S_6	2.72	142.85	53.32	37.40	52.52	8.13	4.86	13.84
	x Kar.	3.02	118.07	47.59	40.40	39.07	8.69	5.91	15.62
	x G. 77	2.78	120.08	46.37	38.70	43.84	8.43	5.33	14.33
G. 70	x Pima 62	2.69	141.73	54.04	38.20	53.05	8.90	5.50	14.80
	x G. 86	2.43	87.86	34.07	38.90	37.03	8.37	5.31	12.42
	x G. 88	2.34	141.73	55.88	39.50	60.63	7.98	5.22	11.27
	x G. 89	2.68	154.59	60.49	39.20	58.81	8.10	5.22	13.20
	x G. 90	2.55	85.13	32.07	37.80	33.67	8.56	5.21	13.53
	x Pima S_6	2.45	129.33	48.65	37.70	52.92	9.50	5.76	14.49
	x Kar.	2.82	96.05	37.93	39.60	34.60	8.63	5.67	14.65
	x G. 77	2.38	91.81	36.34	39.70	38.53	8.44	5.55	12.14
Pima 62	x G. 86	2.48	414.38	57.93	40.20	59.09	8.99	6.05	13.42
	x G. 88	2.57	94.88	37.93	40.00	36.88	7.99	5.3	12.32
	x G. 89	2.87	138.81	54.72	39.50	48.48	7.76	5.09	13.45
	x G. 90	2.13	88.48	34.76	39.40	41.56	8.50	5.54	10.98
	x Pima S_6	2.48	87.77	34.04	38.90	35.54	8.00	5.12	12.12
	x Kar.	2.88	135.87	53.79	39.57	47.45	8.54	5.59	1489
	x G. 77	2.85	83.46	33.36	39.97	29.23	8.21	5.46	14.01
G. 86	x G. 88	2.66	101.78	39.15	38.47	8.16	8.91	5.57	14.61
	x G. 89	2.35	89.33	34.02	38.20	38.13	7.70	4.78	11.16
	x G. 90	2.24	129.33	51.42	40.10	47.21	8.17	5.47	13.42
	x Pima S_6	2.81	126.73	47.67	37.70	45.12	8.78	5.31	15.38
	x Kar.	2.51	112.63	44.50	39.60	44.97	8.38	5.52	12.67
	x G. 77	2.61	130.93	51.88	39.70	50.17	7.78	5.48	12.22
G. 88	x G. 89	2.52	111.93	43.21	38.71	44.41	8.51	5.39	13.16
	x G. 90	2.86	139.63	55.19	39.60	48.73	8.92	5.83	15.49
	x Pima S_6	2.63	104.13	37.69	36.30	39.68	8.32	4.75	13.92
	x Kar.	2.51	167.33	67.16	40.20	66.94	8.13	5.49	12.19
	x G. 77	2.72	127.03	51.09	40.22	46.68	8.52	5.76	13.86
G. 89	x G. 90	2.56	129.53	50.80	39.30	50.77	8.81	5.73	13.76
	x Pima S_6	2.70	108.93	41.18	37.90	40.41	7.72	4.72	12.93
	x Kar.	2.78	162.13	64.59	39.90	58.40	8.14	5.41	13.59
	x G. 77	2.26	77.73	30.36	39.20	34.34	7.68	4.96	10.56
G. 90	x Pima S_6	2.84	115.23	41.95	36.50	40.65	8.39	4.83	15.15
	x Kar.	3.09	154.93	57.84	37.40	50.13	9.22	5.50	17.87
	x G. 77	2.77	112.13	44.52	39.80	40.46	8.96	5.93	14.96
Pima S_6	x Kar.	2.81	114.23	41.36	36.30	40.68	8.99	5.12	16.09
	x G. 77	2.53	171.53	62.50	36.50	67.85	7.51	4.37	12.17
Kar.	x G. 77	2.58	146.13	56.74	38.90	56.70	8.12	5.17	12.88
L.S.D. 0.05		0.246	0.250	1.159	3.891	4.885	1.315	0.619	2.145

L.S.D. 0.01	**0.326**	**0.331**	**1.534**	**5.150**	**6.465**	**1.741**	**0.819**	**2.839**

For lint cotton yield per plant (L.C.Y./P.) the cross G. 88 x Kar. was the best cross and had the highest mean with the mean value 67.16 (g). On the other hand, the cross G. 89 x G. 77 was the lowest cross with the mean value 30.36 (g.). In addition, the cross G. 45 x Kar. was the highest and superior cross for lint percentage (L. %) with the mean value 40.40% and the lowest mean for the same trait was the cross G. 45 x G. 70 with the mean value 34.70% as well as, the highest mean and superior crosses for seed index (S.I) and lint index (L.I) were the crosses G. 70 x Pima S_6 and Pima 62 x G. 86 with the mean values of 9.50 and 6.05, respectively. However, the lowest crosses for the same traits were G. 86 x G. 89 and G. 45 x G. 88 with the mean values of 7.70 and 4.13, respectively.

The results of the analysis of variance the half for diallel crosses mating design for all yield and yield components traits were calculated and the results are presented in Table 4. The results showed that the mean squares of general combining ability (G.C.A) as well as, the mean squares of specific combining ability (S.C.A) were highly significant for all the studied traits except of SCA for seed index which was significant. The results also indicated that the S.C.A. mean square were greater than those of G.C.A. for seed cotton yield per plant, boll weight, lint cotton yield per plant and number of bolls per plant.

Table 4: The analysis of variance and mean squares of the half diallel crosses mating design from F_1 crosses for yield and yield component traits.

S.V.	d.f	B.W	S.C.Y./P.	L.C.Y./P.	L. %	No.B./P.	S.I.	L.I.	No.S./B.
G.C.A.	9	0.0865**	966.575**	201.923**	28.510**	68.279**	2.135**	1.1992**	10.649**
S.C.A.	45	0.1044**	1937.52**	298.469**	12.778**	275.984**	1.0711*	0.5429**	5.002**
Error	108	0.023	0.024	0.511	5.77	9.09	0.659	0.146	1.754

***, ** significant at 0.05 and 0.01, levels of probability, respectively.**

These results indicated that the non-additive genetic variance were predominated and played the major role in the expression of these traits. On the other hand, the G.C.A. mean squares were greater than those of S.C.A. mean squares for lint percentage, seed index, lint index and number of seeds per boll and GCA/SCA ratio was used as a measure to reveal the nature of genetic variance involved high values of more than unity were obtained for the above traits and these characters showing the importance of additive and additive by additive gene action and these results cleared that the additive genetic variance played the major role in the expression of these above traits.

These results were in agreement with those obtained by Carvalho *et al.* (1995); Awad (2001); Zeina *et al.* (2001); Lasheen (2003); Abd El-Hadi *et al.* (2005) and Abd El-Bary *et al.* (2008).

The estimates of general combining ability effects (gi) for yield and yield components traits of the parental varieties were obtained and the results as presented in Table 5. These results showed that the (P_9) Kar. was the best combiner and desirable for all the studied traits with except lint percentage (L.

%). The arental variety G. 77 (P_{10}) was the best combiner and desirable general coming ability effect for the final trait (L%).

Table 5: General combining ability effects (g_i) of parental varieties for yield and yield component traits.

Parents	Yield and yield components traits.							
	B.W.	**S.C.Y./P.**	**L.C.Y./P.**	**L. %**	**No.B./P.**	**S.I.**	**L.I.**	**No.S./B.**
P_1	-0.002**	-3.0444**	-2.885**	-1.847**	-1.230**	0.005	-0.369**	0.275**
P_2	-0.063**	-6.728**	-2.925**	-0.447**	-1.278*	0.238**	0.049**	0.050
P_3	0.0001	-3.165**	-0.819**	0.264	-1.222**	-0.055**	0.033**	-0.259**
P_4	0.003**	2.341**	1.558**	0.425**	0.736**	-0.102**	0.061**	-0.348**
P_5	-0.027**	1.227**	0.706**	0.751**	1.009**	-0.418**	-0.025**	-0.257**
P_6	-0.035**	2.586**	1.522**	0.245	1.443**	-0.316**	-0.137**	-0.832**
P_7	0.010**	0.635**	0.475**	0.087	0.077	0.190**	0.143**	0.286**
P_8	0.033**	2.062**	-0.385**	-1.038**	0.222	0.150**	-0.131**	0.543**
P_9	0.115**	10.715**	4.809**	0.367*	2.207**	0.329**	0.309**	1.018**
P_{10}	-0.035**	-6.629**	-2.087**	1.192**	-1.968**	-0.050**	0.066**	-0.475**
S.E.	0.0006	0.0001	0.0128	0.144	0.227	0.0165	0.0037	0.0438

***,** significant at 0.05 and 0.01, levels of probability, respectively.**

The specific combining ability effects (s_{ij}) for all studied crosses with respect to yield and yield component traits were obtained and the results are presented in Table 6.

The results cleared that no hybrid exhibited positive and significant value for all the studied traits. However, the cross G. 45 x Kar. showed positive and highly significant specific combining ability effect (s_{ij}) values for boll weight (B.W), seed cotton yield per plant (S.C.Y./P.), lint cotton yield pier plant (L.C.Y./P.) and lint index (L.i), respectively. Concerning seed cotton yield per plant (S.C.Y./P) and lint cotton yield per plant (L.C.Y./P) the cross Pima S_6 x G. 77 had the highest, highly significant and positive specific combining ability effect values. On the other hand, the crosses G. 88 x G. 77, G 88 x Kar., G. 86 x G. 88 and G. 90 x Kar. out of the 45 crosses had desirable significant specific combining ability effects (S_{ij}) values for lint percentage (L. %), number of bolls per plant (No.B./P.) seed index (S.I) and number of seeds per boll (No.S./B.), respectively. These results were in common agreement with the results obtained by many authors among them Khann *et al.* (1981); William and Meredith (1990); Coyle and Smith (1997); Abd El-Maksoud *et al.* (2000), Lasheen *et al.* (2003), Abd El-Hadi *et al.* (2005) and Abd El-Bary *et al.* (2008).

The genetic parameters estimates were obtained and the results are presented in Table 7. The results revealed that the magnitudes of dominance genetic variance (σ^2D) were positive and larger than those additive genetic variance (σ^2A) for all the studied traits. These results lined that the non-additive genetic variance including dominance (σ^2D) was important and played the major role in inheritance of the studied traits.

Concerning heritability in broad ($h^2_{b.s}$%) and narrow ($h^2_{n.s}$%) senses the results showed that the calculated values for $h^2_{b.s}$% were larger than those for $h^2_{n.s}$% for all studied traits. These results insure the major role of over dominance gene effects in the genetic expression of these studied traits. The calculated values of $h^2_{b.s}$% ranged from 47.23% for seed index (S.I.) to

99.99% for seed cotton yield per plant (S.C.Y./P.), respectively. However, heritability in narrow sense (h^2_n%) ranged from 0.00% for boll weight seed cotton yield per plant, lint cotton yield per plant and number of bolls per plant to 60.91% for lint index.

These results were in agreement with many investigators among them El-Feki *et al.* (1998), Abd El-Maksoud *et al.* (2000), Khorgade *et al.* (2000), Abd El-Hadi *et al.* (2005); Abd El-Bary (2003), Chris Braden *et al.* (2003) and Abd El-Bary *et al.* (2003).

Table 6: Specific combining ability effects (s_{ij}) of each cross for yield and yield component traits.

Crosses		B.W.	S.C.Y./P.	L.C.Y./P.	L. %	No.B./P.	S.I.	L.I.	No.S./B.
G. 45	x G. 70	0.045**	-2.540**	-2.961**	-1.503	-1.922	0.413	-0.115*	1.389**
	x Pima 62	0.045**	22.098**	6.377**	-1.014	7.476**	-0.391	-0.455**	-0.089**
	x G. 86	0.043**	45.472**	15.709**	-0.395	16.638**	-0.424	-0.363**	-0.333**
	x G. 88	-0.098**	-14.645**	-9.402**	-4.001*	-4.162	0.375	-0.654**	0.209**
	x G. 89	-0.060**	23.157**	0.825*	2.005	11.388**	0164	0.491**	-0.270**
	x G. 90	-0.154**	-1.703**	0.142**	1.064	2.103	0.048	0.215**	-0.897**
	x Pima S_6	0.069**	21.700**	9.819**	1.789	6.758*	-0.292	0.183**	-0.414**
	x Kar.	0.290**	-11.733*-*	-1.101**	3.383	-8.673**	0.063	0.786**	0.891**
	x G. 77	0.191**	7.622**	4.569**	0.858	0.272	0.211	0.452**	1.094**
G. 70	x Pima 62	0.130**	29.492**	11.040**	-0.114	8.787*	0.446*	0.234**	1.567**
	x G. 86	-0.133**	-29.884**	-11.300**	0.425	-9.192**	-0.037	0.023	-0.725**
	x G. 88	-0.193**	25.99**	11.358**	0.699	14.128**	-0.07	0.012	-1.949**
	x G. 89	0.158**	36.60*	15.155**	0.905	11.878*	-0.092	0.124*	0.546*
	x G. 90	-0.017**	-30.90**	-12.218**	-0.336	-11.896**	-0.135	-0.163**	-0.249*
	x Pima S_6	-0.139**	11.864**	5.223*	0.689	7.209**	0.845*	0.658**	0.458
	x Kar.	0.145**	-30.069**	-10.695**	1.183	-13.093**	-0.237	0.132**	0.140*
	x G. 77	-0.141**	-16.964**	-5.388**	0.458	-4.991	-0.012	0.254*	-0.877**
Pima 62	x G. 86	-0.146**	23.074**	10.454**	1.014	12.806**	0.883**	0.772	0.585**
	x G. 88	-0.023**	-25.313**	-8.701**	0.488	-9.670**	0.198	0.125*	-0.600**
	x G. 89	0.281**	17.259**	7.280**	0.494	1.493	-0.136	0.013	1.099**
	x G. 90	-0.497**	-31.121**	-11.640**	0.553	-4.062	0.098	0.180**	-2.483**
	x Pima S_6	-0.173**	-33.258**	-11.500**	1.178	-10.227**	-0.362	0.034	-1.599**
	x Kar.	0.145**	6.189**	3.059**	0.439	-0.298	-0.031	0.071	0.689**
	x G. 77	0.265**	-28.876**	-10.177**	0.014	-14.346**	0.051	0.0180	1.306**
G. 86	x G. 88	0.067**	-23.919**	-9.852**	-1.206	-10.35**	1.162**	0.354**	1.772**
	x G. 89	-0.241**	-37.727**	-15.804**	-0.967	-10.815**	-0.149	-0.321**	-1.096**
	x G. 90	0.107**	4.223**	2.649**	1.092	-0.370	-0.186	0.085	0.040
	x Pima S_6	0.155**	0.196**	-0.240	-0.183	-2.608	0.465	0.200**	1.743**
	x Kar.	-0.231**	-22.557**	-8.611**	0.311	-4.743	-0.144	-0.027*	-1.435**
	x G. 77	0.023**	13.88**	5.665**	-0.414	4.629	-0.337	0.169**	-0399**
G. 88	x G. 89	-0.035**	-14.014*	-5.759**	-0.786	-4.812	0.980**	0.371**	0.809**
	x G. 90	0.260**	15.636**	7.264**	0.266	0.880	0.880**	0.534**	2.025**
	x Pima S_6	0.001	-21.291**	-9.369**	-1.909	-8.315**	0.321	-0.278**	0.195**
	x Kar.	-0.198**	33.256**	14.907**	0.585	16.954**	-0.082	0.029	-2.007**
	x G. 77	0.166**	10.301*	5.727**	9.860**	0.869	0.723**	0.535**	1150**
G. 89	x G. 90	-0.032**	4.178**	2.062**	0.472	2.480	0.673**	0.539**	0.863**
	x Pima S_6	0.079**	-17.849**	-6.698**	0.197	-8.022**	-0.381	-.196**	-0.223**
	x Kar.	0.080**	26.698**	11.515**	0.791	7.987*	-0.169	0.061	-0.032
	x G. 77	-0.290**	-40.357**	-15.812**	-0.734	-11.905**	-0.221	-0.153**	-1.572*
G. 90	x Pima S_6	0.174**	-9.599**	-4.878**	-1.045	-9.419	-0.214	-0.359**	0.886**
	x Kar.	0.345**	21.448**	5.812**	-1.550	1.082	0.408	-0.133**	3.124**
	x G. 77	0.179**	-4.007**	-0.605**	0.025	-4.422	0.556*	0.543**	1.714**
Pima S_6	x Kar.	0.042**	-20.679**	-9.805**	-1.525	-8.519**	0.214	-0.235**	1.091**
	x G. 77	-0.091**	53.966**	18.235**	-2.150	22.830	-0.777**	-0.745**	-1.333**
Kar.	x G. 77	-0.116**	19.913**	7.278**	-1.166	6.691**	-0.453*	-0.389**	-1.705**
S.E.		0.0013	0.008	0.170	1.925	3.030	0.220	0.049	0.585

***,** significant at 0.05 and 0.01, levels of probability, respectively.**

Table 7: The estimates of genetic parameters, which included additive and non-additive genetic variances and heritability in broad and narrow senses for yield and yield component traits.

Genetic parameters	B.W.	S.C.Y./P.	L.C.Y./P.	L. %	No.B./P.	S.I.	L.I.	No.S./B.
σ^2g	-0.0005	-26.97	-2.682	0.437	-5.7696	0.0296	0.0182	0.1569
σ^2s	0.0271	645.84	99.319	2.335	88.965	0.1371	0.1322	1.0829
σ^2e	0.0076	0.0080	0.170	1.923	3.03	0.219	0.0487	0.585
σ^2A	-0.001	-53.94	-54.36	0.874	-11.54	0.059	0.036	0.314
σ^2D	0.071	645.84	99.32	2.335	88.97	0.137	0.132	1.083
$H^2_{b.s}$ %	90.33	99.99	99.98	62.53	96.71	47.23	77.53	70.48
$H^2_{n.s}$ %	0.00	0.00	0.00	17.03	0.00	33.01	60.91	15.84

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التحليل الوراثى لصفات المحصول ومكوناته فى القطن المصرى

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فى هذه الدراسة تم استخدام ١٠ أصناف من القطن وهى: جيزه ٤٥ ، جيزه ٧٠ ، جيزه ٨٦ ، جيزه ٨٨ ، جيزه ٨٩ ، جيزه ٩٠ ، جيزه ٧٧ هذه الأصناف مصرية بالإضافة إلى ثلاث مستوردات أجنبية هى: بيما ٦٢ ، بيماس ٦ وهى أصناف قطن أمريكية بالإضافة إلى الصنف كارشنسكى وهو صنف قطن روسى. وجميع هذه المواد الوراثية تابعة للنوع *G. barbadense*, L. فى الموسم الزراعى ٢٠٠٦م تم زراعة هذه الأصناف كلها وذلك لاجراء التهجين بالنظام نصف الدائرى ، وتم الحصول على ٤٥ هجن فردى. وفى الموسم الزراعى ٢٠٠٧م تم زراعة كل هذه التراكيب الوراثية (الأباء العشرة بالإضافة إلى الهجن الـ ٤٥) فى تجربة قطاعات كاملة العشوائية فى محطة البحوث الزراعية بسخا. وتم قياس أثر الجين والقدرة العامة والخاصة على التآلف وتقدير المكونات الوراثية بالإضافة لمعامل التوريث فى بالمدى الواسع والضيق للصفات المستخدمة وهى: متوسط وزن اللوزة ، محصول القطن الزهر للنبات ، محصول القطن الشعر للنبات ، تصافى الحليج ، متوسط عدد اللوز للنبات ، معامل البذرة ، معامل الشعر بالإضافة لعدد البذور فى اللوزة.

ويمكن تلخيص النتائج فيما يلى:

- أظهرت نتائج تحليل التباين وجود اختلافات عالية المعنوية بين كل التراكيب الوراثية المستخدمة لكل الصفات الموجودة تحت الدراسة.
- أظهر تقدير متوسطات الأداء للأباء أن الأب الرابع جيزه ٨٦ كان الأفضل بالنسبه لصفات وزن اللوزة ، محصول القطن الزهر للنبات ، محصول القطن الشعر للنبات بالإضافة لمعامل الشعر

بينما الصنف الروسى كارشنسكى كان الأفضل بالنسبه لصفات معامل البذرة ، معامل الشعر عدد البذور فى اللوزة كما أظهرت متوسطات أداء الهجن أن معظم الهجن الـ ٤٥ تحت الدراسة كانت أفضل وأعلى من أداء الأباء بالنسبه لكل الصفات تحت الدراسة ويظهر أن أفضل الهجن كانت جيزه ٩٠ × كارشنسكى ، بيما س٦ × جيزه ٧٧ ، جيزه ٨٨ × كارشنسكى ، جيزه ٤٥ × كارشنسكى ، بيما س٦ × جيزه ٧٧ ، جيزه ٧٠ × بيما س٦ ، بيما ٦٢ × جيزه ٨٦ بالإضافة إلى جيزه ٩٠ × كارشنسكى للصفات ، وزن اللوزة ، محصول القطن الزهر للنبات ، محصول القطن الشعر للنبات ، تصافى الحليج ، عدد اللوز للنبات ، معامل البذرة ، معامل الشعر وعدد البذور فى اللوزة على الترتيب.

- أظهرت النتائج أن الصنف كارشنسكى كان الأفضل فى القدرة العامة على التآلف بالنسبه لكل الصفات تحت الدراسة باستثناء صفة تصافى الحليج فقد كان الصنف جيزه ٧٧ هو الأفضل فى هذه الصفة.
- بالنسبه للقدرة الخاصة على التآلف أظهرت النتائج أن معظم الهجن الفردية تحت الدراسة أمتلكت قدرة خاصة على التآلف مرتفعة وعالية المعنوية (مفيدة).
- أظهرت النتائج أيضا أن التباين الغير إضافى (السيادى) كان ألأعلى والأكثر تفوقا بالمقارنة بالتباين الإضافى لجميع الصفات تحت الدراسة وأنه الأكثر أهمية والمتحكم فى توريث الصفات الموجودة تحت الدراسة.
- أظهرت النتائج أن معامل التوريث بالمدى الواسع كان أعلى من معامل التوريث فى المدى الضيق لكل الصفات تحت الدراسة.
- من هذه النتائج يمكن استخلاص أنه يمكن استخدام الهجن المتفوقة الناتجة فى تحسين الصفات المدروسة سواء باستخدامها كسلالات جديدة أو من خلال الانتخاب فى أجيالها الانعزالية المتقدمة.