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GENETICAL ANALYSIS FOR F_1 AND F_2 GENERATION IN SOME EGYPTIAN COTTON CROSSES (*Gossypium barbadense* L.)

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ABSTRACT

Five cotton varieties belong to *Gossypium barbadense* L. i.e. Giza 89,Giza 90 Giza 83, Pima S_4 and Pima S_6 were selected as parents and crossed in a half diallel pattern to evaluate general and specific combining ability effects (GCA and SCA) and heterotic effects for some agronomic traits i.e. boll weight (B.W.), seed cotton yield (S.C.Y.), lint yield (L.C.Y.), lint percentage (L.%), seed index (SI), length at 2.5% , strength g/tex and micronaire value (Mic). Analysis of variance revealed significant differences among entries for all traits studied except for B.W., S.I. and Mic in F_1 and F_2 generations as well as length at 2.5% in F_2's generation which showed significant differences. The mean squares in both F_1's and F_2's for general combining ability (GCA) were insignificant for all traits except for S.C.Y. and L.C.Y. in F_1's and F_2's generations. Meanwhile, the mean squares for specific combining ability (SCA) were insignificant for all traits except S.C.Y. and L.C.Y. in both generations and strength g/tex in F_1's generation which showed significant. The GCA/SCA ratio of variance components indicated that additive genetic variance was generally importance for B.W., L%, SI and Mic in the F_1 hybrids and for B.W., L.C.Y., L.% and Mic in the F_2 generation. Mid-parents heterosis values were significant and positive for S.C.Y., L.C.Y. and length at 2.5% in the cross Giza 89 x Giza 90 (P_1 x P_2), S.C.Y., L.C.Y., L% and length at 2.5% in the cross Giza 89 x Giza 83 (P_1 x P_3), S.C.Y., S.I., length at 2.5% and Mic in the cross Giza 89 x Pima S_4 (P_1 x P_4), SCY, L.C.Y. and length at 2.5% cross Giza 89 x Pima S_6 (P_1 x P_5), SCY, LY and Mic in the cross Giza 90 x Giza 83 (P_2 x P_3), S.C.Y., L.C.Y.and length at 2.5% in the cross Giza 90 x Pima S_4 (P_2 x P_4), length and Mic in the cross Giza 83 x Pima S_4 (P_3 x P_4) and S.C.Y. in the cross Pima S_4 x Pima S_6 (P_4 x P_5). On the other hand, significant negative heterotic values were observed for B.W. and S.I. in the cross Giza 89 x Giza 90 (P_1 x P_2), B.W. in the crosses of Giza 89 x Pima S_4 (P_1 x P_4) and Giza 90 x Giza 83 (P_2 x P_3). Better-parents heterosis values were significant and positive for 1% in the cross Giza 89 x Giza 83 (P_1 x P_3), S.I. and length cross Giza 89 x Pima S_4 (P_1 x P_4), S.C.Y. in the cross Giza 89 x Pima S_6 (P_1 x P_5), L.C.Y.in the cross Giza 90 x Giza 83 (P_2 x P_3) and S.C.Y. and L.Y. in the cross Giza 90 x Pima S_4 (P_2 x P_4). These results indicated to the importance of specific combining ability in the genetic expression of these traits with respect to the studied crosses. Regarding inbreeding depression, significant positive effect were obtained for L.C.Y.in the cross (P_1 x P_2), B.W., S.C.Y. and L.C.Y.in the cross (P_1 x P_3), S.C.Y .and S.I. in the cross (P_1 x P_4), S.C.Y., L.Y. and L.% in the cross (P_1 x P_5), S.C.Y. and L.C.Y. in the cross (P_2 x P_3), S.C.Y., L.C.Y. and L.% in the cross (P_2 x P_4), S.C.Y. in the cross (P_2 x P_5) and in the cross (P_3 x P_4) and S.C.Y. in the cross (P_4 x P_5). This finding revealed the importance of heterotic effect in these traits with respect to the studied crosses .

INTRODUCTION

Diallel analysis is one of the methods that reveal yield potentiality of the cotton cultivars and their crosses on the basis of their general and specific combining ability. General combining ability (GCA) includes the additive variance, while specific combining ability (SCA) could be considered as a measure of non-additive genetic variance arising largely from dominance and epistatic deviations. Several studies have been established in this respect by many investigators.

El-Dobaby *et al.* (1997) found highly significant effect of GCA and SCA for each of seed cotton yield/plant, boll weight, lint percentage, seed index and lint index. Hendawy *et al.* (1999) reported that both GCA and SCA were highly significant in all studied fiber attributes.

Khorgade *et al.* (2000) and Zia *et al* (2001)determined GCA and SCA in seven American cotton genotypes, they indicated that the GCA and SCA were highly significant for ginning percentage, lint index, seed index, micronaire value and upper half means. El-Adl *et al.* (2001) revealed that GCA were highly significant for boll weight and ginning out turn, while SCA were highly significant for yield and staple length. Laxman and Genesh (2003) revealed that SCA variance were higher for boll weight, seed cotton yield, seed and lint index and halo length than GCA. Esmail *et al.* (2005) studied combining ability in some Egyptian cotton genotypes, they found that significant positive GCA effects with regard to seed cotton yield and most of its contributing variables. El-Adly (2008) found highly significant effects for GCA for seed cotton yield/plant, lint yield, lint percentage, seed index and upper half mean, while he found highly significant for SCA for lint percentage, seed index, lint index and upper half mean.

The objective of this investigation is to study the relative magnitude of additive and non-additive genetic variance through evaluation both general and specific combining ability (GCA and SCA) effects for yield and yield components in diallel crosses.

MATERIALS AND METHODS

A half diallel of five cotton cultivars namely, Giza 89, Giza 90, Giza 83, Pima S_4 and Pima S_6 belong to *G. barbadense* L. were evaluated for seed cotton yield and some agronomic characters. In 2007 season, the five parents were grown and all possible crosses according to half diallel mating design were carried out. In 2008 season, the 10 F_1's hybrid seeds were planted in order to obtain the F_2's generation through self-fertilization. The parental varieties were also crossed to obtain additional F_1's hybrid seeds. The F_1's seeds and F_2's seeds were produced at Seds Experimental Station, Agricultural Research Center at Bany Souif governorate. In 2009 season, a randomize complete blocks trial with three replicates was carried out including the five parental varieties and ten F_1's and F_2's populations in Seds Experimental Station. Each plot was two rows 7 m long and 60 cm apart, the space between hills 50 cm. The hills were thinned to one plant/hill. Cultural practices were carried out as usually done in Seds Experimental Farm. Eight characters were studied, i.e.

1. Boll weight (BW), average weight in grams.
2. Seed cotton yield/plant (SCY) in grams.
3. Lint coton yield/plant (LY) in grams.

4. Lint percentage (L%). $L\% = \frac{\text{Lint yield}}{\text{Seed cotton yield}} x100$
5. Seed index (SI) in grams.
6. Length in mm
7. Strength (G/tex)
8. Micronaire reading (Mic)

Estimates of combining ability were carried out according to Griffing's (1956) method 2 model 1 and were analyzed on a plot mean basis to obtain estimates of general and specific combining ability (GCA and SCA) effects and variances. All effects were assumed to be fixed.

Heterosis was expressed for all studied traits as percent increase of the F_1's performance above the mid-parents (M.P.) and better parents (B.P.) values. Inbreeding depression was calculated from comparison between F_1 and F_2 generations.

RESULTS AND DISCUSSION

Analysis of variance:

The analysis of variance for genotypes, general combining ability (GCA) and specific combining ability (SCA) in addition to GCA/SCA ratio are presented in Table 1 for two populations (F_1 and F_2). The results showed that the differences among genotype were significant or highly significant for all traits in both populations (F_1's and F_2's) except for boll weight (B.W.), seed index (S.I.) and micronaire values (Mic) in F_1's and F_2's. Mean squares of GCA and SCA showed that the GCA were highly significant for seed cotton yield (S.C.Y.) and lint yield (L.C.Y.) for the two populations (F_1's and F_2's). The mean squares of SCA were significant or highly significant for seed cotton yield (S.C.Y.), lint yield (L.C.Y.) and the strength G/tex in F_1's and lint yield (L.C.Y.) and strength G/tex in F_2's.

Table 1: Mean squares for genotypes and combining ability (GCA and SCA) in F_1's and F_2's generations for studied traits.

S.O.V.		B.W.	S.C.Y.	L.C.Y.	L.%	S.I.	Length	Strength G/tex	Mic
Genotypes	F_1	0.095	762.811**	142.759**	2.918*	0.447	3.571**	10.517**	0.550
	F_2	0.201	1304.6**	110.831**	2.754**	0.407	2.003	7.544**	0.389
General combining ability (GCA)	F_1	0.059	1017.213**	20.756**	1.514	0.222	1.058	3.057	0.380
	F_2	0.081	286.441**	81.860**	2.089	0.104	0.499	1.780	0.168
Specific combining ability (SCA)	F_1	0.021	313.093**	58.318**	0.756	0.120	1.243	3.685*	0.105
	F_2	0.061	494.251	18.977**	0.916	0.149	0.735	2.809*	0.114
GCA/SCA	F_1	2.810	0.342	0.356	2.003	1.850	0.851	0.830	3.619
	F_2	1.328	0.580	4.314	2.281	0.698	0.679	0.634	1.474

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

GCA/SCA ratio indicated that the GCA was greater than SCA for all studied traits in the two generations except for seed cotton yield (S.C.Y.), lint yield (L.C.Y.), length mm and strength G/tex in F_1's and seed cotton yield (S.C.Y.), seed index (S.I.), length and strength G/tex in F_2's generations. Therefore, it could be concluded that most of the genetic variance for those traits was due to additive and non-additive gene actions. These results are in general agreement with those reported by Rahoumah and El-Shaarawy (1992), Khorgade *et al.* (2000), El-Adl *et al.* (2001), Laxman and Genesh (2003) and Ismail *et al.* (2005).

Combining ability:

General combining ability effects (GCA) of the parents for each trait are presented in Table 2. The results showed that the parent Giza 89 showed significant and positive GCA effects for boll weight (B.W.) and length in F_1's. While, it was highly significant and positive GCA effects for seed index (S.I.) and micronaire values (Mic) in F_1's and for boll weight (B.W.) and micronaire value (Mic) in F_2's. So GCA effects were negative and significant for seed cotton yield (in F_1's and F_2's), lint yield (L.C.Y.), lint percentage (L%) in F_1's, while it was negative and highly significant for lint yield (L.C.Y.) and lint percentage (L%) in F_2's.

Table 2: Parental mean performances and mean estimates of GCA effects of five parents and their F_1's and F_2's generations.

Traits	Generations	P_1 (G89)	P_2 (G90)	P_3 (G83)	P_4 (PS_4)	P_5 (PS_6)	L.S.D.		$\hat{g}_i$	$\hat{g}_i - \hat{g}_{ij}$
							1%	5%		
B.W.	$\bar{X}$	3.1	3.1	2.8	2.7	2.7				
	F_1	0.089*	0.98**	-0.007	-0.088*	-0.092**	0.091	0.067	0.033	0.420
	F_2	0.101**	0.101**	-0.142*	0.015	-0.075*	0.099	0.073	0.036	0.458
S.C.Y.	$\bar{X}$	135.5	155.6	177.3	161.7	169.6				
	F_1	-6.043*	-0.905	4.557	0.805	1.586	7.245	5.370	2.622	33.511
	F_2	-10.446*	1.778	6.135	-1.031	3.564	13.721	10.170	4.966	63.465
L.C.Y.	$\bar{X}$	48.5	61.9	65.5	61.2	63.8				
	F_1	-2.777*	1.099	1.704	-0.149	0.123	2.880	2.134	1.042	13.319
	F_2	-5.307**	0.489	2.827*	-1.054	3.046*	3.068	2.274	1.110	14.192
L.%	$\bar{X}$	35.8	39.8	36.9	37.8	37.6				
	F_1	-0.351*	0.815**	-0.099	-0.166	-0.199	0.446	0.331	0.162	2.064
	F_2	-0.683**	0.731**	0.155	-0.373*	0.170	0.416	0.308	0.151	1.924
S.I.	$\bar{X}$	9.8	9.9	9.3	9.5	9.0				
	F_1	0.254**	0.088	-0.089	-0.041	-0.212**	0.169	0.125	0.061	0.782
	F_2	-0.010	0.205**	-0.062	-0.019	-0.114	0.178	0.132	0.065	0.118
Length	$\bar{X}$	31.0	31.0	30.8	31.0	31.7				
	F_1	0.520*	-0.318	-0.309	0.310	-0.204	0.536	0.398	0.194	2.481
	F_2	0.036	-0.297	-0.083	-0.083	0.427	0.602	0.446	0.218	2.782
Strength G/tesx	$\bar{X}$	33.6	37.6	38.8	37.6	35.9				
	F_1	-0.970	-0.265	0.478	0.711	0.045	1.485	1.100	0.537	6.867
	F_2	-0.631	-0.408	0.583	0.292	0.164	1.315	0.975	0.476	13.519
Mic	$\bar{X}$	4.1	4.1	3.3	3.1	4.2				
	F_1	0.293**	0.155*	-0.164**	-0.283**	-0.002	0.164	0.122	0.059	0.759
	F_2	0.176**	0.062	-0.071	-0.229**	0.062	0.156	0.115	0.056	0.721

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

Meanwhile, the parent Giza 90 showed significant, highly significant and positive GCA effects for boll weight (B.W.), lint percentage (L.%) in both generations, seed index (S.I.) in F_2's and micronaire value in F_1's. Parent Giza 83 showed insignificant GCA effects for all traits in both generations except for boll weight (B.W.) which showed highly significant negative GCA in

F_2's, lint yield (L.C.Y.) which showed significant positive GCA in F_2's and micronaire values which showed significant negative GCA in F_1's. Meanwhile, parent Pima S_4 (Ps_4) showed insignificant GCA effects for all traits except boll weight (B.W.) which showed significant negative GCA in F_1's, lint percentage (L.%) which showed significant negative GCA in F_2's and micronaire values which showed highly significant negative GCA in both generations. Parent Pima S_6 (PS_6) showed insignificant GCA effects for all traits except boll weight (BW) which showed highly significant and significant negative GCA in F_1's and F_2's, lint yield (L.C.Y.) which showed significant positive GCA in F_2's and seed index (S.I.) which showed highly significant negative GCA in F_1's.

It is worth noting that, estimates of GCA effects either positive or negative would indicate that a given parent is much better or much poor than the average of the group involved in the diallel system.

Table 3 showed the SCA effects for each of the ten combinations crosses. From those results, it could be noticed that the cross (P_1 x P_2) showed insignificant SCA effect for all traits except boll weight (B.W.) which showed highly significant negative SCA in both generations and seed index (S.I.) which showed highly significant negative in F_1's generation. The cross (P_1 x P_3) showed highly positive SCA for seed cotton yield (S.C.Y.) in F_1's, lint yield (L.C.Y.) in both generations, lint percentage in F_1's, seed index (S.I.) in F_1's, length in F_1's and strength g/tex in F_1's generation, while it showed highly significant negagive SCA effects for boll weight (BW) in F_2's generation. Meanwhile, the crosses (P_1 x P_4) and (P_1 x P_5) showed highly significant positive SCA effects for most of studied traits. While, it showed highly significant negative SCA effects for boll weight (B.W.) in F_1's, seed cotton yield (S.C.Y.) in F_2's, lint yield (L.C.Y.) in F_2's and seed index in F_2's generation. On the other hand, showed significant negative SCA effects for boll weight (BW) in F_1's generation while it showed significant positive SCA effect for strength g/tex in F_2's generation meanwhile, it showed highly significant positive SCA effect for boll weight (B.W.) in F_2's, seed cotton yield (S.C.Y.) in F_1's, lint yield (L.C.Y.) in F_1's, lint percentage (L%) in F_1's and seed index (S.I.) in F_2's generation. The cross (P_2 x P_3) showed highly significant negative SCA effect for boll weight (B.W.) and span length at 2.5% (2.5%S.L.) in F_1's, while, it showed significant negative SCA for seed cotton yield in F_2's. Meanwhile, it showed highly significant positive SCA for seed cotton yield (SCY) in F_1's, lint yield (L.C.Y.) in F_1's, seed index (SI) in F_2's and micronaire (M.C.) value in F_1's generation.

The cross (P_2 x P_4) showed significant and highly significant positive SCA for boll weight (BW) in both generations, seed cotton yield (S.C.Y.) in F_1's, lint yield (L.C.Y.) in F_1's and length at 2.5% in F_1's generation, meanwhile, it showed highly significant negative SCA for lint yield (L.C.Y.) in F_2's, lint percentage (L%) in F_2's and strength G/tex in F_2's generation. The cross (P_2 x P_5) exhibited highly significant positive SCA effects for lint yield in F_2's and seed cotton yield in F_1's generation, meanwhile, it showed significant and highly significant negative SCA effects for lint percentage in both generations and micronaire value in F_1's generation.

The cross (P_3 x P_4) showed highly significant positive SCA effects in both generations for boll weight (B.W.), while, it showed highly significant positive SCA for seed cotton yield (S.C.Y.), lint yield (L.C.Y.) and length in F_1's generation, meanwhile, it showed highly significant negative SCA in F_2's generation for lint yield (L.C.Y.), lint percentage (L.%) and strength G/tex. The results showed that the cross (P3 x P_5) was significant and highly significant negative SCA effects for most of studied traits in F_2's and length in F_1's generation. The cross (P_4 x P_5) showed highly significant negative SCA for some of studied traits in F_1's generation, meanwhile, it showed highly significant positive SCA effects for seed index in F_2's and the strength G/tex in F_1's.

The cross which showed significant positive SCA effects could be considered promising crosses for improving these traits.

Heterosis and inbreeding depression:

Table 4 revealed mid-parents and better parent heterotic effects for the characters studied. Concerning the cross (P_1 x P_2), negative significant and highly significant heterotic effects relative to mid-parents were found for boll weight (B.W.) and seed index (SI), while it was positive significant and highly significant for seed cotton yield (S.C.Y.), lint yield (L.C.Y.) and length. Meanwhile, heterosis effects to better parent were negative and significant for B.W., L.% and SI. Regarding the cross (P_1 x P_3) positive significant and highly significant heterotic effects relative to mid-parents were found for S.C.Y., L.C.Y., L.% and length and better parents for L.% and length. The cross (P_1 x P_4) showed negative significant and highly significant heterotic effects relative to mid-parent and better parent for boll weight (B.W.), while it showed positive significant and highly significant relative to mid-parent for S.C.Y., S.I., length and micronaire value (Mic). All traits studied in the cross (P_1 x P_5) showed insignificant heterotic effects relative to mid-parents except S.C.Y., L.C.Y.and length which showed positive significant and highly significant. While, heterosis effects to better parent were negative and highly significant for boll weight (B.W.), meanwhile, it showed positive significant for seed cotton yield (S.C.Y.) and lint yield (L.C.Y.) with respect to the cross (P_2 x P_3) (Table 4). Negative significant heterosis effects were detected for BW, while it showed positive significant and highly significant heterosis effects for S.C.Y., L.C.Y.and micronaire value relative to mid-parents, while, it showed negative significant and highly significant for BW and SI. Meanwhile, it showed positive significant for LY relative to better parents. The cross (P_2 x P_4) showed positive and significant for L.C.Y.relative to better parents. The cross (P_2 x P_4) showed positive and significant heterosis effects relative to mid parents for S.C.Y., L.C.Y.and the length, while better parent heterosis effects were positively significant for seed cotton yield and lint yield and negatively significant for lint percentage (L.%). Concerning the cross (P_2 x P_5), insignificant heterotic effects relative to mid and better parents for all traits except lint percentage (L.%) which showed negative and highly significant relative to better parent. The cross (P_3 x P_4) showed insignificant heterotic effects relative to mid and better parents for all traits except length and micronaire value which showed positive and significant heterosis to mid parents. With respect to cross (P_3 x P_5) insignificant heterosis effects were detected for all traits. The cross (P_4 x P_5) showed insignificant heterosis effects relative to mid parents for all traits except SCY which showed positive and significant, while seed index (S.I.) and micronaire value traits revealed negative significant and highly significant heterosis to better parent (Table 4).

Table 4: Heterosis value (%) over both mid parents (M.P.) and better parent (BP) and inbreeding depression (ID) for studied traits.

Crosses	Parame-ters	Characters							
		B.W.	S.C.Y.	L.C.Y.	L.%	S.I.	Length	Strength G/tex	Mic.
P_1 x P_2	H.M.P.	-11.23**	19.70**	20.83**	1.28	-5.08*	5.00*	-3.84	8.87
	H.B.P.	-11.70*	11.95	7.70	-3.85*	-5.72*	4.94	-8.95	8.87
	I.D.	3.571	22.560	18.741*	3.133	-3.226	2.761	-6.122	6.667
P_1 x P_3	H.M.P.	-1.48	22.34**	26.63**	3.68*	3.57	8.44**	4.33	6.65
	H.B.P.	-5.32	7.73	13.39	5.33**	2.39	8.16**	-1.29	-0.81
	I.D.	16.667**	32.304**	14.286*	4.370*	5.000	4.762	3.394	-12.195*
P_1 x P_4	H.M.P.	-9.97*	12.91*	10.74	-1.71	7.20**	8.43**	-5.28	21.82**
	H.B.P.	-15.96**	9.98	7.24	-2.38	5.46*	8.16**	-7.09	8.06
	I.D.	-26.923**	44.407**	27.286	2.981	13.592**	1.190	-8.571	8.889
P_1 x P_5	H.M.P.	-7.19	21.86**	24.27**	2.09	1.83	4.93*	-0.02	11.31
	H.B.P.	-14.89**	14.94*	17.25*	2.04	-1.02	3.05	2.32	0.00
	I.D.	-14.815*	40.585**	23.396**	5.208**	-3.093	0.920	-4.632	4.762
P_2 x P_3	H.M.P.	-9.60*	15.21**	18.79**	0.56	-2.78	-1.24	-8.46	14.41*
	H.B.P.	-13.98**	8.16	15.58*	-3.10	-5.72*	-1.51	-9.80	2.42
	I.D.	-3.704	34.411**	20.608**	1.295	-8.60**	-4.262	-4.286	4.762
P_2 x P_4	H.M.P.	1.56	14.51*	14.69*	0.06	-0.93	5.82	-1.96	5.38
	H.B.P.	-6.45*	16.74*	16.42*	-4.02*	-4.38	5.59	-0.97	-10.48
	I.D.	-13.793	33.210**	25.659**	6.806**	-5.263	5.810*	9.920	-5.405
P_2 x P5	H.M.P.	0.89	7.74	6.30	-1.40	3.27	-1.34	-7.58	4.98
	H.B.P.	-8.60	5.50	5.18	5.78**	-1.68	-3.05	-7.97	-7.94
	I.D.	-3.571	23.197**	-2.086	0.000	2.062	-6.189	-6.358	-2.564
P_3 x P_4	H.M.P.	-1.22	7.09	7.47	0.36	-1.60	4.96	-6.98	17.71*
	H.B.P.	-3.57	2.39	3.97	-0.88	-2.46	4.74	-8.34	15.31
	I.D.	3.704	26.171	9.838	2.667	-5.435	1.852	-6.197	-10.526
P_3 x P_5	H.M.P.	-0.41	-3.15	-4.32	-1.19	0.00	-2.43	-.67	4.72
	H.B.P.	-3.57	-7.39	-7.23	-1.60	-0.36	-4.00	-8.94	-11.90
	I.D.	3.704	25.518	0.329	-3.514*	0.00	-8.882*	-4.249	-10.811
P_4 x P_5	H.M.P.	-6.25	11.78*	9.58	-1.99	-4.50	3.03	9.39	-10.00
	H.B.P.	-6.25	9.20	7.37	-2.29	-6.69*	1.89	6.82	-21.43**
	I.D.	-8.00	28.024*	6.131	0.811	-13.636	-.929	3.483	-18.182*

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

Inbreeding depression (ID%) effects were calculated for each cross. The cross (P_1 x P_2) showed insignificant inbreeding depression for characters studied except lint yield (L.C.Y.) which showed positive significant inbreeding depression. Regarding the cross (P_1 x P_3) positive significant and highly significant inbreeding depression effects were found for boll weight (B.W), seed cotton yield (S.C.Y.), lint yield (L.C.Y.) and lint percentage (L.%) while it showed negative and significant inbreeding depression for micronaire value (Mic). Cross (P_1 x P_4) showed positive highly significant inbreeding depression for S.C.Y. and S.I., while it showed negative and highly significant for BW. With respect to the cross (P_1 x P_5) insignificant inbreeding depression for SI, length, strength G/tex and Mic, while B.W. recorded negative significant inbreeding depression effect and S.C.Y., L.C.Y. and L.% showed positive highly significant inbreeding depression. In cross (P_2 x P_3) showed positive highly significant inbreeding depression for SCY and LY, while, it showed negative highly significant inbreeding depression for seed index (SI). In cross (P_2 x P_4) we showed positive significant and highly significant inbreeding depression for seed cotton yield (S.C.Y.), lint yield (L.C.Y.), lint percentage (L.%) and length. With respect to the cross (P_2 x P_5) (Table 4). Insignificant inbreeding depression (ID%) effects for all traits except S.C.Y. which showed positive and highly significant and length which showed negative significant inbreeding depression. Insignificant inbreeding depression showed in cross (P_3 x P_4) for all characters except S.C.Y. which showed positive significant inbreeding depression. Cross (P_3 x P_5) showed insignificant inbreeding depression for all characters except lint percentage (L.%) and length which showed negative significant and highly significant inbreeding depression. Concerning the cross (P_4 x P_5), insignificant inbreeding depression effects relative to all traits except S.C.Y. which showed positive significant inbreeding depression while SI and Mic showed negative significant and high significant inbreeding depression. The above results indicated that insignificant ID% may be due to the presence of linkage between genes in these materials. In general, the present investigation revealed that not only additive but also non-additive genetic variances were important in the inheritance of yield and yield components characters in cotton breeding programs. Therefore, its could be concluded that recurrent selection program is a proper for improvement these traits with respect to the studied characters.

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التحليل الوراثي للجيل الأول والجيل الثاني في بعض هجن القطن المصري

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خمسة أصناف من القطن تابعة للنوع جوسيبيم باربادنس استخدمت في هذه الدراسة وهي الأصناف جيزة 89 , جيزة 90, جيزة 83, بيما س4 و بيما س6 تم انتخابها وإدخالها في التهجين نصف الدائري وتم الحصول علي الجيل الثاني وزراعته والجيل الأول وذلك لتقدير القدرة العامة والخاصة علي التالف وكذلك درجة التوريث بالمدى الواسع والضيق إلي جانب معامل التربية الداخلية وذلك لصفات وزن اللوزة و محصول القطن الزهر جم/نبات , محصول القطن الشعر جم/نبات , تصافي الحليج , معامل البذرة , طول التيلة بالمليمتر , المتانة بالجرام تكس وكذلك النعومة بالميكرونير . أظهرت النتائج لقياسات القدرة العامة علي التالف وجود اختلافات معنوية لصفات محصول القطن الزهر ومحصول القطن الشعر وطول التيلة في كلا الجيلين وكذلك أيضا لمتانة التيلة وأظهرت قيمة GCA/SCA ان التباين الإضافي كان له السبق والتحكم في توريث صفات وزن اللوزة , تصافي الحليج , معامل البذرة و النعومة في الجيل الأول ولصفات وزن اللوزة , محصول القطن الشعر , تصافي الحليج والنعومة في الجيل الثاني .

بالنسبة لتقدير قوة الهجين علي أساس متوسط الآباء كانت معنوية وموجبة للهجين جـ89 x جـ90 لصفات محصول القطن الزهر والشعر والهجين جـ89 x جـ83 لصفات محصول القطن الزهر والشعر وتصافي الحليج و الهجين جـ89 x بيما س4 لصفات محصول القطن الزهر ومعامل البذرة وطول التيلة والهجين جـ89 x بيما س6 لصفات محصول القطن الزهر والشعر وطول التيلة والهجين جـ90 x جـ83 لصفات محصول القطن الزهر والشعر والنعومة , محصول الزهر والشعر وطول التيلة للهجين جـ90 x بيما س4 , وطول التيلة والنعومة للهجين جـ83 x بيما س4 والهجين بيما س4 x بيما س6 لصفات محصول القطن الزهر . علي الجانب الآخر بالنسبة لقوة الهجين علي أساس الأب الأفضل أظهرت النتائج وجود اختلافات عالية المعنوية وموجبة للهجن جـ89 x جـ83 لصفة تصافي الحليج ,وصفات معامل البذرة والطول للهجين جـ89 x بيما س4 , محصول القطن الزهر والشعر للهجينين جـ89 x بيما س6 و جـ90 x جـ83 و جـ90 x بيما س4 علي الجانب الآخر هناك بعض الهجن التي أظهرت قوة هجين منخفضة .

بالنسبة لمعامل التربية الداخلية كان معنويا وموجبا لصفة محصول القطن الشعر للهجين (P_1 x P_2) ولصفة وزن اللوزة ومحصول القطن الزهر للهجين (P_1x P_3) ومحصول القطن الزهر ومعامل البذرة للهجين (P_1 x P_4) ومحصول القطن الزهر والشعر وتصافي الحليج للهجين (P_1x P_5) و (P_2xP_4) إلي جانب أن معامل التربية الداخلية كان معنويا وسالب لبعض الهجن تحت الدراسة

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Table 3: Estimates of specific combining ability effects (S_{ij}) for studied traits.

Traits	Generation	P_1 x P_2	P_1 x P_3	P_1 x P_4	P_1 x P_5	P_2 x P_3	P_2 x P_4	P_2 x P_5	P_3 x P_4	P_3 x P_5	P_4 x P_5	LSD		S_{ij}	S_{ii} - S_{ij}
												1%	5%		
B.W.	F_1	-0.200**	0.105	-0.148**	-0.110*	-0.205**	0.110*	0.048	0.110**	0.019	-0.100	0.143	0.106	0.052	0.090
	F_2	-0.373**	-0.297**	0.346**	0.203**	0.003	0.313**	0.003	0.313**	-0.021	-0.078	0.156	0.116	0.057	0.098
S.C.Y.	F_1	5.948	17.286**	7.905	24.157**	12.914**	13.700**	3.019	13.700**	-17.143**	7.576	11.455	8.491	4.146	7.181
	F_2	6.425	-3.532	-26.765**	-14.494	-19.289*	-11.789	-5.084	-11.789	-24.575**	-6.375	21.694	16.080	7.852	13.600
L.C .Y	F_1	2.094	9.022**	2.275	11.137**	6.579**	4.865**	-0.440	4.865**	-7.378**	2.208	4.553	3.375	1.648	2.854
	F_2	-0.484	6.578**	-5.375**	0.059	-2.651	-5.337**	5.497**	-5.337**	-4.808*	2.840	4.851	3.596	1.756	3.041
L.%	F_1	0.065	1.579**	-0.287	1.179**	0.113	-0.187	-0.854**	-0.187	-0.440	-0.406	0.706	0.523	0.255	0.442
	F_2	-0.051	0.092	-0.313	-0.222	0.111	-1.894**	-0.570*	-1.894**	0.806**	-0.265	0.658	0.488	0.238	0.412
S.I.	F_1	-0.517//	0.325**	0.578**	0.116	-0.175	-0.089	0.349**	-0.089	0.059	-0.422**	0.267	0.198	0.097	0.168
	F_2	-0.162	-0.062	-0.671**	0.524**	0.396**	0.181	-0.190	0.181	-0.157	0.500**	0.282	0.209	0.152	0.177
Length	F_1	0.571	1.562**	0.943**	0.524	-0.633*	0.948**	-0.571	0.948**	-0.881**	0.367	0.848	0.629	0.307	0.532
	F_2	0.125	0.211	1.444**	-0.032	0.344	-0.656	0.668	-0.656	0.954**	0.454	0.951	0.705	0.344	0.596
Strength G/tex	F_1	-0.875	2.383**	-1.151	1.249	-1.622	0.444	-1.522	0.444	-1.598	3.068**	2.347	1.740	0.850	1.471
	F_2	0.508	0.117	1.441	1.937*	-0.606	-3.149**	0.146	-3.149**	-0.844	1.479	2.079	1.541	0.752	1.303
Mic	F_1	0.138	0.057	0.543**	-0.005	0.329**	-0.086	-0.200*	-0.086	-0.048	-0.329**	0.259	0.192	0.094	0.163
	F_2	0.125	0.211	1.444**	-0.032	0.344	-0.656	0.668	-0.656	0.954**	0.454	0.951	0.705	0.344	0.596

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