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GENETIC ANALYSIS OF YIELD AND ITS COMPONENTS IN INTRA-SPECIFIC COTTON CROSSES

Abdel-Zaher, G.H.[1], T.M. EL-Ameen[1], A.F. Lasheen[1] and S.Sh. Abduallah[2]

1- Cotton Research Institute, Agricultural Research Centre, Giza
2- Faculty of Agriculture in Sohag, South Valley University.

ABSTRACT

This study was carried out during three successive seasons, 2000, 2001 and 2002 at the Experimental Farm of Faculty of Agriculture in Sohag, South Valley University. The main objective of this study was to estimate heterosis, inbreeding depression, potence ratio, type of gene action, genetic advance under selection and heritability in broad and narrow senses for yield and some yield components in two intra-specific cotton crosses between three varieties belong is to (*G. barbadense*). Cross 1 was (Giza 80 x Giza 89) and Cross 2 was (Giza 83 x Giza 80). The six populations, P_1, P_2, F_1, F_2, Bc_1 and Bc_2 were grown in 2002 season. Data were recorded on seed cotton yield/plant, lint yield/plant, no. of bolls/plant, boll weight, lint percentage, seed index and lint index. The results indicated highly significant and negative heterosis relative to mid and better parents for boll weight, seed index and lint index in the second cross, and positive and highly significant heterosis over mid-parents for the same traits in cross 1. Highly significant negative heterosis relative to better parent for boll weight and lint index, but was highly significant positive for seed index in cross 1. Significant inbreeding depression was found for lint index in both crosses and seed index in cross 1 and significant inbreeding gain for no. of bolls/plant in cross 1 and boll weight and seed index in cross 2. Overdominance was found for seed cotton yield/plant in both crosses, seed index in cross 1, and no. of bolls/plant and boll weight in cross 2. While, partial dominance was obtained for the remaining characters. The role of non allelic interaction was recorded in governing most studied characters in the two crosses. The additive gene effects were significant and positive or negative for all studied characters except for seed cotton yield/plant in both crosses, lint yield/plant and no. of bolls/plant in cross 2 and seed index in cross 1. The dominance gene effects were important in the inheritance boll weight and seed index in both crosses, and were relatively high in magnitude compared with the additive effects in all characters. The additive x additive interaction effects were significantly negative for boll weight, seed cotton yield/plant and seed index in cross 1. Most of studied characters were significantly affected by one or two types of epistatic effects (j and l), in both crosses except seed cotton yield/plant and lint yield/plant in both crosses, and no. of bolls/plant in cross 1. The estimates of heritability in broad sense were larger than their corresponding in narrow sense for all traits in both crosses. Maximum predicted genetic advance as percent of F_2 mean ($\Delta g\%$) were achieved for no. of bolls/plant in both crosses and seed cotton yield/plant and lint yield/plant in cross 2.

Key words: ***Heterosis, Inbreeding depression, Potence ratio, Type of gene action, Heritability, Intra-specific, Gossypium barbadense, Yield and yield components.***

كـــان الفعـــل الوراثى المضيف معنوى موجب أو سالب لكل الصفات ما عدا محصول القطن الزهـــر / نـــبات لكلا الهجينين ومحصول الشعر / نبات وعدد اللوز / نبات فى الهجين الثانى ومعامل البذرة فى الهجين الأول .

كـــان الفعل الوراثى السيادى له أهمية كبرى فى وراثة صفة وزن اللوزة ومعامل البذرة لكلا الهجينين مقارنة بالفعل المضيف فى كل الصفات .

وجـــد أن التبايـــن الراجع الى التفاعل بين العوامل المضيفة (الاضافة × الاضافة) معنوى سالب لصفة وزن اللوزة ومحصول القطن الزهر / نبات ومعامل البذرة فى الهجين الأول.

أظهرت معظم الصفات المدروسة تأثيراً معنوياً وذلك نتيجة احد أو أثنين من طرز فعل الجين (I أو j) لكـــلا الهجينيـــن ما عدا صفتى محصول القطن الزهر / نبات ومحصول الشعر / نبات فى كلا الهجينين وعدد اللوز / نبات فى الهجين الأول .

كانـــت درجـــة التوريـــث العامة مرتفعة بالمقارنة بدرجة التوريث الخاصة لكل الصفات لكلا الهجينين .

كان التحسين الوراثى المتوقع للانتخاب مرتفع بالنسبة لمتوسط الجيل الثانى لصفة عدد اللوز / نبات فى كلا الهجينين وصفة محصول القطن الزهر / نبات ومحصول الشعر / نبات للهجين الثانى .

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Key words: *Heterosis, Inbreeding depression, Potence ratio, Type of gene action, Heritability, Intra-specific, Gossypium barbadense, Yield and yield components.*

INTRODUCTION

The goal of most cotton breeding programs is directed mainly towards higher yielding and improved fiber properties of commercial cotton cultivars.

Since yield is known to be a complex trait highly affected by environmental conditions thus, direct selection for yield is not expected to be effective. Therefore, the breeder avoids selection for yield and prefers to select for its components individually. The value of genotype is not an inherent absolute quality of the genotype but depends on the range of environments over which it has been tested. So, the estimates of genotypic variance would depend on the environment under which the material will be tested. Kassam *et al* (1981b), in two interspecific cotton crosses (Ashmouni x Cocker 100 W) and (Dendera x Cocker 100 W) and found significant heterosis and inbreeding depression values for lint percent and boll weight. Narrow sense heritability of relatively high values were obtained for lint percent while low values were found for seed index. Lint percentage was mainly controlled by additive and dominance gene effects, while boll weight showed the presence of additive, dominance and additive x additive gene effects. El-Kilany and Al-Mazar (1985b) in a crosses between Delta Pine 70 x Dendera, McNair 220 x Dendera, and Mcnair 220 x Giza 45, they found a negative and highly significant heterotic effects for boll weight and lint percentage, whereas lint index exhibited of positive heterosis. Inbreeding depression was significant negative in all traits under study. Also, all type of epistasis were highly significant in the McNair 220 x Dendera cross, while same type of gene effects were involved in the inheritance of such traits in the other two crosses. Rahoumah *et al* (1989) studied the inheritance of economic yield components cotton characters of an inter-specific cross between *G. barbadense* and *G. hirsutum* (Giza 45 x Russian variety 108-F), and obtained highly significant negative heterosis for lint percent and seed index. Overdominance and partial dominance controlled both characters, respectively in interspecific hybrid *G. barbadense* x *G. hirsutum*. Hassan and Awaad (1997) studied a half diallel analysis of crosses among eight genotypes and they reported that additive and dominance gene effects were significant for boll weight in F_1 and F_2 generations, while for seed index in F_1 hybrids. The magnitude of dominance gene effect was larger than those the additive one. Moderate to high heritability estimates in narrow sense were detected for the previous characters.

This investigation was conducted to estimate heterosis, inbreeding depression, potence ratio, genetic advance, gene action, heritability in broad and narrow sense and partitioning of the genetic variance for yield and yield components in the two intra-specific crosses between three varieties Giza 83, Giza 80 and Giza 89 (Giza 80 x Giza 89) and (Giza 83 x Giza 80) (*Gossypium barbadense* L.). The three varieties were the long staple and the two varieties were grown in south Egypt.

MATERIALS AND METHODS

This investigation was carried out at the Experimental Farm of Sohag Faculty of Agriculture, South Valley University, during three successive summer seasons of 2000, 2001 and 2002, using three cotton cultivars; Giza 80, Giza 89 and Giza 83 (*Gossypium barbadense* L.).

In 2000 growing season, the parental cultivars were crossed as follows, cross 1 (Giza 80 x Giza 89) and cross 2 (Giza 83 x Giza 80) to produce the F_1 hybrid seeds. In 2001 seeds of parents and (F_1's) were sown and the F_1 hybrid plants from each cross were self-pollinated to produce F_2 population seeds and each F_1 hybrid was crossed to both parents to produce Bc_1 (F_1xP_1) and Bc_2 (F_1xP_2). Self-pollination was also made for the parents to get parents' selfed seeds. Moreover, the parents were re-crossed to produce more F_1 hybrid seeds.

In 2002 the parents, F_1, F_2 hybrids and backcrosses to both parents were planted in a complete randomized block design with three replications. Each replicate included two rows of each of the F_1, Bc_1, Bc_2 and the parents, in addition to eight rows of F_2 population. Rows 5 meter long and 65 cm apart. Seed were planted in hills spaced 50 cm apart with in row. Plants were thinned to one plant per hill. All cultural practices were carried out as usual for the ordinary cotton fields.

The following characters were recorded on an individual plant basis of the six population for each cross:

1 - Seed cotton yield per plant in grams (S.C.Y./P.).

2 - Lint yield per plant in grams (L.Y./P.).

3 - Number of bolls per plant (no. B./P.).

4 - Boll weight in grams (B.W.).

5 - Lint percentage (L.p.), the ratio of lint cotton to seed cotton expressed as percentage.

6 - Seed index (S.I.), estimated as weight of 100 seeds taken at random from each single plant in grams.

7 - Lint index (L.I.) in grams, mean lint index was determined by the following formula:

Lint index = [seed index x lint percentage]/[100-lint percentage].

Data were analyzed according to the procedures and methods outlined by Warner (1952) and Miller *et al* (1958). Partitioning of the genetic variance D, H and E were calculated according to the procedure outlined by Mather and Jinks (1971).

Individual joint scaling test was applied to the six population data of each cross as outlined by Mather (1949). The three parameters A, B and C as well as their variance were calculated.

Estimations of the types of gene effects were obtained using the relationships given by Jinks and Jones (1958) as follows:

$$m = \tfrac{1}{2}\overline{P}_1 + \tfrac{1}{2}\overline{P}_2 + 4\,\overline{F}_2 - 2\,\overline{Bc}_1 - 2\,\overline{Bc}_2$$

$$d = \tfrac{1}{2}\overline{P}_1 - \tfrac{1}{2}\overline{P}_2$$

$$h = 6\overline{Bc}_1 + 6\,\overline{Bc}_2 - 8\,\overline{F}_2 - \overline{F}_1 - 1.5\,\overline{P}_1 - 1.5\,\overline{P}_2.$$

$$i = 2\overline{Bc}_1 + 2\,\overline{Bc}_2 - 4\,\overline{F}_2.$$

$$j = 2\,\overline{Bc}_1 - \overline{P}_1 - 2\,\overline{Bc}_2 + \overline{P}_2.$$

$$l = \overline{P}_1 + \overline{P}_2 + 2\overline{F}_1 + 4\,\overline{F}_2 - 4\,\overline{Bc}_1 - 4\,\overline{Bc}_2$$

where:

m = the constant mean.

d = pooled additive effects.

h = pooled dominance effects.

i = pooled interaction between additive and additive effects.

j = pooled interaction between additive and dominance effects.

l = pooled interaction between dominance and dominance effects.

The standard errors of these estimates can be obtained in the usual way for examples:

$$V[d] = \tfrac{1}{4}\,VP_1 + \tfrac{1}{4}\,VP_2.$$

$S.E. [d] \text{ or } Sd = \sqrt{V[d]}$

and the significance of [d] can be tested by:

$t = d/S.E. [d].$

RESULTS AND DISCUSSION

The analysis of variance of the six populations in the two intra-specific crosses for yield and yield components showed significant differences for the traits studied except seed index and lint index in cross 1 and seed cotton yield/plant and lint percentage in cross 2 (Table 1).

Table (2) shows the performance of the six populations for seven characters under study in the two crosses. The results indicated that the performance of P_1 in cross 1 and Bc_2 and P_2 in cross 2 were higher than P_2 and Bc_1, respectively, for most studied characters, while in first cross F_2 surpassed F_1 for seed cotton yield/plant, lint yield/plant and no. of bolls/plant. Similar results were obtained by Abdel-Zaher (1999) and El-Disouqi and Ziena (2001).

Data in Table (3) illustrated heterosis, inbreeding depression and potence ratio in the two crosses. Highly significant and negative heterosis relative mid and better parent were obtained for boll weight, seed index and lint index in the second cross, while positive and highly significant heterosis over the mid-parent were found for the same traits in cross 1. Highly significant negative heterosis relative to better parent were obtained for boll weight and lint index, but was highly significant positive for seed index in cross 1. These results are in agreement with those obtained by El-Kilany and El-Okkia (1981), Allam (1992) and Eissa (1996). El-Okkia *et al* (1989) found that the heterosis relative to mid-parent was significant and positive for seed cotton yield/plant, lint yield/plant and lint index and significant negative for seed index and lint percentage, while showed significant negative heterosis relative to better parent for lint yield, lint percentage and lint index. El-Disouqi *et al* (2000) showed significant negative heterosis relative the better parent for lint percentage and lint index. Significant positive heterosis relative to the better parent, indicating that increasing

Table 1. Mean square of the yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Cross	Source of Variation	Degree of freedom	Mean squares						
			S.C.Y./p.	L.Y./p.	No. B./p.	B.W.	L.p.	S.I.	L.I
Cross 1	Replicates	2	63.480	8.177	8.094	0.006	0.148	0.034	0.0002
G. 80 x	Generations	5	124.186*	20.232*	42.571*	0.054*	1.535**	0.166	0.204
G. 89	Error	10	24.804	3.776	8.090	0.008	0.125	0.062	0.047
Cross 2	Replicates	2	14.613	1.790	2.483	0.0004	0.047	0.008	0.014
G. 83 x	Generations	5	33.629	8.711**	6.677*	0.030**	2.835	0.321**	0.333**
G. 80	Error	10	7.202	0.815	1.260	0.003	0.113	0.016	0.019

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

Table 2. Means of P_1, P_2, F_1, F_2, Bc_1 and Bc_2 and standard error for yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Characters / Generations		$\bar{P}_1$	$\overline{Bc}_1$	$\bar{F}_1$	$\bar{F}_2$	$\overline{Bc}_2$	$\bar{P}_2$
Seed cotton yield per plant (gm)	C_1	99.55±1.86	101.50±3.49	90.47±2.27	109.16±2.38	103.50±2.72	95.82±2.88
	C_2	100.07±2.27	96.07±2.97	100.60±2.62	98.53±2.26	101.11±2.60	99.55±1.86
Lint yield per plant (gm)	C_1	40.05±0.76	39.53±1.43	35.34±0.96	42.19±0.96	40.57±1.11	36.49±1.12
	C_2	38.73±0.86	35.36±1.38	39.65±1.01	37.40±0.89	38.03±0.95	40.05±0.76
No. of bolls per plant	C_1	40.00±0.70	45.91±1.42	39.00±0.69	47.64±1.04	47.00±1.07	46.13±1.21
	C_2	42.02±0.82	42.04±1.24	43.96±0.92	42.49±0.84	44.04±0.90	40.00±0.70
Boll weight (gm)	C_1	2.50±0.03	2.21±0.04	2.32±0.03	2.31±0.03	2.21±0.04	2.10±0.03
	C_2	2.39±0.04	2.20±0.05	2.29±0.04	2.32±0.03	2.30±0.001	2.50±0.03
Lint percentage (%)	C_1	40.27±0.24	38.89±0.30	39.00±0.21	38.72±0.21	39.11±0.22	38.08±0.20
	C_2	38.75±0.20	38.42±0.23	39.44±0.20	37.93±0.19	37.68±0.28	40.27±0.24
Seed index (gm)	C_1	10.00±0.08	9.69±0.15	10.30±0.10	10.04±0.11	9.68±0.14	9.89±0.16
	C_2	9.61±0.12	10.46±0.13	9.62±0.0003	9.88±0.09	9.69±0.10	10.00±0.08
Lint index (gm)	C_1	6.76±0.09	6.18±0.14	6.59±0.09	6.37±0.10	6.22±0.11	6.09±0.11
	C_2	6.08±0.10	6.54±0.09	6.26±0.08	6.06±0.07	5.88±0.10	6.76±0.09

Table 3. Heterosis, inbreeding depression and potence ratio for yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Estimates	H.M.P.		H.B.P.		I.D.		P.R.	
Characters	Cross 1	Cross 2	Cross 1	Cross 2	Cross 1	Cross 2	Cross 1	Cross 2
Seed cotton yield per plant (gm)	-7.39±19.08	0.79±20.15	-9.13±19.67	0.53±23.27	-20.66	2.06	-1.930	1.534
Lint yield per plant (gm)	-7.65±7.86	0.66±7.80	-11.75±8.19	-1.00±8.49	-19.37	5.68	-0.822	0.197
No. of bolls per plant	-9.44±6.61	7.18±7.14	-15.46±9.38	4.60±8.26	-22.17*	3.34	-0.663	1.456
Boll weight (gm)	0.77±0.27**	-6.36±0.29**	-7.29±0.30**	-8.44±0.31**	0.43	-1.21**	0.045	-1.400
Lint percentage (%)	-0.44±1.75	-0.19±1.70	-3.15±2.13	-2.07±2.09	0.74	3.83	0.079	-0.049
Seed index (gm)	3.59±0.92**	-1.91±0.90*	3.00±0.88**	-3.84±0.94**	2.50*	-2.68*	3.148	-0.477
Lint index (gm)	2.61±0.77**	-2.46±0.71**	-2.45±0.85**	-7.31±0.81**	3.32**	3.25**	0.251	-0.235

where:

H.M.P. = Heterosis relative to the mid-parent.
H.B.P. = Heterosis relative to the better parent.
I.D. = Inbreeding depression
P.R. = Potence ratio.

alleles were more frequent than decreasing ones, and significant negative heterosis, indicating that decreasing alleles were more frequent.

Significant in inbreeding depression for lint index in both crosses and seed index in cross 1, indicating the accumulation of additive gene effects which in turn increased the mean expression of these characters. While, it was inbreeding gain for no. of bolls/plant in cross 1, and boll weight and seed index in cross 2. This finding suggested that the genes which controlled these characters were not completely segregating. Similar findings were recorded by Rady and Gomaa (1983) and Ismail *et al* (1991). Abdel-Zaher (1999) estimated inbreeding depression in two intra-specific cotton crosses i.e. 1. Giza 80 x C.B. 58 and 2. Giza 83 x C.B. 58, and show insignificant for all yield and yield components except for boll weight and lint index which showed positive and highly significant in the two crosses. While, it was positive and highly significant for lint percentage in cross 1 and seed index in cross 2.

Potence ratio was more than unity for seed cotton yield/plant in both crosses, seed index in cross 1, and no. of bolls/plant and boll weight in cross 2, indicating over dominance and/or repulsion linkage. In the same time, the remaining characters exhibited positive or negative values of potence ratio, less than unity, indicating partial dominance.

The results of scaling tests A, B and C are given in Table (4). It is worthy to mention that the A, B and C tests were significant for no. of bolls/plant in cross 1, lint percentage and lint index in cross 2, both A and B were significant for lint percentage in cross 1 and boll weight in cross 2, respectively. It is evident that the values of B and C deviated significantly from zero in both seed cotton yield/plant and lint yield/plant in the first cross. These results indicate the importance of non-allelic interaction in governing most studied characters in the two crosses. These results are supported by El-Kilany and Al-Mazar (1985b), Eissa (1996), Hassan and Awaad (1997) and Abdel-Zaher (1999).

Table (5) shows the types of gene action and epistatic effects using generation means for all characters in the two crosses. The constant mean (m) values were highly significant and positive for all studied characters in both crosses.

The additive gene effects (d) were significant and either positive or negative for all studied characters except for seed cotton yield/plant in both crosses, meanwhile, lint yield/plant and no. of bolls/plant in second cross and seed index in the first cross.

Table 4. The results of joint scaling test for the yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Estimates	A		B		C	
Characters	Cross 1	Cross 2	Cross 1	Cross 2	Cross 1	Cross 2
Seed cotton yield per plant (gm)	12.97±7.57	-8.53±6.88	20.72±6.57**	2.08±6.10	60.35±11.09**	-6.70±10.88
Lint yield per plant (gm)	3.67±3.11	-7.65±3.06*	9.32±2.67**	-3.64±2.28	21.53±4.51**	-8.49±4.24*
No. of bolls per plant	12.82±3.00**	-1.89±2.77	8.87±2.55**	4.13±2.10*	26.44±4.61**	0.02±3.97
Boll weight (gm)	0.40±0.10**	-0.27±0.11*	0.00±0.00	-0.19±0.08*	-0.004±0.14	-0.20±0.15
Lint percentage (%)	-1.50±0.69*	-1.35±0.54*	1.13±0.53*	-4.35±0.65**	-1.50±0.98	-6.19±0.90**
Seed index (gm)	-0.92±0.33**	1.70±0.31**	-0.84±0.35*	-0.24±0.25	-0.32±0.50	0.66±0.45
Lint index (gm)	-0.98±0.31**	0.73±0.23**	-0.24±0.26	-1.27±0.23**	-0.54±0.45	-1.13±0.36**

Table 5. Types of gene action for yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Characters	Crosses	m	d	h	i	j	l
Seed cotton yield per plant (gm)	C. 1	124.35±13.11**	1.87±1.71	-26.86±33.14	-26.66±13.00*	-7.75±9.49	-7.02±20.88
	C. 2	99.57±12.11**	0.26±1.47	-5.19±30.25	0.24±12.02	-10.61±8.41	6.22±19.16
Lint yield per plant (gm)	C. 1	46.81±5.34**	1.78±0.68**	-7.02±13.53	-8.54±5.30	-5.64±3.87	-4.44±8.55
	C. 2	42.18±4.91**	-0.66±0.57	-16.62±12.45	-2.80±4.88	-4.02±3.54	14.08±7.92
No. of bolls per plant	C. 1	47.82±5.51**	-3.07±0.70**	8.11±10.74	-4.76±5.47	3.96±3.81	-16.93±8.46
	C. 2	38.79±4.58**	1.01±0.54	9.63±11.54	2.22±4.55	-6.02±3.25*	-4.47±7.31
Boll weight (gm)	C. 1	2.70±0.17**	0.20±0.02**	-1.19±0.42**	-0.40±0.16*	-0.40±0.12**	0.80±0.27**
	C. 2	2.70±0.17**	-0.06±0.02*	-1.13±0.44*	-0.26±0.17	-0.08±0.13	0.72±0.28*
Lint percentage (%)	C. 1	38.04±1.13**	1.09±0.15**	1.74±2.85	1.14±1.12	-2.63±0.82**	-0.78±1.80
	C. 2	39.03±1.06**	-0.76±0.15**	-4.81±2.71	0.48±1.05	3.00±0.80**	5.22±1.73**
Seed index (gm)	C. 1	11.38±0.60**	0.06±0.09	-4.27±1.55**	-1.44±0.60*	-0.08±0.46	3.19±0.98**
	C. 2	9.00±0.49**	-0.20±0.07**	2.88±1.25*	0.80±0.49	1.94±0.36**	-2.26±0.80**
Lint index (gm)	C. 1	7.10±0.53**	0.33±0.07**	-2.42±1.33	-0.68±0.52	-0.75±0.38*	1.90±0.83*
	C. 2	5.83±0.40**	-0.34±0.06**	0.49±1.03	0.59±0.40	2.00±0.30**	-0.06±0.66

The dominance gene effects (h) were important in the inheritance of boll weight and seed index in both crosses, and were relatively high in magnitude compared with the additive effects in all characters. These results indicated that improvement of these characters could be achieved through recurrent selection. The additive x additive interaction effects (i) were significant negative for boll weight, seed cotton yield/plant and seed index in cross 1.

Most of studied characters were significantly affected by one or two type of epistatic effects (j and l), in both crosses except seed cotton yield/plant, lint yield/plant in both crosses, and no. of bolls/plant in cross 1. Similar results were obtained by Abdel-Zaher (1999) and El-Disouqi and Ziena (2001).

The partitioning of the genetic variance in Table (6) indicated that the major part of genetic variance was of the additive type for no. of bolls/plant, boll weight, lint percentage, lint index and lint yield/plant in cross 1, and seed cotton yield/plant and seed index in cross 2. The dominance genetic variance was larger than the additive variance for the remaining traits. Awad *et al* (1986) found additive genetic variance for lint percentage and seed index, while dominance genetic variance was detected for the remaining traits.

Table (7) shows heritability estimates in broad and narrow sense, as well as, excepted genetic advance under selection (Δg) for yield and yield components in the two crosses. The estimates of heritability in broad sense were larger than their corresponding in narrow sense for all traits in both crosses.

Maximum predicted genetic advances as percent of F_2 mean (Δg %) were achieved for no. of bolls/plant in both crosses and seed cotton yield/plant and lint yield/plant in cross 2. Similar results were obtained by El-Adly (1996). Abo-Arab *et al.* (1997) found that the predicted genetic gains relatively high for boll weight, seed cotton yield/plant, lint yield/plant and seed index.

CONCLUSION

In general, it can be concluded that in traits controlled by additive gene effect and high heritability values, the improvement could be achieved by simple selection. On the other hand, the existence of high dominance gene effect would need hybrid programs.

Table 6. Partitioning of genetic variance for yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Estimates	D		H		E	
Characters	Cross 1	Cross 2	Cross 1	Cross 2	Cross 1	Cross 2
Seed cotton yield per plant (gm)	276.60	453.20	470.98	16.72	253.48	232.29
Lint yield per plant (gm)	38.03	31.48	93.87	79.60	41.14	35.15
No. of bolls per plant	106.62	41.33	30.15	50.36	36.60	30.05
Boll weight (gm)	0.04	0.01	0.08	0.09	0.04	0.05
Lint percentage (%)	2.62	0.21	1.77	3.90	2.10	2.03
Seed index (gm)	0.07	0.39	1.35	0.09	0.64	0.50
Lint index (gm)	0.56	0.17	0.50	0.11	0.43	0.35

where:

D = Additive variance **H = Dominance variance** **E = Environmental variance.**

Table 7. Heritability estimates in both broad (h^2b) and narrow (h^2n) sense and expected genetic advance upon selection (Δg) for the yield and yield components in the two intra-specific cotton crosses (Giza 80 x Giza 89) and (Giza 83 x Giza 80).

Estimates	Heritability				Genetic advance			
	Broad sense		Narrow sense		Δg		Δg %	
Characters	Cross 1	Cross 2	Cross 1	Cross 2	Cross 1	Cross 2	Cross 1	Cross 2
Seed cotton yield per plant (gm)	50.25	49.84	27.14	48.93	12.62	36.57	11.56	37.12
Lint yield per plant (gm)	50.80	50.35	22.74	22.24	4.28	15.55	10.15	41.58
No. of bolls per plant	62.44	52.53	54.71	32.64	11.13	13.59	23.35	31.98
Boll weight (gm)	48.69	35.72	24.39	8.45	0.44	0.05	19.28	2.19
Lint percentage (%)	45.47	34.73	34.02	3.34	1.38	0.12	3.56	0.32
Seed index (gm)	36.56	30.34	3.30	27.30	0.06	-0.68	0.63	-6.92
Lint index (gm)	48.63	24.42	33.71	18.59	1.14	-0.63	17.84	-10.43

Our results show that epistatic variation plays major role in the inheritance of cotton quantitative traits which lead to hybrid program following by selections which will start in the next segregating generations.

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كـــان الفعـــل الوراثى المضيف معنوى موجب أو سالب لكل الصفات ما عدا محصول القطن الزهـــر / نـــبات لكلا الهجينين ومحصول الشعر / نبات وعدد اللوز / نبات فى الهجين الثانى ومعامل البذرة فى الهجين الأول .

كـــان الفعل الوراثى السيادى له أهمية كبرى فى وراثة صفة وزن اللوزة ومعامل البذرة لكلا الهجينين مقارنة بالفعل المضيف فى كل الصفات .

وجـــد أن التبايـــن الراجع الى التفاعل بين العوامل المضيفة (الاضافة × الاضافة) معنوى سالب لصفة وزن اللوزة ومحصول القطن الزهر / نبات ومعامل البذرة فى الهجين الأول.

أظهرت معظم الصفات المدروسة تأثيراً معنوياً وذلك نتيجة احد أو أثنين من طرز فعل الجين (I أو j) لكـــلا الهجينيـــن ما عدا صفتى محصول القطن الزهر / نبات ومحصول الشعر / نبات فى كلا الهجينين وعدد اللوز / نبات فى الهجين الأول .

كانـــت درجـــة التوريـــث العامة مرتفعة بالمقارنة بدرجة التوريث الخاصة لكل الصفات لكلا الهجينين .

كان التحسين الوراثى المتوقع للانتخاب مرتفع بالنسبة لمتوسط الجيل الثانى لصفة عدد اللوز / نبات فى كلا الهجينين وصفة محصول القطن الزهر / نبات ومحصول الشعر / نبات للهجين الثانى .

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المجلة المصرية لتربية النبات

العدد السابع (١)		عدد خاص		٢٠٠٣

تصدرها الجمعية المصرية لتربية النبات