Evaluation of some crosses for earliness and economical traits in cotton (*Gossypium barbadense Linn.*)

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ABSTRACT

Top-crosses among ten cotton genotypes (*G. barbadense*, L.) namely Giza 70, Giza 77, Giza 85, Giza 86, Giza 87 and Giza 88 as a females. Meanwhile Giza 45, Giza 89, Karshenky$_2$ and Suvin were used as males. . Seeds of the parental genotypes and F_1 crosses were grown in a randomized complete blocks design experiment with four replications. Data from parents and F_1 generations were recorded at two locations (Sakha Agricultural Research Station and Meet Ghamr) in 1998 season.

The means of F_1 crosses exceeded the mid and better parents for most studied traits although they were negative and significant for position of first fruiting node, days to first flower and days to first opening boll while, some others were positive and significant for yields (seed cotton yield or lint / plant) and yield components and only over mid-parents for most fiber traits.

The ratio of the components of general to those of the specific combining abilities (G.C.A./S.C.A ratio) variance was greater than unity for position of first fruiting node, earliness index, fiber fineness and 2.5 % span length, indicating that the additive genetic variance was important in the inheritance of those traits.

Several crosses had significant negative S.C.A. effects for earliness measurements and positive for yields and yield components whereas some crosses were small for fiber properties.

The genotypes Karshenky$_2$, Giza 85 and Suvin were good general combiners for earliness measurements. Giza 88, Giza 86 and Giza 89 were the best general combiners for yields and most yield components. Both Giza 45 and Giza 87 were the best general combiners for 2.5 % span length, fiber fineness and fiber strength.

INTRODUCTION

Breeding strategy aimed at transfering earliness, high yields, yield components and fiber quality by using the availability of sufficient genetic materials (germplasm or cultivars) into local genotypes by using : 1-approperiate breeding methods 2- Effective testing and evaluation facilities to produce desirable new combinations.

Several researchers studied the genetic components i.e. general and specific combining ability, G.C.A / S.C.A ratio and nature of gene action. Jagtap (1986) found significant heterosis relative to mid and better parents for days to first flower and seed cotton yield per plant. Tang *et al.,* (1993) found that both dominance and additive genetic variances were significant for seed cotton yield and lint yield while, additive genetic variance was significant for fiber fineness (Micronaire value). Sorour *et al*, (2000) reported that additive genetic variance was of great importance for days to first opening boll, seed cotton yield, fiber length and fiber fineness. El-Adl *et al*, (2000 a and b) obtained significant mid-parents heterosis for some traits, better-parent heterosis was of economical importance. Dominance genetic effects were larger than additive genetic effects for first fruiting node, days to first flower, days to first opening boll, seed cotton yield, lint cotton yield and fiber fineness. Kosba *et al* (1999 a and b) found that heterosis over mid-parents were 1.80% for earliness index and 33.41% for seed cotton yield, while heterosis over better-parent was not sizeable. Dominance gene action played the major role in the inheritance of yield and yield components, whereas the additive gene action was more important for earliness traits and fiber fineness.

Hence this work was initiated to determine the following aspects :

1) Test and evaluation of 6 lines with 4 testers and their 24 F_1 resulted from a Top -crosses analysis . 2) Extent of heterosis. 3) General combining ability for the parental genotypes and specific combining ability for the parental combinations. 4) Nature of gene action.

MATERIALS AND METHODS

Six Egyptian cotton varieties Giza 70 , Giza77 , Giza 85 , Giza 86 , Giza 87 , Giza 88 were used as a females and crossed to Giza 45 , Giza 89 , Karshenky$_2$ (Russian variety) and Suvin (Indian variety) as a males (*G. barbadense,* L.). Seeds of the parental genotypes and F_1 crosses were grown in a randomized complete blocks design experiment with four replications at two locations; Sakha Agricultural Research Station at Kafr El-Sheikh governerate and Meet Ghamr (Daqahlia governorate) in 1998 season Each replicate contained one row. The row was 4 m long 0.60 m apart; eight hills were grown in each row at 0.50 m distance. At the seedling stage plants were thinned to one plant per hill. Agricultural practices for the two locations were followed as recommended by Cotton Research Institute. Data and measurements i.e. position of first fruiting node, days to first flower, days to first opening boll, earliness index, seed and lint cotton yields per plant in grams, lint percentage, boll weight, number of bolls per plant, fiber fineness (Micronaire reading), fiber strength (Pressly Index) and fiber length at 2.5 % span length (Fibrograph reading A.S.T.M. 1991) were recorded.

Statistical and genetic analysis:

The population sum of squares from the analysis of variance of genotypes were partitioned into variation among three groups: parents, parent, vs. crosses and crosses. The crosses sum of squares were further subdivided into variations due to testers (males), lines (females) which were estimators for general combining ability (G.C.A.) which were equal to 0.5 additive effects and line x tester interaction were which estimators of specific combining ability (S.C.A.), non additive which equal dominance effects (Hallaner and Mirandi, 1981) The estimation of heterosis was made according to Steel and Torrie (1960) and genetic components was estimated using methods outlined by Kompthorne (1957).

RESULTS AND DISCASSION

The analysis of variance (Table 1) indicated the presence of significant variation among genotypes for earliness, yields, its components and fiber properiets. The differences between crosses

Table 1: The combined analysis for earliness, yields, yield components and fiber characters in Top-crosses mating design

S.O.V	d.f	Position of first fruiting node	Days to first flower	Days to first opening boll	Earliness index	Seed cotton yield/p	Lint yield/ plant	Lint %	Boll weight	No.of bolls/ plant	2.5% Span length	Fiber fineness	Fiber strength
Replicates (R)	6	0.08	5.47	9.248	13.841	13.17	6.37	3.88	0.04	8.52	0.77	0.28**	2.94**
Environment (E)	1	26.86**	0.63	820.27**	14.773**	165.4**	38.29**	0.012	1.55**	59.10*	294.2**	0.29**	0.52
Genotypes (G)	33	6.77**	404.9**	435.24**	256.06**	2418.7**	288.7**	25.69**	0.14**	468.2**	6.6**	0.12**	0.98*
Parents (p)	9	16.62**	527.4**	677.05**	413.72**	3229.**	345.0**	26.64**	0.20**	462.8**	10.9**	0.14**	1.82**
Par. *vs.* cross	1	0.87**	1201.2**	877.89**	776.76**	8266.3**	699.9**	3.55	0.11**	1302.4**	9.9**	0.09	1.94**
Crosses (C)	23	3.17**	322.6**	321.37**	171.72**	1847.1**	248.7**	26.29**	0.12**	434.09**	4.8**	0.11**	0.60
Lines (L)	5	0.50	240.2**	188.34**	208.89**	1670.3**	173.4**	88.01**	0.11	369.87**	11.5**	0.12**	0.27
Testers (T)	3	16.01**	1679.6**	1906.8**	707.22**	5685.4**	770.7**	11.63	0.37**	1063.4**	13.0**	0.39**	0.42
L × T	15	1.49**	78.59**	48.621**	52.231**	938.3**	69.4**	8.61**	0.05**	129.64**	0.97	0.08*	0.96*
G × E	33	1.71	2.005	14.645	9.373	59.95**	9.9	3.95	0.014	21.03	0.84	0.05	0.45
P×E	9	0.86**	4.099	33.426**	12.635	40.36**	9.2	4.99*	0.01	16.39*	0.48	0.09*	0.42
Par. *vs.* C × E	1	2.22**	0.037	7.324	5.109	3.44	1.7	3.77*	0.001	0.918	3.78	0.01	0.57
C×E	23	2.02**	1.271	7.614	8.282	70.07**	10.5	3.56	0.015	23.72**	0.86	0.04	0.46
L×E	5	1.69	0.666	6.016	11.171*	106.73**	25.7	2.55	0.015*	21.01	0.61	0.05	0.37
T×E	3	2.69	1.588	21.44**	14.681*	182.2**	7.7	8.14*	0.063**	99.44**	0.11	0.03	0.12
L×T×E	15	1.99**	1.409	5.381	6.039	35.42**	6.0	2.98	0.006	9.48	1.09	0.04	0.56
Error	198	0.15	4.569	5.321	7.081	13.97	5.04	1.78	0.018	7.548	1.27	0.04	0.52

- * and ** significant and highly significant at 0.05 and 0.01propability levels.

and their parents were significant for all studied traits, indicating the possible presence of heterosis in all traits in the F_1 generation.

Genotypes X environment interactions were significant. Partition revealed that parent x environment interactions were siginficant for all traits, except days to first flower, earliness index , lint cotton yield , boll weight, 2.5% span length and fiber strenght, indicating that parental performance was unstable across at the two locations .

The (F_1 crosses vs parents) X environment interactions were significant for position of first fruiting node and lint %, indicating the presence of these two traits across environments . Partitioning of the cross x environments sums of squares into variation due to tester x enviroment and line x environments interactions were significant for some studied traits. Similar results were recorded by Cano – Rios, (1987), Abo . EL-Zahab. *et al* (1992), Abo El-Yazied M.A. (1999) and Sorour *et al* (2000 a and b).

Extent of heterosis

Heterosis is a result of partial dominance, complete dominance, over dominance, epistasis and a combination of these factors. The magnitude of heterotic effects of F_1 crosses for all characters measured are presented in Tables 2 and 3. Heterosis over mid-parents for earliness measurements were negative and significant for all studied traits except earliness index. Large magnitudes of heterosis in these crosses were also reported for yields, yield components and fiber quality. Useful heterosis over better parent was found for all studied traits except, fiber properties .The presence of heterosis from the mid and better parent for earliness, yields and its components may be due to the genetic diversity between the materials used, while the absence of heterosis from the better parent for fiber quality may be due to the genetic materials which are closely related. Superiority of the F_1 crosses over mid and better parents value are further evidence of non additive gene effects for these traits. The above cases of heterosis (where non additive gene action is important), parental performance per se will not necessarily be indicated of the performance in cross

Table 2. Heterosis relative to mid-parents .

Crosses	Position of first fruiting	Days to first flower	Days to first opening	Earliness index	Seed cotton yield/p	Lint yield/ plant	Lint %	Boll weight	No.of bolls/ plant	2.5% Span length	Fiber fineness	Fiber strength
G 70 ⇒ G 45	-6.45**	-2.12	-0.38	16.9*	-10.0**	-11.5**	0.95	5.88	18.2**	-3.23	0.00	-1.85
G 70 ⇒ G 89	3.85	-5.55**	-2.78**	9.25*	20.5**	20.9**	-0.59	6.22	11.6**	-1.11	0.00	-2.86
G 70 ⇒ Kar 2	33.2**	-1.53	-1.69	0.74	28.5**	33.9**	5.31	12.1**	18.3**	-0.47	-3.6	0.00
G 70 ⇒ Suvin	11.8**	3.23	-0.0	4.12	-16.9**	-18.3**	-2.16	-2.71	-16.7**	-1.25	-3.6	-0.98
G 77 ⇒ G 45	-0.35	-4.34*	-1.13	13.8*	3.06	9.62**	6.56*	5.09	-2.00	-0.91	3.7	-7.34
G 77 ⇒ G 89	-2.09	-2.92	-3.57**	-4.98	5.28**	-1.96	-9.28**	5.43	0.09	-0.63	-1.75	-4.37
G 77 ⇒ Kar 2	6.49	-9.83**	-3.54**	8.80*	-15.0**	16.3**	-0.62	3.33	11.4**	-1.27	3.7	3.92
G 77 ⇒ Suvin	9.59*	4.39*	-2.42	-1.99	6.21**	5.80	-1.52	0.00	7.97*	-0.47	0.00	-0.96
G 85 ⇒ G 45	-4.07	-3.38*	-0.78	18.7*	2.35	5.79	4.23	6.67	-5.60	-5.18*	-1.8	-5.66
G 85 ⇒ G 89	-3.29	5.80**	-0.81	0.11	47.6**	42.6**	-0.56	14.9**	21.6**	-4.4	0.00	1.36
G 85 ⇒ Kar 2	12. 8**	0.59	-1.32	8.41*	49.2**	57.6**	6.87**	2.45	30.5**	2.19	-1.8	1.01
G 85 ⇒ Suvin	12.6**	1.78	0.41	2.11	-7.37**	-8.68**	-2.06	2.69	-10.6*	0.16	1.82	1.00
G 86 ⇒ G 45	0.00	-6.77**	-5.04**	9.91*	17.6**	22.5**	4.69	-7.76	22.7**	-3.89	0.00	-8.18
G 86 ⇒ G 89	7.81*	-3.91*	-4.65**	4.06	20.8**	17.8**	-2.54	-1.34	18.9**	-5.48*	-1.69	-2.80
G 86 ⇒ Kar 2	17.2**	-9.49**	-7.26**	5.09*	15.4**	17.8**	3.29	-1.40	15.4**	-0.47	0.00	2.91
G 86 ⇒ Suvin	-1.96	-8.49**	-6.91**	3.99	0.91	3.57	4.13	0.42	-0.51	0.31	0.00	-1.92
G 87 ⇒ G 45	-8.41**	-5.16**	-3.33**	7.34*	-4.83	-8.33**	-3.56	5.37	-8.33*	-2.71	1.89	-9.09*
G 87 ⇒ G 89	-1.80	-1.53	-1.12	3.25	42.0**	32.2**	-5.57*	7.14	25.9**	-1.88	0.00	-2.80
G 87 ⇒ Kar 2	0.00	-2.13	0.79	3.21	27.1**	16.7**	-5.73*	3.00	20.7**	-1.23	1.89	4.85
G 87 ⇒ Suvin	3.25	-12.75**	-8.20**	6.37*	11.4**	3.90	-5.35*	-1.33	12.3**	-1.39	-5.66	-0.96
G 88 ⇒ G 45	-1.82	-8.84**	-0.76	13.2*	0.84	-1.31	1.85	11.9**	-11.1**	-2.91	-3.57	0.93
G 88 ⇒ G 89	4.42	-6.15**	-1.57	38.8*	2.26	19.4**	-2.57	2.69	16.1**	0.32	1.69	-5.66
G 88 ⇒ Kar 2	19.8**	-14.03**	-2.14	6.95*	43.2**	37.3**	-1.22	-2.83	31.1**	0.93	-7.14	2.97
G 88 ⇒ Suvin	1.85	-11.17**	-2.87*	-0.23	1.38	-5.03	-6.31**	-5.53	4.72	2.89	-7.14	-0.97
L.S.D 0.05	0.47	2.60	2.80	3.23	4.53	2.72	1.62	0.16	3.33	1.37	0.24	0.95
0.01	0.63	3.44	3.72	4.29	6.02	3.62	2.15	0.22	4.43	1.82	0.32	1.26

Table 3. Heterosis relative to better parent.

Crosses	Postion of first fruiting node	Days to first flower	Days to first opineing	Earliness index	Seed cotton yield/p	Lint yield/ plant	Lint %	Boll weight	No.of bolls/ plant	2.5% Span length	Fiber fineness	Fiber strength
G 70 ⇨ G 45	10.81**	5.53**	3.91**	6.53**	-16.80**	-19.00**	-0.31	5.37	-28.00**	-4.92	-3.45	-3.64
G 70 ⇨ G 89	3.91**	-4.03*	1.56	2.38	10.20**	16.00**	-5.57*	4.23	1.30	-4.43	-6.67	-2.85
G 70 ⇨ Kar 2	73.21**	7.05**	5.36**	-10.30**	2.13	6.35	4.33*	8.29	0.17	-2.80	-6.90	-3.81
G 70 ⇨ Suvin	11.67**	8.93**	0.81	-4.15	-19.00**	-20.60**	-2.76	-9.28*	-29.60**	-3.45	-6.90	-3.81
G 77 ⇨ G 45	11.31**	0.97	2.31	-0.47	-10.60**	-6.01	3.02	-0.87	-11.50**	-3.33	3.70	-8.18
G 77 ⇨ G 89	1.70	-2.51	3.08**	-6.84**	-9.70**	-12.10**	-12.80**	1.75	-11.50**	-3.17	-6.67	-5.56
G 77 ⇨ Kar 2	47.81**	0.18	0.89	1.13	-13.12**	-12.30**	-2.72	-5.24	-9.35**	-2.85	3.70	-1.85
G 77 ⇨ Suvin	15.61**	12.52**	0.00	-5.69*	-3.82*	-3.95	-2.42	-1.69	-4.03	-1.88	0.00	-4.63
G 85 ⇨ G 45	3.54	10.23**	7.56**	0.44	-7.61**	0.61	-2.27	3.23	-19.60**	-10.4	3.57	-9.09
G 85 ⇨ G 89	2.62	13.43**	4.20**	-2.23	34.80**	29.20**	-1.39	13.80**	13.90**	-4.04	-3.33	-0.57
G 85 ⇨ Kar 2	63.05**	3.57	-4.20**	4.17	38.90**	40.50**	1.42	-3.96	29.90**	1.25	-3.57	-0.99
G 85 ⇨ Suvin	22.83**	1.88	2.52	2.09	-19.90**	-18.20**	-5.95*	-1.69	-22.20**	-0.96	0.00	0.00
G 86 ⇨ G 45	-6.68*	-4.26*	5.04**	-2.42	11.10**	9.98	-1.70	-14.40**	21.40**	-6.23	-3.45	-8.18
G 86 ⇨ G 89	-3.3	-0.86	-1.53	0.33	12.80**	10.90**	-3.62	-6.36	17.40**	-8.31	-3.33	-4.59
G 86 ⇨ Kar 2	71.80**	3.57	4.46**	-3.85	-6.68**	-8.03*	-1.99	-10.60**	4.81	-2.19	-3.45	-2.75
G 86 ⇨ Suvin	8.38**	1.52	-0.81	-1.58	-1.80	-1.23	0.28	0.00	-1.64	-1.24	-3.45	-6.42
G 87 ⇨ G 45	-6. 18*	3.89	-2.88	-1.80	-5.43*	-10.70*	-3.86	3.85	-9.40*	-2.71	0.00	-9.09
G 87 ⇨ G 89	7.34*	2.98	2.29	-3.60	43.60**	28.90**	-11.70**	5.63	23.50**	-6.90	-6.67	-4.59
G 87 ⇨ Kar 2	54.50**	13.66**	13.39**	-8.38**	6.36**	-2.61	-6.62*	-0.96	9.75**	-5.25	0.00	-0.92
G 87 ⇨ Suvin	19.29**	-1.82	-1.61	-2.53	7.68**	0.00	-7.67**	-0.18	10.08**	-5.25	-7.41	-5.50
G 88 ⇨ G 45	6.83*	-6.12**	3.94**	-3.05	-7.28**	-12.6**	-2.93	4.72	-13.20**	-0.11	-6.90	-0.91
G 88 ⇨ G 89	-0.92	-3.99	0.00	3.52	11.20**	10.90**	-5.01	-1.72	11.50**	-1.89	0.00	-5.66
G 88 ⇨ Kar 2	73.21**	-1.93	4.46**	1.75	13.30**	6.40	-4.69	-11.60**	21.60**	-0.31	-10.30	-1.99
G 88 ⇨ Suvin	11.13**	3.89	-1.61	-1.74	-2.34	-10.70**	-8.50**	-6.33	2.56	1.82	-10.30	-3.77
L.S.D 0.05	0.548	2.978	3.230	3.707	5.233	3.143	1.869	0.188	3.827	1.570	0.280	1.099
0.01	0.726	3.929	4.241	4.892	6.951	4.174	2.482	0.250	5.051	2.072	0.368	1.443

*and ** Significant and highly significant at 0.05% 0.01% probability levels respectively

combination, in this case a mating scheme such as the top cross can be useful for parental selection.

These results were in agreement with those obtained by Gupta and Singh (1987), El-Lawendy (1999), Kosba *et al* (2000 a) and Sorour *et al* (2000 a).

Combining ability

General combining ability (G.C.A.) could be defined as the average performance of the genotypes in the crosses involving these genotypes.

The results in Table 4 indicated that the parental tester Karshenky$_2$ showed significant negative G.C.A. effects for all earliness measurements expect, earliness index. The female Giza 85 and the male Suvin exhibited significant negative G.C.A. effects for the other traits except, position of first fruiting node. The three Egyptian cotton varieties Giza 88 , Giza 86 and Giza 89 showed G.C.A. effect for a high yields and No. bolls / plant with Karshenky$_2$. The female Giza 85 and the male Suvin showed G.C.A. effects for high seed index. Giza 85 and Suvin showed G.C.A. effects for high boll weight. Significant positive G.C.A. effects were observed for fiber fineness and fiber length as 2.5 % span length in male Giza 45. Only the male Giza 87 showed G.C.A. effect for high fiber strength.

Specific combining ability (S.C.A.) is the deviation of particular cross from expectation based on the average of its components. The results in Table 5 indicated that the F_1 crosses Giza 87 x Kar.$_2$ showed S.C.A. effect for low position of first fruiting node trait. Giza 88 x Suvin showed effects for low number of days to first flower and days to first opening boll. Significant positive S.C.A. effects were observed for earliness index by the cross Giza 70 x Karshenky.$_2$. The F_1 crosses Giza 86 x Giza 45 and Giza 88 x Kar.$_2$ gave the highest S.C.A. effects for yields and number of bolls. The cross Giza 77 x Giza 45 showed S.C.A. effects for high lint %. The F_1 cross Giza 88 x Giza 45 showed S.C.A. effects for high boll weight in most crosses. S.C.A effects were small for all fiber characteristics studied in the present materials .The variety Giza 87 when crossed with Giza 89 and Giza 45 showed S.C.A. effects for high seed index and fiber length (2.5 % span length), respectively. However these low level S.C.A effects

Table 4: General combining ability effects of the parental genotypes.

Characters / Parents		Pos. of first fruit node	Days to first flower	Days to first openin	Earliness index	Seed cotton yield/p	Lint yield/ plant	Lint %	Boll weight	No. of bolls/ plant	2.5% Span length	Fiber fineness	Fiber strength
Lines	G 70	-0.178	1.281	0.446	-1.497	-5.719*	-2.990**	-0.03	-0.068	-1.024	-0.115	-0.015	-0.428
	G 77	-0.126	1.588*	-1.103	-0.788	5.429*	1.872**	-0.473	0.056	1.803*	0.043	0.016	0.020
	G 85	0.119	-4.482**	-3.084**	3.881**	-10.666**	-1.737**	1.794**	0.069*	-6.487**	-1.079**	0.029	-0.466
	G 86	0.01	0.551	0.138	-0.649**	2.539	2.578**	1.823**	-0.039	1.509*	-0.197	0.076	0.012
	G 87	0.103	3.022*	4.25**	-3.105**	0.774	-2.564**	-2.616**	-0.506	1.700*	0.599*	-0.106*	0.772
	G 88	0.72	-1.96*	-0.647	2.158*	7.644**	2.840**	-0.228	0.036	2.497**	0.518	0.001	0.090
L.S.D ($g_i - g_j$)													
	0.05	0.194	1.058	1.142	1.317	1.85	1.111	0.661	0.066	1.360	0.558	0.099	0.389
	0.01	0.257	1.405	1.517	1.750	2.458	1.476	0.878	0.088	1.806	0.741	0.132	0.516
Testers	G 45	0.683**	6.413**	7.074**	-4.319**	-9.089**	-2.937**	-0.27	-0.001	-4.142**	0.503*	-0.087*	-0.020
	G 89	-0.123	3.183**	2.573**	-0.905	15.2**	5.600**	0.557**	0.046	4.758*	-0.725*	0.209*	-0.016
	Kar 2	-0.706**	-6.757**	-7.650**	3.966**	.335	0.192	0.106	-0.123**	3.330**	0.036	-0.051	0.129
	Suvin	0.145	-2.828**	-1.998**	1.258*	-6.446**	-2.854**	-0.636**	0.078**	-3.946**	0.186	0.071	-0.093
L.S.D ($g_i - g_j$)													
	0.05	0.158	0.864	0.932	1.076	1.511	0.907	0.539	0.054	1.110	0.456	0.081	0.317
	0.01	0.210	1.148	1.238	1.429	2.007	1.205	0.716	0.072	1.475	0.605	0.107	0.421

-*and ** Significant and highly significant at 0.05%, 0.01% probability levels respectively.

Table 5: Estimates of specific combining ability effects for the 12 studied traits.

Crosses	Position of first fruiting node	Days to first flower	Days to first opineing boll	Earliness index	Seed cotton yield/p	Lint yield/ plant	Lint %	Boll weight	No.of bolls/ plant	2.8% Span length	Fiber fineness	Fiber streugth
G 70 ➡ G 45	-0.61*	0.33	0.58	0.65	-4.06	-2.83*	-1.34*	0.017	-2.50	-0.028	0.206	0.401*
G 70 ➡ G 89	-0.06	4.52**	-1.74	3.14*	4.33	2.40*	0.71	-0.008	2.52	0.275	-0.110	-0.415
G 70 ➡ Kar 2	0.58*	1.70	-0.07	4.10**	9.38**	4.02**	0.97	0.043	3.30	0.039	0.044	-0.273
G 70 ➡ Suvin	-0.02	3.15**	1.24	0.22	-9.64**	-3.59**	-0.34	-0.051	3.31	-1.286*	0.040	-0.113
G 77 ➡ G 45	0.20	-0.98	1.87	1.54	7.32**	4.24**	1.59*	-0.003	3.08	1.457*	0.082	-0.222
G 77 ➡ G 89	0.20	-1.22	-0.57	-3.46*	15.67**	-7.11**	-1.69*	-0.024	-6.56**	0.234	-0.091	-0.077
G 77 ➡ Kar 2	0.58	-3.15**	-3.36**	3.43*	-5.84**	-2.19	-0.35	-0.022	-3.37	-0.414	0.038	0.186
G 77 ➡ Suvin	0.18	-5.35**	2.06	-1.51	14.20**	5.09**	0.46	0.004	6.85**	-0.277	-0.029	0.113
G 85 ➡ G 45	-0.13	0.71	-1.08	2.48	-5.05	-2.09.	-0.19	-0.038	-1.51	0.421	-0.081	-0.136
G 85 ➡ G 89	-0.15	-1.31	-0.83	-2.42	11.07**	3.36**	0.10	0.108	2.27	-0.382	0.034	0.335
G 85 ➡ Kar 2	-0.15	-2.00	-0.38	0.93	5.72**	3.39**	0.95	-0.073	4.11*	0.545	0.001	-0.285
G 85 ➡ Suvin	0.43*	-0.02	3.29*	-0.99	-11.74**	4.66**	-0.87	0.003	-4.89**	0.258	0.046	0.086
G 86 ➡ G 45	0.44*	0.04	.037	-1.85	17.60**	5.84**	-0.10	-0.156*	12.85**	-0.165	-0.199*	-0.189
G 86 ➡ G 89	-0.32	1.14	1.08	0.97	-4.86	-2.33	-0.71	-0.048	-1.31	-0.276	-0.051	0.069
G 86 ➡ Kar 2	0.33	0.12	-0.74	-0.21	-12.58**	-4.65**	-0.41	0.058	-7.76**	0.152	0.029	0.973*
G 86 ➡ Suvin	-046*	-1.30	0.04	1.09	-0.15	1.14	1.21	0.146*	-3.77*	0.289	0.062	-0.016
G 87 ➡ G 45	-0.9	6.04**	-1.08	-2.84	-11.30**	-3.38**	-0.33	-0.005	-5.62**	1.188*	0.016	0.924*
G 87 ➡ G 89	0.41	2.74	1.79	0.92	11.04**	4.02**	0.78	0.010	5.17**	0.140	0.056	0.097
G 87 ➡ Kar 2	-0.52*	-4.33**	4.70	-1.06	-8.13**	-3.69**	-0.86	0.017	-3.49	-1.283*	-0.028	0.327
G 87 ➡ Suvin	0.20	-6.1**	-5.50**	2.98*	8.39**	3.05**	0.41	-0.023	3.93*	-0.245	-0.044	-0.401
G 88 ➡ G 45	0.19	0.52	0.10	0.02	-4.51	-1.75	0.36	0.185**	-6.30**	1.431*	-0.300*	0.970*
G 88 ➡ G 89	0.19	1.56	0.27	0.084	-5.90	0.33	0.81	-0.038	-2.089	0.009	0.162	-0.409
G 88 ➡ Kar 2	0.39	-1.00	-0.25	0.92	11.45**	3.12**	-0.30	-0.068	7.21**	-0.239	-0.084	-0.092
G 88 ➡ Suvin	-0.33	-1.08	-0.19	-1.78	-1.04	-1.03	-0.88	0.079	1.19	0.261	-0.076	-0.069
L.S.D 0.05	0.39	2.12	2.28	2.63	3.70	2.22	1.32	0.133	3.73	1.116	1.213	0.777
0.01	0.51	2.81	3.03	3.80	4.92	2.95	1.76	0.176	4.96	1.482	1.611	1.032

-*and ** Significant and highly significant at 0.05%, 0.01% probability levels respectively.

in F_1 crosses resulted in only a small amount of heterosis for fiber properties. Similar findings were recorded by Jagtap (1986), Tang *et al* (1993) and Gwen and Smith (1997).

Nature of gene action

The components of genetic variance of crosses were partitioned into the main effects of lines (females) , testers (males) are equivalent to general combining ability (G.C.A.) and line x tester interaction as an indicator for specific combining ability variance (S.C.A.) . An estimate of relative importance of additive and non-additive effects of genes can be obtained from the ratio of the components of general to those of specific (Table 6). The ratio G.C.A./S.C.A. variances was larger than unity for position of first fruiting node, earliness index, fiber fineness and fiber length (2.5 % span length), indicating that the additive genetic variance played a major role in the inheritance for these traits. The presence of both additive and non additive gene action for most of the traits indicated that selection procedures based on the accumulation of additive effects should be successful in improving these traits to maximize selection advance procedures which are effective in shifting gene frequency. El-Adly (1995), El-Lawendey (1999) and El-Adl *et al* (2000 a and b) found similar results.

Breeding potential of the materials

The cotton breeding could be reliable on the estimates of general combining ability to improve the commercial varieties. In this investigation, the genotypes $Karshenky_2$, Giza 85 and Suvin were good general combiners for earliness measurements. Meanwhile Giza 88, Giza 86 and Giza 89 were found to be good general combiners for yields and most yield components. Giza 45 and Giza 87 were found to be good general combiners for fiber strength at 2.5 % span length and fiber fineness.

Table 6 The partitioning of the genetic variance into general and specific combining ability

parameters	Position of first fruiting node	Days to first flower	Days to first opening boll	Earliness index	Seed cotton yield/p	Lint yield/ plant	Lint %	Boll weight	No.of bolls/ plant	2.5% Span length	Fiber fineness	Fiber strength
G.C.A	0.160**	2.307*	-2.260	5.159**	13.41	1.50	0.334	0.002	1.976	0.730**	0.101**	-0.029
S.C.A	-0.027	9.573**	5.357**	4.247**	134.8**	19.94**	0.986*	0.009**	38.58**	0.016	0.002	0.388**
Additive	0. 320	4.614	4.520	10.318	26.91	3.00	0.608	0.004	3.951	1.460	0.202	-0.057
Dominance	-0.027	9.573	5.357	4.247	134.8	19.94	0.586	0. 006	38.58	0.016	0.002	0.388
Error	0.038	1.142	1.770	1.330	3.47a	.260	0.445	0.005	1.887	0.317	0.010	0.154
G.C.A/S.C.A ratio	5.935	0.241	0.422	1.215	0.998	0.075	0.570	0.167	0.051	4.563	5.500	0.075

- *and ** Significant and highly significant at 0.05%, 0.01% probability levels, respectively.

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تقييم بعض الهجن للتبكير والصفات الاقتصاديةفي القطن

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تم تقيم ٢٤ هجين ناتجة من التهجين القمي بين ٦ سلالات (أمهات) وهي جيزة ٧٠ ، جيزة ٧٧ ، جيزة ٨٥ ، جيزة ٨٦ ، جيزة

٨٧ ، جيزة ٨٨ وأربعة كشافات وهي جيزة ٤٥ ، جيزة ٨٩ ، كارشنكي ٢

(صنف روسي) وسيوفن (صنف هندي) في تجربتين حقليتين هما محطة بحوث سخا بمحافظة كفر الشيخ ومنطقة ميت غمر بمحافظة الدقهلية موسم١٩٩٨ وذلك بهدف تقدير قوة الهجين والقدرة العامة والخاصة علي التآلف وطبيعة الفعل الجيني لبعض صفات التبكير والمحصول ومكوناته وصفات التيلة وامكن تلخيص أهم النتائج فيما يلي :-

- أظهرت التراكيب لوراثية (الأباء – الهجن) اختلافات معنوية لجميع الصفات المدروسة أما التفاعل بينها وبين المناطق فقد أعطى قيماً مختلفة معنوياً في بعض الصفات .
- وكانت قوة الهجين بالنسبة لمتوسط الأباء معنوية لكل الصفات في حين كانت معنوية لصفات التبكير والمحصول ومكوناته فقط للأب الأعلى .
- كان التباين الراجع للقدرة العامة علي التآلف أكثر أهمية من التباين الراجع للقدرة الخاصة علي التآلف لصفات ارتفاع عقدة أول فرع ثمري ، معامل التبكير ، نعومة الشعيرات ، الطول الممتد عند نسبة توزيع ٢,٥% مما يدل علي أن الفعل المضيف كان الأكثر أهمية في وراثة هذه الصفات .
- كان الصنف كارشنكي ٢ أفضل الأباء قدرة علي التآلف لصفات التبكير والأصناف جيزة ٨٦ ، جيزة ٨٨ ، جيزة ٨٩ أفضلها في صفات المحصول ومكوناته في حين كان الصنفان جيزة ٤٥ ، جيزة ٨٧ أفضل الأصناف في الصفات التكنولوجية للالياف .