Egypt. J. Agric. Res., 80 (1), 2002.

USING BIPARENTAL MATING SYSTEM TO PRODUCE NEW PROMISING RECOMBINATIONS IN COTTON

ZEINA, A.M.

Cotton Research Institute, Agric. Res. Centre, Giza.

(Manuscript received 28 March 2001)

Abstract

The present work was carried out at Sakha Agricultural Research Station during 1998 and 1999 seasons to know the extent of biparental mating system (North Carolina Design III) effectiveness in breaking unfabourable linkage groups and obtained new promising recombinations. In 1998 season, there were four sets, each set was consisted of five F_2 plants as male was group and each male was mated with the two parents as females. In 1999 seasons forty biparental progenies were derived from crossing of "Giza 88 x Pima S_6" F_2 with their parents. Mean performance of biparental progenies F_2 x Giza 88 exhibited higher values than those of F_2 x Pima S_6 and its parents (pure lines Giza 88 and Pima S_6) for seed cotton yield/plant, lint yield/plant, lint percentage, boll weight, seed index, lint index, mean length, micronaire reading and yarn strength, while, boll weight, seed index, lint index, half fall, hair weight, micronaire reading and yarn strength were larger in (F_2 x Pima S_6). Also, significant differences were found among the crosses of females (Giza 88 and Pima S_6) with some males for most studied traits and with most males for hair weight and half fall. Also, both seed cotton yield/plant and lint yield/plant with males No. 4 and 5 in set I and III. For mean length and micronaire reading with male 4 in set I and with males 2 and 3 in set III were significant. These results suggested breaking up the gene linkage block of some progenies of F_2 so we can obtain promising strains that have high yield. The variance due to paternal effect was larger than that due to maternal effect for most studied traits. The proportional contribution values of males were higher than those of females and its interaction for all traits. While, the proportional contribution values of females were intermediate, it was higher than those interaction males x females for seed cotton yield/plant, lint percentage, lint index, mean length, half fall and micronaire reading. The females x males interaction was higher than females for lint yield/plant, boll weight, seed index and yarn strength. Additive variance was accounted for the largest major proportion of the phenotypic variance for all traits. These results show that additive effect playing the major role of the inheritance for these traits so direct selection could improve these traits. Highly significant positive RA, RG and RP was obtained for seed cotton yield/plant with lint yield/plant, boll weight, seed index and mean length. While, significantly negative values were recorded with lint percentage, half fall and micronaire reading. Also, the RD was positive with lint index, half fall, hair weight and yarn strength. Lint yield showed high positive RA, RG and RP with most traits, for lint percentage with boll weight, lint index hair weight and half fall. While, negative significant RA, RG and RP for lint percentage with seed index and mean length.

INTRODUCTION

Estimation of genetic parameters in biparental hybrids has been an objective in some cotton (*Gossypium barbadense* L.) breeding programs. The plant breeder is interested in the determination of gene effects to establish the most advantageous breeding programs for the improvement of the desired character. In addition, the breeding programs in cotton requires measurement of multiple traits in order to develop a commercially desirable cultivar. Most studies of genetic correlations have involved population generated with the objective of selections for pure line cotton breeding. These research data, however, provided a general perspective of the genetic association among cotton traits and their offspring (Meredith, 1984). The relationships of yield and fiber traits of inbred lines to the same traits in F_2 hybrids have been studied in terms of genetic combining ability. Significant general and specific combining ability was observed for most traits measured (Meredith, 1990; Tang *et al.,* 1993a, 1993b). Tang *et al.* (1996), reported that dominance variance accounted for major proportion of phenotypic variance and relatively high broad sense heritability of lint percentage and boll weight. Also, they showed high significant negative additive, dominance, genotypic and phenotyic correlations and high significant positive environmental correlation between the previous two traits in upland cotton. El-Harony (1999) found that females and males were equally in proportional contribution for seed cotton yield/plant, while males contribution were higher than those of females for lint index, seed index and boll weight. He found that females and males mean squares were significant and that additive variance was accounted for the major proportion of the phenotyic variance of seed cotton yield/plant, lint percentage and lint index. Also, he showed high significant positive additive correlation between lint percentage and lint index and for genotypic and phenotypic correlations between boll weight and lint index. Abo-Arab (1999) found that the variance due to males was either larger or smaller than the variance due to females for most studied traits. It seems that maternal effect might play some role in the inheritance of these traits and the proportional contribution values of males were higher than those of females for boll weight, lint percentage, seed index and lint index in progenies the cross "TNB_1 x G. 75" F_2 with their parent and for seed cotton yield/ plant, lint percentage and no. of seed/boll in progenies of the cross "TNB_1 x G. 76" F_2 with their parents, while the proportional contribution of females surpassed those of males of seed cotton yield/plant and number of seeds/boll in first cross and for boll weight, seed index and lint index in second cross Highly significant positive additive correlation was obtained in the first cross for boll weight with lint percentage and for seed cotton yield/plant with no. of seeds/boll and in the second cross between boll weight and both seed cotton yield/plant and lint percentage.

The objective of the research reported herein was to estimate genetic variances, covariances, and heritabilities, break up of linkage association between the studied characters and these data will also provide heritability estimates and relative size of additive and dominance genetic correlation among yield components and this will provide guidance as to the usefulness of these populations for selection of strains useful in pure line breeding for cultivar development.

MATERIALS AND METHODS

The mating design used in this study was North Carolina design III (Comstock and Robinson, 1952) where the F_2 population was produced by crossing followed by selfing the F1 of the two varieties (*Gossypium barbadense* L.), i.e. Giza 88 x Pima S_6 where the first cultivar is an extra-long stable and new Egyptian cotton variety, characterize by lint length 34.6 mm, pressly index 11.2 and Micronaire value 3.5 and the second American cotton variety characterized by long staple, high lint percentage, earlier and higher yield than G. 88.

In 1998 season, there were four sets (S = 4) of F_2 plants as males, each set consisted of five males group (m = 5), each male was mated with the parents as females. At the end of the season forty biparental hybrids were obtained with twenty relative to Pima S_6 and the other twenty relative to G. 88. The forty biparental hybrids along with the two parents were evaluated at Sakha agricultural Research Station in 1999. The experimental design was a randomized complete block with three replication. Each plot consisted of one row for each genotype 4.5 m long and 0.60 m apart. Hills were spaced 50 cm apart and comprised one plant/hill. Normal cultural practices were applied as recommended for ordinary cotton growing. At the end of the season, seed cotton yield of each genotype was harvested and ginned for each plant. Data was taken on ten guarded plants. The measurements were carried out as follows:

A. Yield and yield components traits:

1. Seed cotton yield per plant (S.C.Y./P.) in grams.
2. Lint yield per plant (L.Y./P.) in grams.
3. Lint percentage (L%) was calculated as follows:

$$\frac{\text{Lint yield}}{\text{Seed cotton yield}} \times 100$$

4. Boll weight (B.W.) in grams.
5. Seed index (S.I.) weight of 100 seeds in grams.
6. Lint index (L.I.) was calculated as follows:

$$\frac{\text{Seed index x lint percentage}}{\text{100 - lint percentage}}$$

B. Fiber traits:

1. Mean length (M.L.) in 1/32 inch measured by Balls' sledge soter.
2. Half fall (H.F.) in 1/32 inch measured by Balls sledge soter which indicates the staple length.
3. Micronaire reading (M.C.) measured by Micronaire instrument which indicates the fiber fineness.
4. Hair weight-(H.W) in terms of millitex (10^{-8} g/cm), which indicates the fiber fineness.
5. Yarn strength (Y.St.) is the product of "Lea strength x yarn count" (60 s carded and 3.6 twist multiplier) measured the "Good Brand Tester".

Genetic analysis:

Data on individual plant bases was subjected to analysis of variance and covariance (assuming all genetic components to be random) by using North Carolina design III (Comstock and Robinson 1952). Analysis of variance is presented in Table 1.

Table 1. Analysis of variance for North Carolina design III.

Source of variation	d.f.	E.M.S.
Sets	s-1	
Replications in sets	s (r-1)	
Females in sets	s	
Males in sets	s (m-1)	$\sigma^2 e + 2 r \sigma^2 m$
Interactions in sets	s (m-1)	$\sigma^2 e + r \sigma^2 mL$
Error	s (2m-1) (r-1)	$\sigma^2 e$
	2S mr. 1	
Total		

Where:

s = set.

m = male.

$\sigma^2 m$ = M.S due to males/sets-M.S. due to error)/2 x r = (1/4) $\sigma^2 A$.

$\sigma^2 mL$ = (M.S. due to interaction. M.S. due to error)/r = (1/2) $\sigma^2 D$.

$\sigma^2 E$ = M.S. due to error/rand refer to environmental variance.

Proportional contribution of lines, tester and their interaction are presented by the magnitude of sum of squares of these genotypes relative to the sum of squares of crosses.

Significance of correlation coefficients was tested by the following formula:

$$t = r\sqrt{\frac{n - 2}{1 - r2}}$$

Where:

r = Correlation coefficient

n = Number of sets under study.

Also, the variances ratio compared with phenotypic variance and broad sense heritabilities were tested by the following formula:

$$S.E. = \sqrt{\frac{\text{Replication in sets mean squares}}{\text{No. of sets}}}$$

RESULTS AND DISCUSSION

Data presented in Tables 2 and 3 showed the mean performances of yield and its components as well as fiber properties. It is clear that mean performances of biparental progenies was higher than the two parents for seed cotton yield/plant, lint yield/plant, lint percentage, boll weight, seed index, lint index, mean length, micronaire reading and yarn strength in the first cross (F_2 x G. 88) and for boll weight, seed index, lint index, half fall, hair weight, micronaire reading and yarn strength in the second cross (F_2 x Pima S_6). Also, it was evident that there were significant differences among the crosses of females (Giza 88 and Pima S_6) with some males for most studied traits and with most males for hair weight and half fall. Also, both seed cotton yield/plant and lint yield/plant in males No. 4 and 5 in set I and III showed higher values. For mean length and micronaire reading with male 4 in set I and in males 2 and 3 in set III the differences were significant.

Generally, these results might indicate break up of linkage for some progeny of F_2. Therefore, it is possible to obtain strains with high performance for the above mentioned traits as shown in Table 2 and 3 for some males in most sets compared with parents. Miller and Rawlings (1967) accomplished this by beginning with the F_2 generation and maintaining plants for six generations in an isolated block, where the mating system was mixed intermitting and selfing (approximately 50% self pollination). Meredith and Bridge (1971) obtained similar results through two generations of random intermitting after reaching F_3. These results were confirmed by the contribution of male, female and male x female interactions in mean performances. Male contributions were higher than females and male x female interaction for all studied traits. Females contribution were intermediate, but they were higher than those males x females interaction for seed cotton yield/plant, lint percentage and lint index, mean length, half fall and micronaire reading, while, males x females interaction were higher than females for lint yield/plant, boll weight, seed index and yarn strength as shown in Table 4.

Table 2. Mean performances of yield and its components traits of biparental progenies in 1999 season.

Sets	Males	S.C.Y/P P1	S.C.Y/P P2	L.Y/P. P1	L.Y/P. P2	L% P1	L% P2	B.W P1	B.W P2	S.I P1	S.I P2	L.I P1	L.I P2
I	1	23.90	23.10	8.47	8.19	35.46	35.45	2.93	2.90	9.50	9.60	5.13	5.20
	2	26.90	25.50	9.37	8.98	34.82	35.38	3.00	3.00	9.83	9.30	4.80	4.93
	3	18.90	18.60	6.30	6.56	33.26	35.31	2.73	2.67	9.70	9.80	4.77	4.87
	4	28.90	28.20	10.24	10.24	35.51	36.33	2.80	2.80	9.07	9.13	4.87	4.97
	5	29.90	29.50	11.46	10.81	35.71	36.57	3.00	3.10	9.30	9.43	5.07	5.17
II	1	18.61	17.82	6.24	6.17	33.55	34.62	2.67	2.70	9.27	9.37	4.60	4.70
	2	22.65	20.71	7.97	7.94	35.19	38.34	2.70	2.77	9.13	9.23	4.83	4.93
	3	20.93	16.53	7.41	6.05	35.39	36.60	2.87	3.00	9.27	9.43	4.97	5.07
	4	16.94	16.92	5.66	5.51	33.41	32.64	2.60	2.50	9.33	9.10	4.57	4.67
	5	17.88	17.10	5.90	6.04	33.76	35.35	2.60	2.67	9.00	9.70	4.50	4.60
III	1	22.83	21.66	8.02	7.77	35.11	35.92	2.77	2.80	9.60	9.70	5.10	5.20
	2	22.46	44.39	7.95	8.15	35.42	36.39	2.67	2.63	9.20	9.30	4.97	5.07
	3	20.12	20.14	7.21	7.33	35.78	36.40	2.53	2.52	9.57	9.67	5.23	5.33
	4	25.23	24.15	8.69	8.12	34.46	33.70	2.83	2.80	9.57	9.67	4.90	5.00
	5	25.15	24.81	9.54	9.54	36.77	38.45	2.67	2.70	9.40	9.50	5.37	5.47
IV	1	22.96	22.51	8.06	8.51	35.07	37.81	2.80	2.93	9.73	9.83	5.17	5.33
	2	24.59	23.59	8.73	8.24	35.25	34.57	2.80	2.80	9.37	9.77	5.00	5.07
	3	21.36	22.41	7.29	8.15	33.99	36.55	2.73	2.73	9.93	9.87	4.93	5.13
	4	21.65	20.15	7.33	7.62	33.68	37.74	2.77	2.68	9.37	9.70	4.73	4.77
	5	23.82	22.05	8.39	7.95	35.23	36.36	2.87	2.71	9.87	9.73	5.27	5.37
Mean		22.90	22.89	8.01	7.89	34.84	36.02	2.77	2.78	9.43	9.54	4.94	5.04
*P mean		17.20	20.20	6.10	6.70	32.50	34.00	2.10	2.80	9.00	9.80	4.50	5.10
L.S.D.	0.05	3.72		1.42		2.37		0.27		0.41		0.51	
	0.01	4.93		1.88		3.14		0.36		0.55		0.68	

Where:

Male = F_2 generation P1 = G. 88 inbred line

P2 = Pima S_6 inbred line *P mean = Mean of parent pure line

Table 3. Mean performances of fiber traits of biparental progenies in 1999 season.

Sets	Males	Mean length P1	Mean length P2	Half fall P1	Half fall P2	Micronaire reading P1	Micronaire reading P2	Hair weight P1	Hair weight P2	Yarn strength P1	Yarn strength P2
I	1	1.13	1.17	49.00	48.33	4.10	4.30	157	158	3030	3025
	2	1.10	1.08	47.00	46.00	4.37	4.17	158	156	2825	2820
	3	1.11	1.10	48.00	47.00	4.17	4.30	154	155	3141	3136
	4	1.15	1.14	48.33	47.33	3.70	3.93	134	148	3037	3032
	5	1.07	1.06	48.00	47.00	3.90	4.10	155	158	2950	2948
II	1	1.12	1.11	49.00	48.00	3.87	4.07	150	151	2843	2838
	2	1.10	1.09	48.33	47.33	4.13	4.33	150	151	2826	2823
	3	1.13	1.12	52.00	51.00	3.90	4.10	132	135	3033	3030
	4	1.10	1.09	47.00	46.00	4.27	4.47	162	163	2927	2923
	5	1.12	1.11	48.00	47.00	3.97	4.17	155	156	3091	3086
III	1	1.10	1.09	51.33	50.33	3.97	4.17	146	147	2925	2923
	2	1.13	1.13	49.00	48.00	3.63	3.83	137	136	2703	2701
	3	1.15	1.14	50.67	49.67	3.87	3.07	136	139	2803	2800
	4	1.12	1.11	48.67	47.67	3.40	3.06	134	137	2833	2830
	5	1.07	1.07	47.00	46.00	3.97	4.17	153	155	2950	2945
IV	1	1.10	109.00	49.33	48.33	3.70	3.90	139	141	3046	3045
	2	1.11	1.10	48.00	47.00	4.50	4.37	158	159	2997	2958
	3	1.12	1.11	48.00	47.00	3.87	4.04	153	154	2950	2945
	4	1.09	1.08	49.67	48.67	3.93	4.13	149	150	2883	2881
	5	1.12	1.11	50.00	49.00	3.80	4.00	135	157	2976	2973
Mean		1.11	1.10	48.82	47.83	3.95	4.11	147.28	149.22	2939	2933
*P mean		1.10	1.00	49.00	46.00	3.40	4.00	148	146	2878	2500
L.S.D.	0.05	0.02		1.62		0.36		2.47		134.6	
	0.01	0.02		2.04		0.46		3.27		178.1	

Where:

Male = F_2 generation P1 = G. 88 inbred line

P2 = Pima S_6 inbred line *P mean = Mean of parent pure line

Analysis of variance Table (5) showed highly significant mean squares for all traits except lint percentage and mean length. Females mean squares were insignificant for yield and yield components traits except lint percentage, while, fiber traits were highly significant differences except for yarn strength. Abo-Arab *et al.* (1992) found significant differences for male or female variance for lint percentage, while male x female interaction was insignificant in all traits and the variance due to males was either greater or smaller than the variance due to females for most studied traits, these results may suggest that maternal effect might play some role in the inheritance of these traits.

Table 4. Contribution as percent of males, females and interaction for all studied traits.

Traits / Sources	S.C.Y/P.	L.Y./P.	L%	B.W	SI	LI	M.L	H.F	M.C	H.W	Y.S.
Females (P)	4.36	0.95	24.39	1.28	10.57	8.18	5.51	13.08	14.85	1.68	0.11
Males (F_2)	91.87	94.61	56.03	89.74	66.58	91.05	94.17	86.85	79.25	96.14	99.73
M x L interaction	3.77	4.44	19.59	8.97	22.85	0.77	0.31	0.06	5.9	2.18	0.16

Where:

P = Percentage contribution of Giza 88 and Pima S_6 for progenies of biparental hybrids.

F_2 = percentage contribution of F_2 in biparental hybrids progenies

P = L M = F_2

The females x males interaction mean squares were insignificant for all traits, indicting that the male or female changes with similar magnitudes in this traits. El-Harony (1999), showed highly significant mean squares of males and females in biparental progenies of Karshenseky-2 x Giza 85 F_2 with its parents for seed cotton yield/plant, lint percentage and lint index. Also, mean squares of males for boll weight and of females for seed index were significant while, of males for seed index and of females for boll weight were insignificant. The female x male interaction mean squares were significant for seed cotton yield/plant, seed index and boll weight and insignificant for lint percentage and lint index. Significant males x females interaction mean squares for any treatment that females behaved somewhat differently from male to another and these males differed markedly in their genetic background and proved efficient in evaluating the females different ranking. On the other hand, these results indicated the break up of linkage between genetic factors which controlled these traits. Abo-Arab (1999) reported significant or highly significant sets mean squares in the cross "TNB_1 x G. 76" F_2 with its parents for all traits except number of seeds/boll, while, lint percentage only was significant in the cross "TNB_1 x G. 75" F_2 with its parents. Also, males, females and their interaction in sets had significant or highly significant mean squares for lint percentage, seed index and lint index, indicating both additive and non additive variances controlled these characters. Values of females were intermediate, but they were higher than those interaction (M x L) for seed cotton yield/plant, lint percentage, lint index, mean length, half fall and micronaire reading (Table 4).

Ratios of σ^2A, σ^2D and σ^2E as a proportion of σ^2p for cotton hybrids are summarized in Table (6). Additive variance accounted for the major proportion of the phenotypic variance for all traits. These results assured that additive effect is playing the major role in the inheritance of these traits. So, direct selection could improve these traits. Tang *et al.* (1993a) and Zeina *et al.* (1991) found significant general (GCA) and specific (SCA) combining ability mean squares and GCA were larger than SCA for lint yield, lint index and boll weight. The estimates of environmental variances were generally small for all studied traits except for yarn strength while, the dominance variances were not affected in these traits. This resulted in high heritabilities in narrow sense for all traits suggesting the high value of σ^2A and small value of σ^2e.

The estimates of genetic (RG) and phenotypic (RP) correlations among yield and it components and fiber traits are presented in Table 7 for most pairs of traits RG and RP were of comparable magnitude. Seed cotton yield/plant showed high positive significant RA, RG and RP with lint yield, boll weight , seed index and mean length, while it showed negative significant RA, RG and RP with lint percentage, half fall and micronaire reading were accounted. The RA associations suggested that selection for high yielding pure lines within these population is effective. The RD was high positive significant with lint index, half fall, hair weight and yarn strength indicating that these traits had dominance variance. The RD correlations suggest that the same combinations should occur with hybrids. Lint yield showed high positively RA, RC and RP with most traits. RA, RG and RP were positive significant for lint percentage with boll weigh, lint index, half fall and hair weight, suggesting the important role of additive inheritance of these traits and indicated that indirect selection for these traits could be achieved by selection for high values of lint percentage. While, negatively significant RA, RG and RP for lint percentage with seed index and mean length were recorded.

Also, significant positive correlations were obtained between boll weight and each of mean length, half fall and hair weight for RD, RG and RP was shown. Moreover, the rest of the traits revealed significant or insignificant positive or negative correlations with these parameters. Several of the residual correlation values (RE) are shown in Table 7. Seed cotton yield/plant showed significant and positive RE with lint yield/ plant, boll weight, hair weight and yarn strength and lint yield plant with boll weight, lint percentage, seed index, lint index, mean length, half fall, hair weight and yarn strength Such RE values suggest that field management might increase seed cotton yield/plant and lint yield/plant by increase boll weight Bing Tang *et al.*, 1996 and El-Harony 1999 obtained the same results. When RE values are significant, these mean that selection within this genetic material is less effective. Dominance correlations have highly negative significant values for any two pairs traits indicating that selection in these populations is so difficult (Meredith 1984).

The RA, RD and RE values reported herein provide useful information that may be valuable for cotton breeders attempting to maximize breeding efforts for yield and its components in biparental progenies.

The present data support the previous studies which showed evidence that linkage associations among these traits were broken up by biparental cross combinations as shown in Tables 2 and 3, both seed cotton yield/plant and lint yield/plant with males No. 4 and 5 in set I and III and for mean length and microniare reading with male No. 4 in set I and males 2 and 3 in set III. From these biparental progenies we can high yielding obtain high yielding strains. However, data on biparental crosses was collected and new arrangement of linkage genes can only occur between heterozygous chromosome segments. Miller and Rawlings (1967) accomplished this by beginning with the F_2 generation and maintaining plants for six generation in an isolated block, where the mating system was mixed intermitting and selfing (approximately 50% self-pollination). Meredith & Bridge (1971) accomplished this through two generation of random intermitting after reaching F_3.

Table 5. Mean square estimates for yield and its components and fiber traits in 1999 season.

Source of variation	d.f	MS										
		S.C.Y/P.	L.Y./P.	L%	B.W	SI	LI	M.L	H.F	M.C	H.W	Y.S
Sets	3	242.89**	34.55**	5.05	0.26**	0.99**	1.02**	0.0003	8.16**	0.41**	569.3**	132961.62**
Rep/sets	8	6.94	0.86	1.83	0.035	0.18	0.33	0.0001	2.49	0.07	25.07	26196.58
Females in sets	4	8.56	0.3	12.3**	0.005	0.08	0.12	0.0007**	7.26**	0.21**	33.92*	269.55
Males in sets	16	45.08**	7.50**	7.06**	0.088**	0.22**	0.19*	0.004**	12.04**	0.28**	485.6**	60782.21**
Fem. x mal. interaction in sets	16	1.85	0.35	2.47	0.009	0.002	0.064	0.0001	0.008	0.2	11	96.58
Error	72	5.33	0.78	2.53	0.029	0.064	0.101	0.00021	1.001	0.05	2.33	6937.19

* and ** significant level at 5% and 1%, respectively.

Table 6. Estimates of proportion of variance components and heritabilities for yield and yield components and fiber traits.

Traits parameters	S.C.Y/P.	L.Y./P.	L%	B.W	SI	LI	M.L	H.F	M.C	H.W	Y.S
σ^2A/σ^2P	0.94	0.94	0.78	0.97	0.63	0.83	0.96	0.95	0.56	0.97	0.94
σ^2D/σ^2P	0	0	0	0	0	0	0	0	0.37	0.02	0
σ^2E/σ^2P	0.06	0.06	0.22	0.01	0.37	0.16	0.02	0.04	0.06	0.002	0.06
σ^2G/σ^2P	0.94	0.94	0.78	0.97	0.63	0.83	0.96	0.95	0.93	0.99	0.94
h^2_n%	94	94	78	97	63	83	96	95	56	98	94
σ^2P	28.2	4.74	3.86	0.04	0.09	0.12	0.03	7.69	0.27	328.76	38209.07

Table 7. Estimate of correlation coefficient among yield and its components and fiber traits of biparental progenies.

Traits	Parameters	S.C.Y/P	L.Y.P.	L%	B.W	SI	LI	M.L	H.F.	M.C	H.W.	Y.S.
S.C.Y/P	RA		0.997**	-0.42**	0.50**	0.98**	-0.93**	0.77**	-0.51**	-0.29**	0.03	0.065**
	RD		0.999**	0.212	-0.49**	-0.97**	0.79**	0.72**	0.79**	-0.4**	0.22*	0.98**
	RG		0.996**	-0.56**	0.35**	0.95**	0.53**	0.74**	-0.61**	-0.38**	-0.3**	0.51**
	RE		0.999**	-0.96**	0.29**	-0.50**	-0.99**	-0.95**	-0.83**	-0.06**	0.99**	0.99**
	RP		0.997**	-0.55**	0.38**	0.88**	-0.89**	0.72**	-0.54**	-0.42**	0	0.56**
L.Y.P.	RA			-0.37**	0.54**	00.98**	0.92**	0.78**	-0.48**	-0.33**	0.09	0.61**
	RD			-0.18*	-0.48**	-0.96**	0.78**	-0.36**	0.78**	-0.37**	0.24**	0.99**
	RG			-0.48*	0.29**	0.92**	0.84**	0.70**	-0.55**	-0.31**	0.05	0.57**
	RE			0.40**	0.23**	-0.44**	0.86**	0.96**	0.99**	0.05	0.99**	0.99**
	RP			-0.49**	0.44**	0.87**	0.89**	0.72**	-0.48**	0.41**	0.07	0.61**
L%	RA				0.57**	-0.53**	0.26*	-0.24*	0.97**	-0.18	0.77**	0.49**
	RD				-0.55**	-0.27*	-0.06	0	-0.01	0.96**	0.13	0.05
	RG				0.63**	-0.74**	0.51**	-0.36**	0.95**	0.97**	0.80**	0.21
	RE				-0.48**	-0.49**	0.78**	0.72**	0.83**	-0.72**	0.47**	0.44**
	RP				0.54	-0.69**	0.44**	-0.41**	0.96**	0.80**	0.75**	0.36**
B.W	RA					0.37**	-0.35**	0.52	0.48**	-0.32**	0.70**	9.99**
	RD					-0.32**	0.07	0.87**	0.73**	-0.29**	0.56**	-0.42**
	RG					0.03*	-0.33**	0.45**	0.64**	0.79**	0.73**	0.93**
	RE					-0.92**	-0.21	0.05	-0.19	0.13	0.27**	0.30**
	RP					0.04	-0.48**	0.40**	0.59**	0.55**	0.73**	0.97**
SI	RA						-0.76**	0.67**	-0.63**	-0.35**	-0.02	0.45**
	RD						-0.61**	0.26*	-0.61**	-0.18	-0.46**	-0.94**
	RG						-0.91**	0.78**	-0.71**	-0.57**	-0.33**	-0.30**
	RE						-0.89**	-0.23*	0.06	-0.43**	-0.49**	-0.48**
	RP						-0.60**	0.37**	-0.77	-0.79**	-0.03	0.24*
LI	RA							-0.94**	0.29**	0.02	0.73**	-0.69**
	RD							-0.60**	0.99**	-0.26*	-0.40**	0.81**
	RG							-0.96*	0.41**	0.31**	0.23*	-0.49**
	RE							0.96**	0.99**	-0.21*	0.87**	0.86**
	RP							0.95**	0.32**	0.09	0.13	-0.63**
M.L	RA								-0.21*	0.32**	-0.21*	0.58**
	RD								-0.57**	-0.47**	0.49**	-0.30**
	RG								0.95**	-0.12	0.23*	0.96**
	RE								-0.19	-0.14	0.21*	0.53**
	RP								-0.22*	0.08	-0.19	0.53**
H.F.	RA									0.06	0.61**	0.40**
	RD									-0.29**	-0.39	0.82**
	RG									-0.32**	0.86**	0.84**
	RE									0.95**	0.62**	0.36**
	RP									0.93**	0.61**	0.38**
M.C	RA										-0.73**	-0.33**
	RD										0.34**	0.09
	RG										0.4	0.04
	RE										0.84**	0.59**
	RP										0.36**	0.41**
H.W.	RA											0.67**
	RD											0.2
	RG											0.99**
	RE											0.66**
	RP											

REFERENCES

1. Abo-Arab, A.R. 1999. Using biparental mating system for encouraging desirable recombinations in cotton Minufiya. J. Agric. Res. Vol. 24(1999) No. 6: 1999-2014.

2. Abo-Arab, A.R., I.A.I. Helal and H.A. El-Harony. 1992. Combining ability for some agronomic and fiber properties in cotton. Monofiya J. Agric. Res. 7: 127-139.

3. Comstock, R.E. and H.F. Robinson. 1952. Estimation of dominance of genes, In: J.W. Gowen (sd), Heterosis pp. 494-516. Iowa State College Press, Ames.

4. El-Harony, H.A. 1999. Evaluation of genetic variances and correlations between cotton yield and its components among biparental progenies. (1999). J. Agric. Sci. Mansoura Univ., 24(3): 935-944.

5. Meredith, W.R.Jr. 1984. Quantitative genetics. In: R.J. Kohel and C.F. Lewis (Eds), cotton agron ser Monger No. 24, pp. 131-150 Crop Sci. Soc Amer, Madison, W.I.

6. Meredith, W.R.Jr. 1990. Yield and fiber-quality potential for second-generation cotton hydrides. Crop Sci. 30: 1045-1048.

7. Meredith, W.R.Jr. and R.R. Bridge. 1971. Break up of linkage blocks in cotton, *Gossypium hirsutum* crop Sci. 11: 695-698.

8. Miller, P.A. and J.O. Rawlings. 1967. Break up of initial linkage blocks through inter mating in a cotton breading program. Crop Sci. 7: 194-204.

9. Tang, B., J.N. Jenkins, I.C. McCarty Jr. and C.E. Watson. 1993a. F_2 hybrids of host plant germoplasm and cotton cultivars: I- Heterosis and combining ability for lint yield and yield components, Crop Sci. 33: 700-705.

10. Tang, B., J.N. Jenkins, J.C. McCarty Jr. and C.E. Watson. 1993b. F_2 hybrids of host plant germoplasm and cotton cultivars: II- Heterosis and combining ability for fiber properties. Crop Sci. 33: 706-710.

11. Tang, B., J.N. Jenkins, C.E. Watson, J.C. McCorty and R.G. Greech. 1996. Evaluation of genetic variances, heritabilities, and correlations for yield and fiber traits among cotton F_2 hybrid populations. Euphytica 91: 315-322.

12. Zeina, A.M. 1991. Types of genetic variations controlling the inheritance of quantitative traits of cotton hybrids. Ph.D. Thesis, Fac. of Agric., Mansoura University.

استخدام نظام التزاوج الرجعى للجيل الثانى مع الاباء لانتاج تراكيب جديدة مبشره فى القطن

عبد المعطى محمد على زينه

معهد بحوث القطن - مركز البحوث الزراعية

اجريت هذه الدراسة بمزرعة محطة البحوث الزراعية بسخا خلال موسمى ١٩٩٨ ، ١٩٩٩ بغرض استخدام التزاوج الرجعى للجيل الثانى مع الاباء Biparental mating system باستخدام (North Carolina Design III) فى كسر الجاميع الارتباطية غير المرغوبة والحصول على تراكيب جديدة مبشرة.

فى موسم ١٩٩٨ تم زراعة الجيل الثانى للهجين (جيزة ٨٨ × بيما س٦) مع كل من ابويه ثم تم التهجين بين اربعة مجموعات كل مجموعة مكونة من خمس نباتات مختارة عشوائيا من الجيل الثانى (كأب) مع نفس المجموعات والنباتات لكل الابوين (كأمهات) وتم الحصول على اربعين هجين عبارة عن ٢٠ هجين رجعى مع جيزة ٨٨ (female) و ٢٠ هجين رجعى مع البيما س٦ (female) تم زراعة ٤٠ هجين مع الاباء موسم ١٩٩٩ ودرست صفات محصول القطن الزهر/نبات ، محصول الشعر/نبات ، تصافى الحليج ، وزن اللوزة ، معامل البذرة ، معامل الشعر ، متوسط الطول ، منتصف السقوط ، قراءة المكيرونير ، النعومة بالوزن ومتانة الشلة.

وكانت أهم النتائج المتحصل عليها ما يلى:

١- كان متوسط النسل الناتج من الجيل الثانى مع جيزة ٨٨ اعلى من نسل الجيل الثانى مع بيما س ٦ والاباء النقية لصفات محصول القطن الزهر/نبات ، محصول الشعر/نبات ، تصافى الحليج ،وزن اللوزة ، معامل البذرة ، معامل الشعر ، متوسط الطول ، قراءة الميكرونير ومتانة الشله.

٢- كانت الفروق معنوية بين الهجن الناتجة من الاباء النقية (أمهات) مع بعض الاباء F2 لمعظم الصفات المدروسة ومع معظم الاباء لصفتى النعومة بالوزن ومنتصف السقوط وأيضا كل من محصول الزهر/نبات ومحصول الشعر/نبات للاب ٤ ، ٥ فى المجموعة الاولى والمجموعة الثالثة وصفة الطول المتوسط وقراءة الميكرونير للاب ٤ فى المجموعة الاولى والاب ٢ ، ٣ فى المجموعة الثالثة كانت معنوية ويتضح من ذلك امكان استخدام طريقة التهجين هذه لكسر ارتباط غير المرغوب والحصول على تراكيب وراثية جديدة ومبشرة تفوق الاباء.

٣- كان التباين الرجعى للاباء اكبر من التباين الرجعى للامهات لمعظم الصفات تحت الدراسة وهذا يوضح ان التأثير الاموي يلعب دور ما فى وراثة هذه الصفات.

٤- كانت قيم المساهمة النسبية للاباء اعلى من قيم مساهمة الامهات وتفاعل الاباء والامهات لكل الصفات المدروسة وكانت قيم مساهمة الامهات متوسطة ولكنها اعلى من قيم تفاعل الاباء مع الامهات لصفات محصول القطن الزهر/نبات ، تصافى الحليج ، معامل الشعر ، الطول المتوسط ، منتصف السقوط وقراءة الميكرونير بينما كانت قيم مساهمة التفاعل الاباء مع الامهات اعلى

من قيم مساهمة الامهات لصفات محصول الشعر/نبات ، وزن اللوزة ، معامل البذرة ومتانة الشله.

٥- كانت مساهمة الصنف جيزة ٨٨ اكبر من الصنف بيما س٦ .

٦- كان تباين الاصناف (females) غير معنوى لكل صفات المحصول ما عدا تصافى الحليج وكان عالى المعنوية لصفات التيلة عدا متانة الشلة وكان التباين الراجع للجيل الثانى (males) معنوى جدا لكل الصفات.

٧- يمثل التباين المضيف جزء كبير من التباين المظهرى لكل الصفات وهذه النتائج تحققت بارتفاع قيم المكافئ الوراثى فى المعنى الضيق.

٨- كان معامل الارتباط المضيف والوراثى والمظهرى موجبا وعالى المعنوية بين محصول القطن الزهر/نبات مع محصول الشعر/نبات ، وزن اللوزة ، معامل البذرة وطول التيلة بينما كان سالبا ومعنوى مع تصافى الحليج ، منتصف السقوط وقراءة الميكرونير وايضا كان معامل الارتباط السيادى موجب ومعنوى مع صفات معامل الشعر ، منتصف السقوط ، النعومة بالوزن ، متانة الشلة واظهر معامل الارتباط المضيف والوراثى والمظهرى لصفة محصول الشعر/نبات ارتباط موجب ومعنوى مع اغلب الصفات كما كان معامل الارتباط المضيف والوراثى والمظهرى موجب وعالى المعنوية لصفة تصافى الحليج مع وزن اللوزة ، معامل الشعر ، منتصف السقوط والنعومة بالوزن بينما كان الارتباط المضيف والوراثى والمظهرى سالب ومعنوى لصفة تصافى الحليج مع معامل البذرة ومتوسط الطول وعندما يكون الارتباط المضيف موجبا بين صفتين فانه يمكن الانتخاب لاى من الصفتين لتحسين الصفة الاخرى اما عندما يكون معامل الارتباط السيادى موجب فانه يمكن الاستفادة من قوة الهجين.